

EUROPEAN HIP SOCIETY



15TH CONGRESS OF THE EUROPEAN HIP SOCIETY

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ABSTRACT BOOK

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EHS23-2064

Short stems

Oral

The outcome of 394 consecutive cemented Exeter short stems used in primary total hip arthroplasties with a maximum follow-up of 28 years

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Objectives: Although data on uncemented short stems are available, studies on cemented short-stemmed THAs are limited. We examined the long-term follow-up of cemented short Exeter stems used in primary THA.

Methods: Within the Exeter stem range, 7 stems have a stem length of 125 mm or less. These stems are often used in small patients and in patients with a narrow femoral canal or with anatomical abnormalities. In this prospectively collected study, we included 394 consecutive cemented Exeter stems used in primary THA (n=333 patients) with a stem length ≤ 125 mm implanted in our centre between 1993-2021. Kaplan-Meier survival analyses were performed to determine 20-year survival rates with stem revision for any reason, for septic loosening, for aseptic loosening and for femoral component fracture as endpoints.

Results: The proportion of male patients was 21%. Median age at surgery was 42 years (IQR: 30-55). The main indication for primary THA was childhood hip diseases (51%). Median follow-up was 6.7 years (IQR: 3.1-11.0). The 20-year stem survival rate of the short stem was 85.4% (95% CI: 73.9-92.0) for revision for any reason and 96.2% (95%CI: 90.5-98.5) for revision for septic loosening. No stems were revised for aseptic femoral loosening. There were 4 stem fractures at 6.6, 11.6, 16.5 and 18.2 years of follow-up. The stem survival with femoral component fracture as endpoint was 92.7% (95%CI: 78.5-97.6) at 20 years.

Conclusion: Cemented short Exeter stems in primary THA show acceptable stem survival rates at long-term follow-up. Although femoral component fracture is a rare complication of a cemented short Exeter stem, orthopaedic surgeons should be aware of its incidence and possible risk factors.

Keywords:

Cement, short stem, primary total hip arthroplasty, long-term follow-up, femoral component fracture

EHS23-2046

Short stems

Oral

Is a Type 2B Short Stem Adequate in Patients with Proximal Femoral Deformities?

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Objectives: We sought to determine the short to medium-term outcomes using a short stem in young adults with a proximal femoral deformity (PFD).

Methods: We prospectively studied 31 patients (35 hips) with PFDs treated with uncemented primary total hip arthroplasty using short stems with cervicometaphyseal fixation between 2011-2018. There were 19 male (23 hips) patients. Twelve cases had previous surgical procedures, and 6 of them were failed childhood osteotomies. Mean age was 44 ± 12 years, mean follow-up was 81 ± 27 months, and no patients were lost to follow-up. PFDs were categorized according to a modified Berry classification. Average preoperative leg-length discrepancy (LLD) was -16.3 mm (-50 to 2).

Results: At a mean time of 81 months of follow-up, survival rate was 97%, taking revision of the stem for any reason and 100% for aseptic loosening as endpoints. No additional femoral osteotomy was required in any case. Average surgical time was 66 minutes (45 to 100). There was a significant improvement in the mHHS score when comparing preoperative and postoperative values (47.3 ± 10.6 vs. 92.3 ± 3.7 , $p=0.0001$). Postoperative LLD was, on average, 1 mm (-9 to 18) ($p=0.0001$). All stems were stable without signs of loosening. Postoperative complications included 1 pulmonary embolism, 1 neurogenic sciatic pain, 1 transient sciatic nerve palsy that recovered completely after 6 months, and 2 acute periprosthetic joint infections. One patient suffered a Vancouver B2 periprosthetic femoral fracture 45 days after surgery and was revised with a distally fixed fluted stem.

Conclusion: A type 2B short stem evidenced promising outcomes at short to medium-term follow-up in young adult patients with PFDs, avoiding the need for corrective osteotomies and revision stems.

Keywords:

Proximal femoral deformity; Femoral reconstruction; Total hip arthroplasty; Short stems; Outcomes; Complications

EHS23-2141
Short stems

Oral

Long-Term Outcomes with a Partial Neck-Preserving Cementless Short Stem in Primary Total Hip Arthroplasty for Young Patients

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Objectives: The popularity of short femoral stems in Total Hip Arthroplasty (THA) has risen due to the preservation of bone and promotion of physiological loading. However, concerns persist about their long-term durability. This study aimed to assess the long-term results of THA patients who received a cementless short stem regarding clinical outcomes, bone changes, complications, and incidence of femoral revision.

Methods: We analyzed 77 patients (56% males, mean age of 47 ± 7 years) who underwent THA with cementless short stem MiniHip (Corin, Cirencester, UK), performed by a single surgeon over 93 hips between 2010 and 2013. Patient's Harris hip score (HHS), the University of California, Los Angeles activity score (UCLA), and radiographic outcomes were evaluated. Stem survival was assessed through an incidence density rate.

Results: The median follow-up was 120 months (IQR 57.5-136.5), with 47 patients having a minimum 10-year follow-up. The patient's HHS improved significantly ($p < 0.001$) and UCLA's score was 7 (SD 1.7) at the final follow-up. Dorr cortical bone types were 29.8% (23/77) A, 63.6% (49/77) B, and 6.49% (5/77) C. No osteolysis, radiolucency, thigh pain, periprosthetic or ceramic fractures were observed. Only 8% experience squeaking without the need for revision. Two acetabular components were revised early, but no stem failures were recorded, yielding an incidence density rate of 0% (95% CI 0-0.05%) over 10 years.

Conclusion: This study showed that the MiniHip short stem is a reliable option for THA in younger patients, with a high implant survival rate and excellent functional outcomes over the long term. The results suggest it is a viable alternative to traditional-length stems, but further research is necessary to validate these findings.

Keywords:

Total Hip Arthroplasty / Cementless Short Stem / Young Patients

EHS23-2342

Short stems

Oral

Age, gender and BMI in short stems

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Objectives: The use of short stems has shown excellent survival rates. Obesity, higher functional demand in male and ageing are known as risk factors for with greater mechanical stress on bones and subsequent aseptic loosening.

The main objective was to show that there is no difference in implant survival and functional results regarding of age, gender and bone mass index (BMI) using calcar-guided short stem.

Methods: In this retrospective, single center study, we included 535 hips on 480 patients operated for a total hip replacement using a single design (Optimys Mathys®) between 2014 and 2019 from consecutive patients after ethics committee approval. We collected Harris Hip score, Forgotten Joint Score (FJS) and WOMAC, and follow-up was made using PROMs using a digitalized tool Orthense®. Data were analyzed per groups: age (< or > 70 years), gender and BMI.

Results: Concerning the survival of the implants, 6 revisions (1.1%) of stems were revised the entire duration of the follow-up. At 48 months of follow-up, overall survival was 98.48% IC95 [96.37-99.37]. There was no difference between the overall survivals according to age groups ($p = 0.384$), gender ($p = 0.186$), or BMI ($p = 0.146$).

The multivariate analysis considering the sex, age and BMI of the patients showed better clinical scores for male, HHS OR = 1.64 IC95 [1.16 - 2.3] and WOMAC OR = 1.43 IC95 [1.04 - 1.95]. Analysis showed obesity negatively influences clinical scores OR = 0.623 IC95[0.426 - 0.910]. There was no other difference between the group < 70 years and >70 years for all the other postoperative scores, HHS ($p = 0.582$), WOMAC ($p = 0.520$), and FJS ($p = 0.394$).

Conclusion: Although functional outcomes may vary, age, gender and obesity do not appear to be limiting factors for the use of short stems.

Keywords:

short stems, THA, BMI, age, gender

EHS23-2313

Short stems

Oral

RSA migration analysis and clinical results of the A2 short stem - a prospective randomized study comparing different implant coatings

List of authors:

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Objectives: New implants have to prove their reliability in prospective studies. This study analyses the A2 short stem (introduced in 2016) clinically and by means of radiostereometry analysis (RSA). The influence of an additional calcium phosphate (CaP) coating on the titanium plasma spray (TPS) surface is analyzed.

Methods: This prospective randomized study includes 60 patients treated with the A2 short stem (Artiqo, Luedinghausen, Germany). The implant coating (CaP vs. TPS) was randomized 1:1. RSA baseline analysis was conducted prior to first mobilization, follow-up measurements were performed at 1 week, 6 weeks and at 3, 6, 12, and 24 months. Follow-up examinations included the following outcome scores: Harris Hip Score (HHS), Forgotten Joint Score (FJS), Short-Form-36 (SF-36) and Hip Osteoarthritis Outcome Score for Joint Replacement (HOOS-JR).

Results: Clinical outcome parameters showed excellent results - mean values after 24 months were: HHS 95,2; FJS 74,6; SF36 PCS 52,9; SF-36 MCS 51,2; HOOS-JR 92,5. The additional CaP coating did not show any impact on clinical results. 2 stems were revised due to increased early migration and aseptic loosening.

RSA showed a prognostically favourable migration pattern with moderate initial migration (0.74 ± 1.11 mm after 6 months) and secondary stabilization. Already at 1 week after surgery (0.27 ± 0.13 mm) 67% of the implants had reached their final position. The CaP group showed a significantly higher migration after 6 weeks and after 3, 6 and 12 months.

Conclusion: The analyzed short stem showed excellent clinical results. RSA evaluation implies reliable osseointegration. An additional CaP coating did not influence clinical results, but was associated with slightly increased implant migration.

Keywords:

short stem; hip arthroplasty; RSA; migration; implant coating

EHS23-2082
Short stems

Oral

Clinical and radiological outcomes of an uncemented metaphyseal short stem at minimum 10 years follow-up: a prospective observational study

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Objectives: There is growing interest around short stems as they provide a less invasive approach for total hip arthroplasty preserving bone stock for a possible revision surgery if required. The main purpose of this work was to assess the long-term performance of an uncemented metaphyseal short stem in terms of survival rate and in addition its clinical and radiological outcomes.

Methods: From January to December 2010, we prospectively enrolled all consecutive patients undergoing primary total hip arthroplasty in our institution with a minimum clinical and radiological follow-up of 10 years. The clinical outcomes were measured using the HHS and the radiological measured indices were stem alignment, sinking and zonal analysis (radiolucencies, stress shielding)

Results: 137 patients (164 hips) were finally included and the measured survival rate of the stem with the Kaplan-Meyer analysis at 10 years was 99.6%, considering only aseptic loosening as failure. The average HHS increased from 55.0 preoperatively to 97.8 at the last follow-up ($p < 0.0001$). Mild varus malalignment was observed in 40% of cases and remained stable in the serial X-rays and was not associated with step loosening. Mild stress shielding was observed around 13 stems (9%) and moderate only around 3 implants.

Conclusion: In conclusion, the uncemented metaphyseal short stems showed excellent survival and clinical results at 10 years and from a radiographical point of view very low stress shielding was observed, moreover besides the high frequency of varus alignment the implanted stem was not associated with revision surgery or with worse clinical outcomes.

Keywords:

THA, short stem, long-term, outcomes

EHS23-2186
Short stems

Oral

Partial neck preserving Short-stemmed Total Hip Arthroplasty in patients under 25 years old: Preliminary results with a minimum 2-year follow-up

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Objectives: To analyze the survival and functional outcomes of short stems in patients under 25 years old at a minimum follow-up of 2 years

Methods: We prospectively studied 23 patients (26 hips) under 25 years treated with primary total hip arthroplasty using a partial neck-preserving cementless short stems between 2011-2022. Mean age was 19 ± 3.9 years, and mean follow-up was 52 ± 28 months. The most frequent cause of surgical indication was avascular necrosis ($n=11$), followed by hip dysplasia ($n=4$), sequelae of septic arthritis ($n=4$), idiopathic chondrolysis ($n=3$), sequelae of trauma ($n=2$), pigmented villonodular synovitis ($n=1$) and synovial chondromatosis ($n=1$).

Results: At the latest follow-up, implant survival was 100%. The average length of hospitalization was 2.4 days ± 1.1 . The bearing surface used was ceramic on highly cross-linked polyethylene in 17 cases and ceramic on ceramic in the remaining 9. A significant improvement was evidenced in the visual analogue pain scale comparing preoperative and postoperative values (8 ± 1.5 vs. 1 ± 1.2 $p<0.001$), while Merle D' Aubigné score improved from 7.8 ± 3.2 to 17.4 ± 0.7 postoperatively ($p<0.001$). The Harris hip score improved from 34.0 ± 13.7 to 91.0 ± 17.4 ($p<0.001$). Three patients had surgery-related complications, including 1 sciatic nerve palsy, 1 peroneal nerve palsy and 1 deep infection; treated with early debridement, antibiotics and implant retention. Femoral neck preservation was on average 20.4 mm (14 to 35) and the dyaphysis was invaded by the stem on average of 32 mm (20 to 52).

Conclusion: Bone preserving short stems evidenced promising outcomes at short term follow-up in patients under 25 years old.

Keywords:

Young patients; Bone preserving; Short stems; Total hip arthroplasty; Outcomes

EHS23-2089
Short stems

Oral

Long-term results of the optimys short stem: Preliminary data of a prospective multi-center observational study including the first 879 hips ever worldwide.

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Objectives: Short stems are a bone and soft-tissue preserving alternative to conventional stems in total hip arthroplasty, however, long-term results are scarce.

The aim of this multicenter study is to present the long-term outcomes of a calcar-guided short stem.

Methods: This is a prospective case series of 879 THAs performed on 782 patients across five centers using identical calcar-guided short stems (optimys, Mathys Ltd., Bettlach, Switzerland).

In a long-term follow-up (>10 years), rates and reasons for complications and revisions were documented. The Harris Hip Score (HHS) was obtained; patients reported pain and satisfaction using a visual analog scale. In addition, standardized radiographs were analysed for radiographic alterations.

Results: As of today, 175 cases have been completely investigated at a follow-up of >10 years (mean 123.5 months, range: 115.7-143.1 months). A total of 61 patients died in the study cohort for non-related reasons. Mild postoperative complications occurred in 86 cases (9.8%), most of which resolved without further intervention. Over the course of the study, stem revisions occurred in 18 cases due to fractures (0.6%), aseptic stem loosening (0.5%), infections (0.2%) and other causes (0.3%). The survival rate (endpoint: all revisions) was 98.4% at 10 years.

Clinical results were excellent. Only few radiographic alterations were detected without clinical correlation.

Data evaluation will be continued until the end of the year.

Conclusion: These preliminary results provide the first long-term data of this particular stem philosophy. The investigated short stem produced highly satisfactory outcomes at long-term. A final evaluation is pending.

Keywords:

short stem, calcar-guided, optimys, long-term data

EHS23-2190
Short stems

Oral

Is a Partial Neck-Preserving Cementless Short Stem a Suitable Option for Dorr Type A Femurs?

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Objectives: Total hip arthroplasty (THA) in patients with Dorr Type A femurs presents challenges due to the narrow medullary canal and thick cortical bone. The use of short stems has been proposed to address these challenges, but their efficacy in this patient population is not well-established. This study aims to evaluate the clinical and radiographic outcomes of using a partial neck-preserving short stem in primary THA for Dorr type A femurs.

Methods: A total of 59 patients (87 hips) who underwent primary THA with a partial neck-preserving cementless short stem between December 2010 and July 2017 were analyzed. All femurs were classified as type A bone according to Dorr's criteria. The surgical technique involved a posterolateral approach. Clinical, radiologic evaluations, and stem survivorship were assessed at a mean follow-up of 45.4 months (range, 24-60).

Results: The mean age of patients was 47 ± 5.38 years. The mean Harris Hip Score improved significantly from 60.8 ± 11.9 (43-79) preoperatively to 97.01 ± 2.2 (79-100) at the last follow-up. Mean diaphyseal stem invasion was 54.29 (16.93). No major perioperative complications occurred. Three intraoperative incomplete calcar fractures were treated with cerclage wires and partial weight bearing, without any subsequent stem failure. Final follow-up revealed successful radiographic osteointegration of the stem.

Conclusion: The use of a partial neck-preserving short stem is a suitable option for patients with narrow medullary canals and thick cortical bone. It significantly improves hip function with low risk of complications, including stem failure. These findings support the use of short stems in primary THA for Dorr type A femurs.

Keywords:

Total hip arthroplasty; Dorr Type A femurs; Short stem; Clinical and radiographic outcomes

EHS23-2033

Short stems

Oral

The influence of obesity on clinical outcomes of a short hip stem

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Objectives: To study the influence of obesity on clinical outcomes and complications after a total hip replacement using a short hip stem.

Methods: Prospective and multicenter study with a minimum one-year follow-up in which we compared clinical outcomes (Harris Hip Score and WOMAC) and complications between obese (BMI >30 kg/m²) and non-obese patients (BMI <30 kg/m²). All patients were treated with the same short hip stem (Furlong Evolution). Comparisons between groups were carried out using Student's t-test, Pearson's X² test - or Fisher's exact test - and one-way repeated measures ANOVA.

Results: Out of the 337 patients included, 241 of them (71.5%) were not obese and 96 (28.5%) were obese. The mean follow-up was 54 months. No statistically significant differences were found in age (p=0.174), height (p=0.227), or sex (p=0.694) between groups.

No statistically significant differences were found in the evolution of Harris Hip Score (44.86 vs 44.88, p=0.990), WOMAC pain (-8.89 vs -8.47, p=0.372), WOMAC stiffness (-4.68 vs -4.42, p=0.208) or WOMAC functional limitations (-34.66 vs -33.27, p=0.298) between groups.

No statistically significant differences were found in stem (p=0.760) or cup (p=0.875) malalignment. There were no revision surgeries in either group.

Although no statistically significant differences were found in intraoperative complications (p=0.559), there was a significantly higher rate of postoperative complications in obese patients (2 vs 11, p<0.001), being dislocation the most common one (1 vs 4, p=0.025).

Conclusion: No differences in clinical outcomes were found between obese and non-obese patients that were treated with a short hip stem, except for the postoperative complication rate, which was significantly higher in obese patients.

Keywords:

obesity, short stem, total hip arthroplasty, outcomes

EHS23-2317

Short stems

Oral

Cemented Exeter short stems performance compared with standard length Exeter stems: a retrospective comparative single surgeon 800 cases cohort study

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Objectives: Management of the dysplastic femur in total hip arthroplasty (THA) may involve short stems. The standard Exeter stem has 150 mm length with offsets ranging from 37.5 to 50 mm; however, 95-, 115-, and 125-mm length stems with offsets 35.5 mm or less are available for patients with smaller or dysplastic femurs. The behaviour of the smaller stems has not been wholly evaluated yet

Methods: This paper analysed data from the Arthroplasty Registry Thessaloniki comparing survivorship of short stems (offset 35.5 mm or less) with the standard stems (37.5 mm offset or greater). Complications and functional scores between groups were also compared.

Results: A single surgeon performed all THAs during the last decade. Primary hip osteoarthritis was the preoperative diagnosis in most cases. Seven hundred thirty two THAs with standard and 72 with short Exeter stems were included. The 1.4% of short stems had 30 mm, 8.9% had 33mm and 89.5% had 35.5mm offset. Demographics and follow up did not differ between groups. All procedures followed the same postoperative protocol. We had one dislocation in the short and two dislocations in the standard Exeter stem group. Three superficial infections were noted in the standard group that were not revised. The cumulative 6-year survival rate for any reason was 99.1 % for the short stem group and 97.8 % for the standard stem group. The Kaplan Meier survival analysis demonstrated no significant difference between groups for any reason (log-rank test 0.493, $p= 0.483$). The mean postoperative scores were similar between groups.

Conclusion: Despite its use in a greater proportion of potentially more difficult developmental dysplasia of the hip cases, short stems demonstrated comparable survival than standard stems at mid-term follow-up.

Keywords:

DDH, short stems, Exeter stem, hip dysplasia

EHS23-2229

Oral

Outcomes / proms in Hip surgery

Comparison of oncologic and functional outcome after hip disarticulation, internal and external hemipelvectomies

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Objectives: The aim was to investigate and compare oncologic and functional outcome in hip disarticulations(HD), internal hemipelvectomies(IH) and external hemipelvectomies(EH).

Methods: This retrospective study of 207 patients who underwent either HD, EH or IH for a musculoskeletal tumor (19% chondro-, 8% Ewing-, 9% osteosarcoma, 22% other, 22% local recurrence tumor, 7% metastasis, 14% infection) at our hospital between 1995 and 2019. The mean follow-up time was 10 (1-25) years.

68 patients had HD (45m, 23f), 46 EH (24m, 22f), and 93 IH (53m, 40f). Overall survival was evaluated using Kaplan-Meier analysis and resection margin (R0 vs. R1/R2/RX), local recurrence and complication rates using the chi-square test. Functionality was assessed using MSTS and Toronto Extremity Salvage Score(TESS) and the Kruskal-Wallis test.

Results: At follow-up, 24% of HD, 17% of EH, and 43% of IH patients were alive. There was a significant difference in overall survival between the groups (median survival[95%-CI]: HD: 2.1 [1.1-3.1]years; EH: 1.2 [0.5-1.9]years; IH: 7.4 [1.3-13.6]years; $p<0.001$). Patients who received HD showed more frequent R0 resection (HD: 98% (39/40), EH: 75% (33/44), IH: 64% (59/92); $p<0.001$) and less frequent local recurrence (HD: 19% (7/36), EH: 24% (9/38), IH: 38% (35/92); $p=0.069$). There was no significant difference in complication rate ($p=0.341$). Survivors (Mean follow-up: HD: 7.4 years, EH: 11.1 years, IH: 11.6 years) showed a relevant difference in postoperative functionality (Mean MSTS and TESS: HD: 23%, 43%, EH: 44%, 75%, IH: 54%, 73%; p -values: 0.001 and 0.005, respectively).

Conclusion: Patients with internal hemipelvectomy showed improved survival and functional scores over the other procedures resulting in limb loss.

Keywords:

Tumor, Hemipelvectomy, Outcome, Hip Disarticulation

EHS23-2171

Oral

Outcomes / proms in Hip surgery

The Subjective Hip Value is a valid, reliable, and responsive instrument for assessing hip function in primary THA

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Objectives: Patient-Reported Outcome Measurements (PROMS) are an essential tool assessing hip function. Previously established PROMs such as the modified Harris Hip Score (mHHS) are multi-item scores that are time-consuming to collect and evaluate. The Subjective Hip Value (SHV), as a single item value, assesses hip joint function with only one question: "What is the overall percent value of your hip if a completely normal hip represents 100%?". No previous study investigated the psychometric properties of SHV in THA patients. Aims: To evaluate psychometric properties of the SHV in THA patients. Hypothesis: The SHV is a valid, reliable, and responsive instrument for assessing hip function in THA patients.

Methods: We conducted a prospective, monocentric cohort study of 137 patients who underwent THA between 6/20-8/21. SHV and mHHS were collected preOP and at follow-ups (6 weeks, 3 months, 6 months, 1 year). Validity, reliability, responsiveness, minimal clinical Important Difference (MCID) and floor/ ceiling effects were evaluated.

Results: Validity: There was a significant correlation ($p = 0.001$) preoperatively ($r = 0.532$), after 6 weeks ($r = 0.649$), after 3 months ($r = 0.765$), after 6 months ($r = 0.854$), and after 1 year ($r = 0.879$). Test-retest reliability ($p=0.001$) and responsiveness ($p=0.007$) showed significant correlations. The MCID for SHV was 10.06%. Floor and ceiling effects were low and comparable to the mHHS.

Conclusion: The Subjective Hip Value is a valid, reliable, and responsive instrument for the assessment of hip function in THA patients.

It can therefore be considered suitable for both preoperative assessment and postoperative follow-up assessment and is an easy to collect, time-efficient addition to existing multi-item scores.

Keywords:

Patient reported outcomes, Total hip arthroplasty

EHS23-2315

Oral

Outcomes / proms in Hip surgery

Influence of Tonnis grade and McKibbin index of the outcome of periacetabular osteotomy. A single surgeon series of 353 cases

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Objectives: The aim of this study was to evaluate the influence of pre-operative Tonnis grade of arthritis and pre-operative McKibbin index (sum of femoral and acetabular version) on the outcome of PAO.

Methods: A single-surgeon series of PAOs were identified from a prospectively collected database between January 2013 and March 2020. Minimally invasive Smith-Peterson approach was used to perform all PAOs. Pre-operative Tonnis grade and McKibbin index was calculated for each case. Patient reported outcome measures (PROMs), i-HOT 12, NAHS, UCLA and EQ-5D, were collected prospectively. Spearman correlation was calculated for Tonnis grade and McKibbin index with respect to the outcome scores at 6 and 12 months. Conversion to total hip arthroplasty was noted.

Results: A total of 352 PAOs were included for final analysis: 229 were unilateral and 123 were bilateral with a female preponderance (n=330). Pre-operative Tonnis grade was: grade 0 = 143 hips; grade 1 = 163 hips and grade 2 = 46 hips. Mean pre-operative McKibbin index was 33.40 (range -11.20 to 90.10). Pre-operative Tonnis grade had a negative correlation with EQ5D-VAS, and NAHS at 6 months but not at 1 year. Similarly pre-op McKibbin index had a negative correlation for iHOT-12 change at 6 months and EQ5D-VAS at 6 months. Four patients went on to have a total hip replacement, with a pre-operative Tonnis grade 1 in two cases and grade 2 in two cases.

Conclusion: A lower preoperative Tonnis grade was associated with better outcome at six months but not at 12 months. Selected patients with Tonnis grade one and two degeneration with dysplasia may still be candidates for PAO, after appropriate counselling and may take a longer time to recover. Pre-op McKibbin index had a negative correlation for PROMs at 6 months.

Keywords:

i-hot-12, peri-acetabular osteotomy, outcomes, minimally invasive surgery

EHS23-2103

Oral

Outcomes / proms in Hip surgery

Which factors are associated with a successful outcome following total hip replacement in patients with early radiographic osteoarthritis?

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Objectives: To assess which factors were associated with a successful total hip replacement (THR) in patients with early radiographic OA.

Methods: From a consecutive series of 1,935 patients undergoing THR we retrospectively identified 70 (3.6%) patients with early OA (Kellgren and Lawrence (KL) grades 0-2). These were compared with 200 patients with advanced OA (KL grades 3-4). Outcomes were Oxford Hip Scores (OHS), EQ-5D and EQ-VAS scores; compared preoperatively with one year postoperatively. We investigated which clinical and radiographic (plain x-ray, CT, MRI) features predicted successful THR. Success was defined as a postoperative OHS of 42 or more.

Results: The early OA group were significantly younger (61 vs 66 years; $P=0.0035$). There were no significant differences in BMI, ASA grade or gender. After adjusting for confounders, the advanced OA group had a significantly greater percentage of possible change (PoPC) in OHS (75.8% versus 50.4%; $P<0.0001$) and improvement in EQ-5D (0.151 versus 0.002; $P<0.0001$). There were no significant differences in complication, revision or readmission rates. In the early OA group, 16/70 (22.9%) patients had a 'successful' THR. Patients who had a 'successful' THR were significantly more likely to have subchondral cysts on CT/MRI (91.7% versus 57.7%; $P=0.0362$). The presence of cysts on CT/MRI was associated with a significantly greater PoPC in OHS (61.6% versus 38.2%; $P=0.0353$). The combination of cysts and joint space width <1 mm was associated with a PoPC of 68%.

Conclusion: We advise caution in performing THR in patients with early OA (KL grades 0-2) on plain radiographs. We advocate preoperative cross-sectional imaging in these patients. In the absence of cysts on CT/MRI, a THR is unlikely to provide a satisfactory outcome.

Keywords:

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EHS23-2312

Oral

Outcomes / proms in Hip surgery

Sexual function before and after peri-acetabular osteotomy: A study using the NAHR dataset

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Objectives: This study aims to describe trends in self-reported reported sexual function before and after PAO.

Methods: Adult (≥ 18 years) patients who underwent PAO for any indication between 1st January 2012 and 31st October 2020 were extracted from the UK Non-Arthroplasty Hip Registry. International Hip Outcome Tool 12 (iHOT-12) questionnaires were collected pre-operatively and at 6 and 12 months. Patients are first asked if 'questions about sexual activity are relevant to them'. The iHOT-12 then asks asking patients to quantify 'how much trouble they experience with sexual activity because of their hip?' with responses converted to a continuous scale (0-100) to measure function. Chi-squared and t-tests were used to compare categorical and continuous variables respectively.

Results: Of 854 procedures (89% female, mean age 31 years (SD 9)), 90% (680 of 759 respondents) indicated pre-operatively that questions about sexual activity were relevant to them (male 90%, female 90%). Overall, mean pre-operative sexual function increased from 38.6 (95%CI 36.4 to 40.9, n=607) to 60.9 (57.8 to 64.0, n=338) at 6 months, and 67.1 (64.0 to 70.3, n=342) at 12 months post-operatively.

At 12 months, both sexes saw significant improvement in their pre-operative sexual function scores ($p < 0.0001$). Males started from significantly higher baseline sexual function (61.6 vs 36.3) and achieved higher scores by 12 months (77.5 vs 66.1) compared to female patients. There was no significant difference in pre- or post-operative scores when comparing younger (< 40 years) and older (> 40 years).

Conclusion: Most patients can expect to experience improvement in their sexual function following PAO, regardless of sex or age group.

Keywords:

i-hot-12, peri-acetabular osteotomy, outcomes, sexual function

EHS23-2117

Oral

Outcomes / proms in Hip surgery

10-year results of an isoelastic monoblock cup made of highly cross-linked polyethylene infused with vitamin E: A prospective cohort study of 101 hips

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Objectives: Bone preservation is one of the main challenges in total hip arthroplasty (THA). The cementless titanium-coated, isoelastic monoblock cup with vitamin E-blended highly cross-linked polyethylene (VEPE) was introduced to the market in 2009 to increase the implant survival rate and decrease the aseptic loosening. The aim of the present study was to obtain long-term clinical follow-up data of the vitamys cup (Fa. Mathys, Bettlach, Switzerland).

Methods: This single-centre prospective study investigated 101 primary THA cases in 96 patients treated with a RM Pressfit vitamys cup. Clinical follow-up was performed using the Harris Hip Score (HHS), pain and satisfaction on a visual analogue scale (VAS). Radiological acetabular bone alterations and complications were documented.

Results: At minimum 10 years follow-up (mean 129.3 months, range: 126.1-148.9) 70 cases were analyzed. 24 cases were deceased with implants in situ. 7 cases were lost to follow-up. The mean HHS was 96.4, VAS satisfaction was 9.9, VAS rest pain was 0.0, and VAS load pain was 0.2. Radiographic analysis revealed one case with osteolysis without clinical symptoms. Two patients had a trauma-related periprosthetic fracture after 5 and 10 years. One patient had a persistent femoral nerve palsy. None of the patients required cup-related revision due to aseptic loosening, mechanical failure, or any other reason after 10 years.

Conclusion: After using vitamin-E blended HXLPE in cementless isoelastic monoblock cups, there were no obvious signs of aseptic loosening occurred. No patients required revision surgery after 10 years follow-up. A survival of 100% indicating reliable and encouraging long-term results for the titanium-coated RM Pressfit vitamys cup.

Keywords:

vitamys, VEPE, HXLPE, Vitamin E, THA

EHS23-2314

Oral

Outcomes / PROMS in Hip surgery

Functional and radiological outcomes of periacetabular osteotomy for hip dysplasia using a minimally-invasive approach - a single surgeon series with a minimum follow up of two years.

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Objectives: We conducted a retrospectively analyses of prospectively collected to evaluate (1) the extent of surgical correction in minimally invasive surgery (MIS) periacetabular osteotomy (PAO), (2) improvements in functional outcomes and any potential predictors and (3) complications of MIS-PAO.

Methods: 352 surgeries performed on 312 HD patients underwent MIS-PAO between 2013-2020. Radiological parameters e.g. Lateral centre edge angle (LCEA), acetabular index (AI) and Tönnis grade of arthritis were calculated. Patients also completed a range of patient reported outcome measures (PROMs). Wilcoxon signed-rank tests were performed to assess for differences between PROMs and radiological outcomes across follow-up periods. Univariate linear regression and logistic regression were used to assess for predictors of change in functional outcome.

Results: Patients had a significant correction in mean LCEA from 17.20 to 35.30 ($p < 0.001$), and mean AI from 13.2 to -0.82). At one-year follow-up all PROMs were significantly greater than their baseline measurement which were maintained at 2 years. Changes in PROMs were independent of radiological parameters and patient factors. A total of 5.96% of patients developed post-operative complications, with four requiring posterior column fixation and four progressing to total hip replacement.

Conclusion: MIS-PAO is a safe procedure that provides significant functional outcome improvements following surgery by 6 months, maintained at 2 years. More than three-fourths of patients achieved improvement of iHOT-12 score beyond the minimal clinically important difference and more than half of patient achieved significant clinical benefit.

Keywords:

i-hot-12, peri-acetabular osteotomy, outcomes, minimally invasive surgery

EHS23-2212

Oral

Outcomes / proms in Hip surgery

Ceramic-on-metal coupling in THA: long term clinical and radiographic outcomes using two different short stems

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Objectives: The ceramic-on-metal hybrid hard-on-hard bearing was initially launched on the market with the purpose of reducing adhesive and corrosion wear and risk of fracture and squeaking. However, this bearing was withdrawn from the market, in the apprehension of local and systemic toxicity. The aim of this study is to evaluate the reliability and safety of ceramic-on-metal bearing at long term follow-up.

Methods: From 2 cohorts of patients who underwent total hip arthroplasty using ceramic-on-metal bearing with two different short stems, 19 of the GROUP A and 25 of the GROUP B were suitable for this retrospective study. All patients were compared clinically using the Harris Hip Score (HHS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), visual analogue scale (VAS), 12-item Short Form Health Survey (SF12P/M), and radiographically. Blood samples were collected in order to evaluate chromium and cobalt ions level. The two groups were compared in terms of metal ions blood levels, and finally all the implanted prostheses were compared with a healthy control group.

Results: All the implanted stems were osseointegrated at a mean follow-up of 114 months. Improvements were observed for all clinical scores in both groups. Radiographic evaluation showed a good ability to restore proper articular geometry. Chromium and cobalt ion analysis revealed values below the safety threshold except for 1 case in GROUP A (cup malposition) and 2 cases in GROUP B (6.1%). No revision occurred.

Conclusion: Ceramic-on-metal bearing is safe and reliable at long term follow-up in association to short stems arthroplasty, if the implant is correctly positioned. Chromium and cobalt metal ions blood levels evaluation should be performed annually.

Keywords:

Ceramic-on-metal; Hard-on-hard bearing; Short femoral stem; Total hip arthroplasty.

EHS23-2311

Oral

Outcomes / proms in Hip surgery

Sexual function before and after hip arthroscopy: A study using the NAHR dataset

List of authors:

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Objectives: This study aims to describe trends in self-reported reported sexual function before and after Hip Arthroscopy (HA).

Methods: Adult (>/-18 years) patients who underwent HA between 1st January 2012 and 31st October 2020 were extracted from the UK Non-Arthroplasty Hip Registry. International Hip Outcome Tool 12 (iHOT-12) questionnaires were collected pre-operatively and at 6 and 12 months. Patients are first asked if 'questions about sexual activity are relevant to them'. The iHOT-12 then asks asking patients to quantify 'how much trouble they experience with sexual activity because of their hip?' with responses converted to a continuous scale (0-100) to measure function. Chi-squared and t-tests were used to compare categorical and continuous variables respectively.

Results: Of 7639 procedures (59% female, mean age 36.5 years (SD 11)), 91% (5616 of 6151 respondents) indicated pre-operatively that questions about sexual activity were relevant to them (male 93%, female 90%, $p < 0.001$). Overall, mean pre-operative sexual function increased from 42.0 (95%CI 41.2 to 42.8, $n=5267$) to 61.8 (60.6 to 63.1, $n=2393$) at 6 months, and 62.1 (60.8 to 63.5, $n=2246$) at 12 months post-operatively.

At 12 months, both sexes saw significant improvement in their pre-operative sexual function scores ($p < 0.0001$). Males started from significantly higher baseline sexual function (53.3 vs 34.2) and achieved higher scores by 12 months (68.8 vs 58.0) compared to female patients. There was no significant difference in pre- or post-operative scores when comparing younger (< 40 years) and older (> 40 years).

Conclusion: Most patients can expect to experience improvement in their sexual function following hip arthroscopy, regardless of sex or age group.

Keywords:

i-hot-12, hip arthroscopy, outcomes, sexual function

EHS23-2073

Oral

Outcomes / proms in Hip surgery

Hip fracture in solid organ transplant patients: Outcomes and survivorship

List of authors:

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Objectives: This study aims to determine the incidence of hip fracture in solid organ transplant (SOT) patients and to compare the outcomes of SOT patients with matched non-SOT controls after hip fracture fixation.

Methods: A retrospective review identified 20 SOT patients with hip fracture at a single center from 2016 to 2021. Patients were matched (1:1) with a cohort of 20 patients with hip fracture without SOT. Patient outcomes, mortality/survival and major clinical outcomes were compared between two groups. The Kruskal-Wallis test was used to evaluate categorical and continuous variables, respectively. The Mann Whitney test was used to compare independent samples (SOT and non-SOT patients). Patient survival was evaluated using Kaplan-Meier survival curves.

Results: The incidence of hip fracture in SOT patients was 20/1787, 1.1%. There were significant differences in mortality rate (73.3% SOT group vs. 26.7% non-SOT group; $p < 0.05$). There were no differences in survival time ($p = 0.746$). There were no differences in time until surgery (5.0 days SOT group vs. 3.1 days non-SOT group; $p = 0.109$), however, there were significant differences in the hospital length of stay (14 days SOT group vs. 8.6 days non-SOT group; $p = 0.018$). There were no differences regarding the complication rate between the two groups (9/20, 45% vs. 6/20, 30% in the SOT and non-SOT groups, respectively).

Conclusion: SOT patients with associated hip fracture required longer hospital length of stay than non-SOT patients. SOT patients did not show greater major clinical complications; however, they presented higher mortality rate compared to non-SOT patients.

Keywords:

Hip fracture; solid organ transplant; transplant patient; survivorship.

EHS23-2237

Oral

Outcomes / proms in Hip surgery

No learning curve for the direct superior approach in total hip arthroplasty: an analysis based on 1,551 total hip arthroplasties from the Dutch Arthroplasty Register

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Objectives: Recently, surgeons introduced a muscle-sparing modification on the classic posterolateral approach (PLA) in total hip arthroplasty (THA): the direct superior approach (DSA). Knowledge of the learning curve of a new surgical approach is essential before implementation in daily practice. We assessed the learning curve of the DSA in primary THA by calculating the survival rate using data from the Dutch Arthroplasty Register (LROI).

Methods: We retrospectively reviewed 1,551 primary THA's operated through DSA between 2016 and 2022. Data was obtained via the LROI. Procedures per surgeon were divided in 5 groups by date of operation: 1-25, 26-50, 51-75, 76-100 or >100, depending on the number the surgeon previously performed. Thereafter, data from different surgeons was pooled together. The risk for revision was calculated via a multilevel time-to-event analysis.

Results: Patients from the 1-25 group had comparable risk for revision compared to patients in the >100 group (hazard ratio [HR]: 1.0, CI: 0.3-3.2). The risk for patients in groups 26-50 and 51-75 was: 1.5 (CI: 0.5-5.0) and 1.8 (CI: 0.5-6.4). From 76 patients and on, the HR was ≈ 1 . There were no statistical differences between groups.

Conclusion: The risk for patients operated in the early phase (1-25) of the learning curve was comparable to patients from the >100 group. We were unable to identify a clear learning curve for the DSA in THA.

Keywords:

Learning curve, Total Hip Arthroplasty, Direct Superior Approach.

EHS23-2344

Oral

Outcomes / proms in Hip surgery

Can machine learning predict minimal clinically important difference using iHot-12 at 1 year following arthroscopic treatment for Femoroacetabular Impingement?

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Objectives: The Non Arthroplasty Hip Register (NAHR) user group maintains a registry of outcomes following treatment for FAI. Although arthroscopic intervention is the most common associated procedure, high attrition in post-operative follow-up within the registry may hinder longer-term identification of patients who fail to meet satisfactory results.

The aim of this study was to establish if machine learning can be used to identify characteristics in patients that enable the identification of patients who are most likely to achieve or fail to achieve a minimally clinically important difference (MCID) at 52 weeks following treatment.

Methods: A retrospective analysis was conducted of patients recorded in the NAHR who had undergone primary hip arthroscopic treatment for femoroacetabular impingement (FAI) between November 2013 and March 2022 (n=6133).

The average difference in score change between the baseline survey and at 12 months was calculated (mean 25.86, SD 27.23). MCID was established as half of one standard deviation (13.61) from the aggregated mean change in iHOT score at 12 months. A total of 907 (63.8%) patients achieved the threshold for achieving MCID.

Results: Model performance was assessed by accuracy and area under the curve in addition to recall. Balanced accuracy of the ML model was 88.1%, recall 89.6% and AUC 92.3%. Sensitivity and specificity were calculated as 83.7% and 93.5% respectively.

Conclusion: Using machine learning, we were able to demonstrate a high level of accuracy, recall and the distinction between patients achieving MCID and those that do not. Application of modelling in this way may provide early identification of patients who are at risk of failing to achieve the MCID threshold at 1 year following intervention.

Keywords:

NAHR, Machine Learning, femoroacetabular impingement

EHS23-2326
Dissatisfied patient

Oral

Reoperation of the unexplained painful primary total hip arthroplasty: is it helpful?

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Objectives: Management of patients with unexplained painful primary total hip arthroplasty (pTHA) is demanding, needs extended diagnostics and indication for revision represents a challenge for surgeons. We aimed to assess the outcomes of reoperation after pTHA due to unexplained pain using strict inclusion criteria at a single institution.

Methods: We retrospectively reviewed reoperations for unexplained painful pTHA between 2010 and 2020 (normal radiographic appearance, after exclusion of infection). Metal-on-Metal THA and cases with prior revisions were excluded. Patient characteristics are described (n=38). We evaluated intraoperative diagnoses, re-revisions and complications, and patient satisfaction at a mean followup of 89 months (SD=29). Kaplan-Meier survival curve for any revision is generated. Bivariate regression analysis was performed to examine the influence of several factors on favored outcome and patient satisfaction.

Results: Mean time to reoperation was 48 months (SD=46). The most common intraoperative diagnosis was arthrofibrosis (61%, n=23). Six patients had postoperative dislocation (16%). Eight patients (21%) underwent revisions within the first 65 months (mean 27, SD=23). Sixteen patients were highly satisfied (42%, n=16/38), 4 patients reported low satisfaction (11%, n=4/38), and 7 patients were unsatisfied (18%, n=7/38). Longer time between primary implantation and reoperation was predictive for high patient satisfaction, (p=0.04 for each).

Conclusion: Only about half of this patient group could benefit from a reoperation. Counseling of risk of postoperative dislocation, need of revision, and persistence of pain should be considered.

Keywords:

reoperation; revision total hip arthroplasty; painful THA; unexplained; patient satisfaction

EHS23-2207
Joint preservation

Oral

Does the dGEMRIC index recover 3 years after FAI surgery following an initial decrease at 1 year followup? A controlled prospective study

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Objectives: Delayed gadolinium-enhanced MRI of cartilage (dGEMRIC) allows objective and noninvasive assessment of cartilage quality. An interim analysis 1 year after correction of femoroacetabular impingement (FAI) previously showed that the dGEMRIC index decreased despite good clinical outcome. Our aim was to evaluate dGEMRIC indices longitudinally in patients with FAI correction and in a control group undergoing conservative therapy for FAI.

Methods: Prospective, comparative longitudinal study. 39 patients (40 hips) who received either surgical FAI correction (n=20) or conservative therapy (n=20) were included. Baseline demographics and presence of osseous deformities did not differ between groups. All patients received indirect MR arthrography at baseline, 1 and 3 year follow-up [FU]. The 3D cartilage models were created using a custom-developed deep learning-based software. The dGEMRIC indices were determined separately for acetabular and femoral cartilage. A mixed-effects model was used for statistical analysis in repeated measures.

Results: The surgical group showed an initial (preoperative to 1-year FU) decrease of dGEMRIC indices: acetabular 512±174 to 392±123 ms; femoral 530 ± 173 to 411± 117ms (both p<0.001). From 1-year to 3-year FU, dGEMRIC indices improved: acetabular 392±123 to 456±163ms; femoral 411±117 to 477±169ms (both p< 0.001). The conservative group showed no significant changes in dGEMRIC indices from baseline over the 1-year to the 3-year FU (all p > 0.6).

Conclusion: Three years after FAI correction, an improvement in dGEMRIC indices was found compared to the 1-year FU. This may be due to normalized joint biomechanics or regressive postoperative activation of the inflammatory cascade following intra-articular surgery.

Keywords:

hip, femoroacetabular impingement, dGEMRIC, MRI

EHS23-2225

Oral

Postop complications

Should High-Risk Patients Seek Out Care from High-Volume Surgeons? An Analysis of 1,134 High-Risk Total Hip Arthroplasty Cases

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Objectives: Patients with a high comorbidity burden (high-risk) can achieve similar improvements in quality of life compared to low-risk patients, but greater morbidity may deter surgeons from operating on these patients. Whether surgeon volume influences THA outcomes in high-risk patients has not been investigated. This study aimed to compare outcomes in high-risk patients operated on by high volume (HV) and non-HV THA surgeons.

Methods: Patients with CCI 5 or more and ASA of 3 or 4 undergoing primary, elective THA between 2013 and 2021 were retrospectively reviewed. Patients were separated into groups based on whether they were operated on by a HV surgeon (defined as the top 25% of surgeons at our institution by number of primary THAs per year) or a non-HV surgeon. Groups were propensity matched 1:1 to control for demographic variables. 90-day readmissions and revisions were compared between groups, and Kaplan-Meier analysis was used to evaluate implant survivorship.

Results: Years of experience were comparable between Non-HV and HV surgeons ($p=0.733$). The HV group had significantly shorter surgical times ($p<0.001$), and shorter length of stay ($p=0.009$). The HV group had significantly fewer 90-day readmissions ($p=0.030$), all-cause revisions ($p=0.023$) and septic revisions ($p=0.020$) compared to the non-HV group at latest follow-up. The HV group had significantly greater freedom from all-cause ($p=0.023$) and septic revision ($p=0.020$) compared to the non-HV group.

Conclusion: High-risk THA patients have fewer 90-day readmissions, revisions, as well as shorter length of stay when treated by HV surgeons. THA candidates with a high comorbidity burden may benefit from referral to high-volume surgeons to reduce procedural risk and improve postoperative outcomes.

Keywords:

Primary THA; High-Risk; CCI; High-Volume

EHS23-2136

Oral

Outcomes / proms in Hip surgery

PATIENTS WITH LOW-GRADE OA HAVE LESS FAVOURABLE OUTCOMES POST-THA COMPARED TO A MATCHED COHORT OF PATIENTS WITH END-STAGE OA.

List of authors:

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Objectives: Total hip arthroplasty (THA) is an effective procedure for patients with end-stage hip osteoarthritis (OA) but little is known about its outcome in low-grade OA. The objective is to compare clinical outcome of THA in low-grade vs end-stage OA patients.

Methods: Out of prospectively recorded data on 2,120 primary anterior approach THAs (1,815 patients), 37 low grade OA (Tönnis 1) cases with available pre- and 1-year postoperative patient reported outcome measures (PROMs) were matched 1:1 by age($p=0.093$), sex($p=1.000$) and BMI($p=0.987$) to 37 end-stage OA (Tönnis 3) controls. Hip Disability and Osteoarthritis Outcome Scores (HOOS) and Short Form-36 (SF-36) scores were analysed.

Results: Similar scores for all pre-operative PROMs were seen in Tönnis 1 and Tönnis 3, except for HOOS Sport (22.8 vs 12.5; $p=0.007$) and SF-36 Physical Functioning (48.0 vs 40.1; $p=0.049$). At 1-year post-op, all HOOS scores were significantly lower in the Tönnis 1 compared to Tönnis 3 group (Symptoms (70.8 vs 83.2; $p=0.007$), Pain (71.1 vs 88.6; $p<0.001$), ADL (75.4 vs 89.9; $p<0.001$), Sport (58.8 vs 73.5; $p=0.019$), QoL (62.8 vs 77.0; $p=0.008$)). The differences between the post- and preoperative HOOS scores were significantly lower in the Tönnis 1 group for all scores. Similarly, except from Emotional wellbeing and Role limitations due to emotional problems, all 1-year post-op SF-36 scores were significantly lower in the Tönnis 1 compared to the Tönnis 3 group, with mean SF-36 scores of respectively 65.1 and 73.6 ($p=0.012$).

Conclusion: This study shows that, although a substantial clinical improvement is seen post-THA in patients with low-grade OA, the extent of improvement and 1-year post-THA outcome is significantly lower in lowgrade OA patients compared to patients with end-stage OA.

Keywords:

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EHS23-2120

Hip-spine relationship

Oral

Prevalence of adverse spino-pelvic characteristics in patients undergoing total hip arthroplasty and its clinical implications - A prospective study

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Objectives: 1. Describe prevalence of patients presenting for THA with adverse spinopelvic characteristics (ASC)
2. Test for association with functional scores
3. Describe early-term dislocation rate with different approaches

Methods: This is a prospective, multi-center, consecutive, cohort series of 460 patients (mean age: 66y; 53% females) undergoing THA through anterolateral- (n=202), direct anterior- (n=216) or posterior- approaches (n=142) without dual-mobility bearings or robotics. All participants underwent spinopelvic radiographs in standing and deep-flexed-seated positions to determine spinopelvic characteristics. ASC were Pelvic tilt >19°; spinopelvic imbalance (PI-LL>10°); and spinal stiffness (lumbar flexion<20°). Pre-operative patient reported outcomes was measured using Oxford Hip Score (OHS).

Results: Presence of any ASC was seen in 41%. Most common characteristic was high pelvic-tilt (34%), followed by spinopelvic imbalance (22%) and spine stiffness (6%). Only 3% had all three characteristics. 1% has all 3 ASC characteristics (n=11). There was no difference in the pre-operative OHS between patients without or with ASC (20 vs. 18; p=0.370). At 1-year, two patients sustained a dislocation (0.4%), both with all three ASC characteristics that had posterior approach. Amongst patients with ASC, anterior- and anterolateral approaches were associated with reduced dislocation risk (p=0.03).

Conclusion: Prevalence of any ASC, especially high pelvic-tilt, is high. However, the presence of all three ASCs is low (3%). Use of the anterior- and antero-lateral approaches in such patients minimizes dislocation risk. However, patients with ASCs, especially all three, treated with posterior approach may benefit from advanced technology to minimize dislocation-risk.

Keywords:

Hip-spine relationship, Dislocation, Approach, Total hip arthroplasty, Adverse spinopelvic characteristics

EHS23-2226
Femoral revisions

Oral

Two-year outcomes of a monoblock tapered femoral stem for complex THA femoral reconstruction: A multicenter prospective study

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Objectives: INTRODUCTION: Patients undergoing complex and revision total hip arthroplasty (THA) have an increased risk of postoperative subsidence, instability and aseptic loosening. Devices that offer greater adaptability may help limit such complications. This study sought to determine the safety and performance of a monoblock tapered femoral stem for complex femoral reconstruction in rTHA.

Methods: METHODS: This multicenter prospective study included patients who had undergone complex and revision THA with a monoblock tapered stem (REDAPT; Smith+Nephew, Memphis, TN, USA) at 4 sites in the US. Patients were included if they had an available preoperative radiograph and patient-reported outcome measures. Patients were followed prospectively thereafter at 6 months and 2 years. Study outcomes included the Hip disability and Osteoarthritis Outcome Score for Joint Replacement score (HOOS JR), Kaplan-Meier survivorship (for all-cause implant revision), and serious adverse events (SAE) leading to revision.

Results: RESULTS: Fifty-three patients (mean age, 64.6 years; mean body mass index, 28.6; 60.4% male) were included. Indications for surgery included complex primary THA (n=5), conversion THA (7), periprosthetic fracture (2), and revision THA (39). Mean HOOS JR score was 53.2 preoperatively, with significant improvement over baseline noted at 6 months (65.8; p=.0123) and 2 years (80.6; <.0001). There were no SAEs leading to revision, and stem survivorship at 2 years was 100%.

Conclusion: DISCUSSION: Two-year results indicate that patients receiving a monoblock tapered stem experience significant improvements in function and excellent survivorship. Further long-term studies will determine if these effects are maintained in the mid- to long-term.

Keywords:

complex femoral reconstruction, hip arthroplasty, revision

EHS23-2075

Trauma of pelvis and/or hip joint

Oral

Incidence and risk factors for urinary tract injury in pelvic fracture: Systematic review and meta-analysis

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Objectives: The aim of this meta-analysis was to determine the incidence and risk factors for urinary tract anomalies associated with pelvic fracture.

Methods: PubMed, EMBASE, Scopus, and the Cochrane Collaboration Library database were searched for potentially relevant studies. The quality of the included studies was assessed independently by two authors using the MINORS criteria. The following data were extracted from the included studies: demographic data, incidence of urinary tract anomalies associated with pelvic fractures, hemodynamic stability, mechanism of injury, types of pelvic fracture and mortality. Review Manager 5.4 software was used to group and analyze all the extracted data.

Results: Ten studies were included, with a pool of 22,700 patients. The incidence of urinary tract anomalies associated with pelvic fracture was 6.88% (95%CI 6.20%-7.55%). Regarding the mechanism of injury, vehicle, motorcycle and pedestrian accidents were risk factors for urinary tract injury: (RR 1.08, 95%CI 1.06-1.11), (RR 1.89, 95%CI 1.78-2.00) and (RR 1.53, 95%CI 1.20-1.95). Pubic fracture and pelvic ring disruption was significantly associated with specific urinary injury (OR 1.94, 95%CI 1.09-3.44) (OR 5.53, 95%CI 4.67-6.54). Patients without urinary tract injury were more likely to discharge home (RR 0.79, 95%CI 0.67-0.92). Mortality was higher in the group with associated urinary tract injury (OR 1.92, 95%CI 1.77-2.09).

Conclusion: The incidence of urinary injury associated with pelvic fracture was 6.88%. Accidents involving vehicles and motorcycles increased the probability of associated urinary injury. Pubic fracture and pelvic ring disruption were more frequently associated with urinary tract injury.

Keywords:

Urinary tract; pelvic fracture; pelvic injury; incidence; meta-analysis

EHS23-2041

Trauma of pelvis and/or hip joint

Oral

What is the Fate of Undisplaced Neck of Femur Fractures Treated with Cannulated Screws?: The Garden Classification Should be Revisited

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Case Study: Objectives: We aimed to report implant survival in Garden type I-II femoral neck fractures treated with cannulated screws in elderly patients.

Methods: This was a retrospective cohort study of 232 consecutive patients (181 females) treated with cannulated screws for unilateral Garden I-II fractures. Mean age was 81 ± 9 years, with a mean BMI of 25 ± 4.5 . Two observers measured baseline radiographic variables with good inter-observer reliability (all Bland-Altman plots within 95% agreement). The posterior tilt angle, measured on a cross-table lateral x-ray, was used to classify the cohort into $< 20^\circ$ ($n=183$) and $\geq 20^\circ$ ($n=49$). No between-group differences were found in demographic or radiologic variables (Pauwels angle [$p=0.78$], Western Infirmary Glasgow angle [$p=0.06$], Garden's angle [$p=0.97$], and Singh index [$p=0.58$]). Mean follow-up was 36.4 ± 3 months, without between-group differences ($p=0.64$). Failure (conversion to arthroplasty) was calculated with cumulative incidence function.

Results: Of the 34/232 (14.65%) failures, 10/183 (5.5%) occurred in the $< 20^\circ$ -posterior tilt group and 24/49 (49%) in the $\geq 20^\circ$ group ($p=0.001$). Implant survival was 86% (95%CI 80-90) at 12 months and 77.3% (95%CI 64-86) at 70 months. Most failures occurred within the first year, with a cumulative incidence of 12.6% (95%CI 8-17). After controlling for confounders, posterior tilt $\geq 20^\circ$ had a higher risk of failure when compared to posterior tilt $< 20^\circ$ (38.78% [95%CI 25-52] vs 5% [95%CI 2.8-9], sub-hazard ratio 8.3, 95%CI 3.8-18), without any other factor being associated to failure.

Conclusions: Cannulated screws are a safe treatment option for Garden I-II fractures, except when posterior tilt is $\geq 20^\circ$, where arthroplasty should be considered.

Keywords:

femoral neck fracture; cannulated screws, undisplaced; posterior tilt

EHS23-2130

Oral

Trauma of pelvis and/or hip joint

Corona Mortis: Clinical Evaluation of Prevalence, Anatomy, and Relevance in Anterior Approaches to the Pelvis and Acetabulum

List of authors:

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Objectives: To evaluate the clinical prevalence, features, and relevance of corona mortis (CM) anastomoses in patients undergoing anterior approaches to the pelvis and acetabulum.

Methods: We retrospectively analyzed 185 cases undergoing Pararectus or Stoppa approaches to the acetabulum or pelvis for osteosynthesis or tumor resection at our institution between 01/2008 and 05/2022.

Results: We found an overall prevalence of any CM anastomosis of 80%. 78% of cases had veinous, and 24% had arterial CM connections. The mean diameters of veinous and arterial CM were 5mm and 3mm, respectively. We found bilateral CM anastomoses in 68% of patients undergoing bilateral dissection. In females, the prevalence of any CM was 30% higher than in males ($p < 0.001$). In two cases, the CM was injured, and the bleeding was controlled immediately. All other CM vessels found were ligated without further complications.

Conclusion: In the first clinical evaluation of the corona mortis that includes the Pararectus approach, we found a higher clinical prevalence of CM vessels than previously reported, with a significant difference between females and males. Further, our study reveals that proactively identifying the CM can keep complications low despite its high prevalence.

Keywords:

pararectus, stoppa, corona mortis, acetabulum, pelvis, trauma, tumor

EHS23-2163
Periprosthetic fractures

Oral

Early to mid-term mortality rates at a tertiary referral centre for revision hip arthroplasty for peri-prosthetic fracture compared to aseptic loosening and infection

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Objectives: Mortality following revision hip surgery for periprosthetic fracture (PPF) has been reported to be as high as 60% at 5 years. The aim of this study was to determine the mortality rate for PPF revisions, compared to revision for aseptic loosening or infection at our tertiary referral centre

Methods: Revision arthroplasty procedures performed between January 2014 and December 2015 at our institution for PPF, aseptic loosening or infection were identified using a prospectively collected PPF referral database and locally collected NJR data. The 3 groups were compared for baseline demographics, admission to higher-level care, length of stay, complications and Kaplan-Meier failure (mortality) at 1 & 5 years post-operative (with log-rank test for equality).

Results: There were 37 PPF, 71 infected and 221 aseptic revisions. PPF had a higher proportion of females (65% vs. 39% in infection and 53% in aseptic; $p = 0.031$) and grade 3 and 4 ASA patients ($p = 0.006$). Median time to surgery from injury for PPF was 8 days (95% CI, 6-16). 19% of PPF revisions required HDU admission, 1% in the aseptic group and none in the infection group ($p < 0.001$). Median length of stay was significantly different (PPF 10; infection 14; aseptic 8 days ($p < 0.001$)). The Kaplan-Meier estimate of 1-year mortality were: PPF = 0%; infection = 2.8% (0.7-11.1%); aseptic = 0.9% (0.2-3.5%). 5-year mortality estimates were: PPF = 17.1% (8-34%), infection = 8.7% (4-18.3%), aseptic = 12% (8.4-17%). Log-rank test of equality was not significant, $p=0.833$.

Conclusion: Despite the PPF group having an average delay to surgery of 8 days, higher ASA grades and more admissions to HDU there was no significant difference in mortality rates between the groups at 1 and 5 years postoperatively.

Keywords:

Peri-prosthetic fracture, mortality, tertiary

EHS23-2206

Oral

Trauma of pelvis and/or hip joint

Factors Affecting the Length of Stay in Patients Sustaining Traumatic Neck of Femur Fractures at a District General Hospital

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Objectives: Length of stay (LOS) for hip fractures in the UK, averages 20.1 days. This appears to fare poorly compared to other developed nations like Finland (9.8 days) and USA (<7 days for some units). This study aims to identify patient/system factors contributing to prolonged LOS for neck of femur (NOF) fracture patients, and possible solutions.

Methods: A retrospective observational cohort study was conducted, assessing LOS for all traumatic NOF fracture patients over a 6-month time frame (n=149). National Hip Fracture Database (NHFD) data was used to collect all relevant data points. 13 factors were identified as possible determinants of LOS. Exclusion criteria: age <60, open fractures, and polytrauma. Analysis was performed using ANOVA, Kruskal-Wallis, Chi-Squared, T test, and linear regression.

Results: 138 patients were included, with 49, 54 and 32 patients having less than 14, 14-27, and 28 or greater days LOS respectively. Factors significantly contributing to increased LOS included: pre-admission mobility (p=0.0026), time to theatre (p=0.0055), discharge destination (<0.0001) and age (<0.0001). 26% (n=8) of patients with LOS 28 days or greater had surgery delayed due to awaiting medical review/investigation or stabilisation. Lower pre-operative Abbreviated Mental Test Score (AMTS) and higher ASA grades also correlated with increased LOS (p=0.0004; 0.0030). Factors not deemed to have significant bearing on LOS are also demonstrated.

Conclusion: This study identifies six factors associated with below average LOS. These significant factors could be used to identify potential early, average and prolonged LOS and put these patients into appropriate pathways with targeted LOS from admission.

Keywords:

NOF, Fracture, Length Of Stay, Independent Factors

EHS23-2085

Trauma of pelvis and/or hip joint

Oral

Outcomes in the Use of Megaprosthesis in the Non-Tertiary Setting: An 8 Year Review

List of authors:

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Objectives: The replacement of entire limb segments is becoming increasingly utilised in managing revision arthroplasty and trauma, particularly in the presence of poor bone quality. Several factors, such as patient frailty and low prevalence, limit the abundance of robust evidence on their usage. We report on the use of megaprosthesis in a District Hospital.

Methods: All patients who had received proximal femur replacement (PFR) or distal femoral replacement (DFR) over an 8 year period were included. Operation details were recorded along with demographic data, pre-morbid mobility and indication for surgery. Outcome measures were post-operative mobility, patient reported outcome measures (PROMS), radiological outcome and complications.

Results: Between 2013 and 2021, we identified 11 patients having undergone PFR and 19 receiving DFR. Mean age was 76 (range: 60-91) and 77.5 (51- 94) respectively. In both cases, peri-prosthetic fracture was the commonest indication (45% and 71%). In PFR group, 64% of patients had no change or improvement from their pre-morbid mobility, this was 81% in the DFR group. Mean Oxford Scores were 34 and 32 respectively. No loosening or other radiological complication were seen in either group. The commonest complication in the PFR group was dislocation (n=2), and knee pain in the DFR group (n=4). Mortality was 67% and 23% respectively.

Conclusion: Indications for the use of megaprosthesis are rare but increasing in prevalence, likely reflecting a growing elderly population. While associated with high mortality rates, our data demonstrate that most patients achieve preserved or improved mobility following surgery as well as modest subjective functional scores.

Keywords:

Elderly trauma, proximal femur replacement, distal femur replacement, megaprosthesis

EHS23-2295
Periprosthetic fractures

Oral

Periprosthetic Fractures around Total Hip Replacement - Is there a Rush to Fix?

List of authors:

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Objectives: Periprosthetic fractures now account for 14.1% of all hip revisions. Surgery is often highly specialised and can involve revision of the implant, fixation of the fracture or a combination. Delays to surgery are frequent as specialist equipment and surgeons are often required. UK guidelines are currently moving in favour of early surgery in a similar way to neck of femur fractures despite a lack of evidential consensus.

Aims:

To evaluate the consequences of delay to surgery in periprosthetic fractures around total hip replacement (THR)

Methods: Retrospective review of all patients having surgery for peri-prosthetic fracture around THR at a single unit between 2012 and 2019. Risk factors for complication, length of stay (LOS) and time to surgery data was collected and analysed using regression analysis.

Results: 88 patients were identified meeting inclusion criteria. 63 (72%) were treated with ORIF, 25 (28%) underwent revision THR. Baseline characteristics were similar in both ORIF and revision groups. Revision surgery was likely to be delayed more than ORIF owing to the need for specialist equipment and personnel (median 143 hours vs 120 hours, $p=0.06$). LOS was a median of 17 days if operated within 72 hours and 27 days if delayed beyond this ($P<0.0001$) but there was no increase in 90 day mortality ($p=0.66$) HDU admission ($p=0.33$) or peri-operative complication ($p=0.27$) with delay beyond 72 hours.

Conclusion: Periprosthetic fractures are complex and often require a highly specialised approach. Delaying surgery does not result in increased mortality or complication, but does increase length of stay. Further multicentre research into this area is required.

Keywords:

Periprosthetic Hip

EHS23-2025
Joint preservation

Oral

Joint damage detected by preoperative MR arthrography under leg traction improves prediction of failure at 2-5years following arthroscopic FAI surgery

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Objectives: MR arthrography (MRA) combined with leg traction for improved visualization of the central compartment has been proposed for improved detection of cartilage damage. The study aims to assess the association between joint damage detected on preoperative traction MRA of the hip with mid-term failure following arthroscopic FAI surgery.

Methods: IRB-approved retrospective cohort study of patients undergoing arthroscopic FAI surgery with a minimum followup of 2 years postoperatively. 106 patients (60% men) with a mean age of 33 ± 10 years were included. Failure was defined as subsequent THA or patients not meeting the patient acceptable symptom state (PASS) < 60 points. MRA were assessed for extensive cartilage damage (>2 hours on the clock-face), acetabular and femoral osteophytes, acetabular cysts. Age >40y, Tönnis grades and joint degeneration on MRA were assessed regarding their association with failure of FAI surgery.

Results: Twenty-six (25%) patients met at least one endpoint: 9 patients had subsequent THA, 17 had iHOT-12 <60 points. Extensive cartilage damage yielded the highest odds (OR=39, $p < 0.0001$) of failure of FAI surgery followed by femoral osteophytes (OR=9.8, $p < 0.001$), acetabular cysts (OR=5.1, $p = 0.0007$), age >40 years (OR=3.7, $p = 0.006$) and Tönnis grade >0 (OR=3.4, $p = 0.009$). Prognostic accuracy in predicting failure was higher for presence of extensive cartilage damage on MRA (PPV=87% and NPV=86%) than that of patient age >40y (PPV=43% and NPV=83%) and Tönnis grades >0 (PPV=39% and NPV=84%).

Conclusion: Joint damage detected by preoperative traction MRA improves prediction of failure at 2-5years following arthroscopic FAI surgery. Accordingly, traction MRA of the hip yields great potential to improve preoperative risk stratification.

Keywords:

Hip, FAI, joint preserving surgery

EHS23-2178
Joint preservation

Poster

Comparing the Efficacy of Intra-Articular multiple Platelet-Rich Plasma versus Hyaluronic Acid for Hip Osteoarthritis with developmental dysplasia of the hip: A Prospective, Double-Blind, Randomized Controlled Trial

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Objectives: Platelet-rich plasma (PRP) is of great interest in clinical practice as an intra-articular injection treatment for hip osteoarthritis (OA). Developmental dysplasia of the hip (DDH) is one of the most common causes of secondary hip OA. However, there are inadequate data on the effects of PRP in hip OA with DDH. This randomised controlled trial examined the efficacy of PRP compared with hyaluronic acid (HA) injection in patients with hip OA secondary to DDH. Factors associated with pain improvement were also assessed in the PRP group.

Methods: This study was a double-blind, randomised controlled trial. Between 2019 and 2021, 42 patients met the inclusion criteria and gave informed consent for this study, and they were randomised into two groups. One group received intraarticular PRP, and the other group received intraarticular HA. The effect on pain relief was assessed using Pain-VAS and WOMAC-pain scores over a 24-week follow-up period. Additionally, functionality was assessed as a secondary outcome.

Results: While both groups showed significant improvements in the Pain-VAS and WOMAC-pain at 24 weeks compared with baseline ($P < 0.001$ and $P < 0.001$ [PRP], $P = 0.015$ and $P = 0.008$ [HA], respectively), the Pain-VAS reduction was significantly greater in the PRP group ($P = 0.036$). K-L grade was the only factor associated with the Pain-VAS improvement in the PRP group.

Conclusion: In patients with hip OA with DDH, intraarticular injection of PRP reduced hip pain and functional improvement that were equivalent to or greater than that of HA over a 24-week follow-up period. The results of this study suggest the possibility that intraarticular injection of PRP is beneficial for patients suffering from hip OA with DDH.

Keywords:

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EHS23-2281

Oral

Infection around the hip

Two-Stage Revision Of The Hip: A Retrospective Analysis Of Seventy-Six Patients Managed With The Same Design Articulated Spacer

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Objectives: The aim of this study is to analyze survivorship as free of infection, clinical outcomes, and spacer-related complications of a specific single articulated modular hip spacer.

Methods: We retrospectively reviewed collected data of seventy-six consecutive patients that underwent two-stage revision of the hip for PJI with a single design articulated hip spacer in a single center from 2016 to 2020. This novel spacer allows choosing the appropriate size of the stem and of the head according to bone defect, and the appropriate antibiotics according to the isolated microorganism.

Results: The average age was 72,4 years, and the average follow-up was 4,6 years. We reported two spacer dislocations (3%), and one peri-spacer fracture (1,4%), in no cases a fracture of the spacer was reported. At the last follow-up the HHS improved significantly to an average of 81.3 ($p < 0.001$). We documented a survivorship free of infections of 91.2% (8 patients) after 1 year, of 86.7% after 2 years and of 84.6 at the last follow-up. Three patients suffered from recurrent dislocation and were revised. We documented that medium gluteus insufficiency, non-optimal restoration of hip's biomechanics ($p = 0.00$) and female gender ($p = 0.0045$) were associated to postoperative dislocation ($p = 0.0034$).

Conclusion: The use of this novel modular articulated spacer during two-stage revision of the hip for PJI resulted in a low rate of reinfection, reduced rate of mechanical complication, and improved function during the interval period. Patients characterized by important bone defects, muscle weakness, and female gender are at high risk for mechanical complications a spacer dislocation, or postoperative dislocation of the revised implant.

Keywords:

periprosthetic joint infection; PPJI; articulated spacer; hip spacer;

EHS23-2034

Infection around the hip

Oral

The Modified-KLIC Score: A Novel Tool to Predict Outcomes Following Debridement, Antibiotics and Implant Retention (DAIR) After Acute Periprosthetic Hip Infection

List of authors:

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Case Study: Objectives: Two preoperative risk models were previously designed to predict DAIR failure: KLIC and CRIME-80 scores. The aim of this study was to validate both scores in an external cohort and to create a new model with additional risk factors.

Methods: We retrospectively evaluated 96 patients with early acute hip-PJI treated with DAIR. At 2-year cut-off, failure was defined as the need for second DAIR, implant removal, or 90-day infection-related death. Association between demographic variables and failures was tested. The model discriminatory performance was measured using the time-dependent AUROC and Harrell concordance index. The calibration-in-the-large (CITL) was calculated as the logistic regression model intercept. A modified KLIC score was created by adding the variable time-from-onset-of-symptoms-to-DAIR.

Results: The 24-month cumulative incidence of failure was 23.96% (95%CI 15.9-32.8). KLIC's discrimination had an AUROC of 0.79 (95%CI 0.67-0.90); with a CITL of -0.57 (95%CI -1.16 to -0.01) and a slope of 0.68 (95%CI 0.35-1.02). CRIME-80's discrimination had an AUROC of 0.63 (95%CI 0.51-0.76); with a CITL of -1.66 (95%CI -2.13 to -1.19) and a slope of 0.35 (95%CI -0.14 to 0.85). The difference between both AUROCs was statistically significant ($p=0.0138$), with the KLIC score being better. As compared to the original KLIC score, the modified-KLIC improved the AUROC curve to 0.85 and the beta slope and alpha intercept to 1.24 and -0.07, respectively ($p=0.02$).

Conclusion: KLIC was superior to CRIME-80 in predicting DAIR failure. The modified KLIC score improved the prediction of DAIR failure. This model can be useful to define the possible indication of a revision in cases where the predictive DAIR failure is high.

Keywords:

periprosthetic joint infection; acute; total hip arthroplasty; DAIR; KLIC

EHS23-2036
Joint preservation

Oral

Results of Arthroscopic AMIC and BMAC for Acetabular Cartilage Lesions

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Objectives: We report on the results of a consecutive series of 37 hips treated with arthroscopic Autologous Matrix Induced Chondrogenesis (AMIC) supplemented with Bone Marrow Aspirate Concentrate (BMAC) for Acetabular Cartilage Lesions. A Chondroglue collagen matrix was applied arthroscopically and the membrane was saturated with BMAC at the end of the procedure.

Methods: Twenty nine men (4 bilateral hips) and 4 woman with mean age of 29 years (range 17-42) were treated between 2015 and 2018 for full thickness acetabular cartilage lesions greater than 125 mm² with this novel arthroscopic technique. Mean cartilage defect was 275 mm² (range 125-550). Twenty hips were graded Tönnis stage 0, 14 stage I and 3 stage II. Five hips were revision procedures; 34 had cam resection for cam-type FAI. Twenty-three had labral repair. Mean preop CE-angle was 27 (range 17-33); 8 hips were graded as having borderline dysplasia.

Results: Mean follow-up was 6 years (range 4.5-7.5). At 2 years FU all had returned to their pre-injury sports (15 soccer, 2 kick-boxing, 1 martial-arts, 1 frisbie, 1 triathlon) within one year. However, with longer FU 1/3 changed their sports level or type, mostly due to new injuries (3 knee injuries, 4 lower back pain). There were 2 failures (revision with resurfacing THR) at 3 and 5 years. Mean UCLA improved from 5 to 9; mean mHHS from 80 to 96. No adverse reactions to the use of BMAC were described.

Conclusion: At a mean of 6 year FU, these results seem promising in the treatment of large full thickness acetabular cartilage lesions. The results favour well compared to a group of patients with similar type of cartilage defects and treated with AMIC only.

Keywords:

cartilage, hip, bmac, amic

EHS23-2122
Hip arthroscopy

Oral

Influence of femoral and acetabular version on patient reported outcomes prior to hip preservation surgery

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Objectives: The goal of this study is to assess (1) prevalence of version abnormalities among young adults with hip pain, and (2) influence of version on age at presentation and patient-reported outcome measures.

Methods: This is a prospective, cross-sectional study of 196 patients (209 symptomatic hips) who presented at a tertiary referral centre for hip preservation surgery between 2018 and 2021 (mean age 33.6±8.9years, 66.0% females, mean BMI 26.3±5.0kg/m²). Of these, 73% underwent hip arthroscopy, 24% peri-acetabular osteotomy, 2% surgical hip dislocation, and 1% femoral derotation osteotomy. Patients underwent a computed tomography (CT) scan to measure acetabular version (AV) and femoral version (FV), which was classified as normal between 10° to 25°. KcKibbin index was calculated. Patient-reported measures were recorded using international Hip Outcome Tool (iHOT).

Results: Mean AV was 18.4°±5.6° and mean FV 12.6°±10.0°. Although 79% of hips fell within the range of 10-25° AV, only 46% had a FV of 10-25°, and 57% had a normal McKibbin index. Patients with high FV presented at younger age (28.5±6.7y) in comparison to patients with normal (34.0±8.8y; p=0.005) or low FV (35.1±9.2y; p<0.001). Patients with combined low version presented the latest in comparison to others (p=0.012). Mean pre-operative iHOT was not different among version abnormality groups (p=0.945).

Conclusion: Version abnormalities are highly prevalent among young adult hip patients. Femoral version has more variability compared to acetabular version. While patients with combined low version present at the oldest age, while patients with high FV present at young age, indicating that an instability pattern is more difficult to cope with than impingement.

Keywords:

Hip dysplasia, Peri-acetabular osteotomy, Hip arthroscopy, Femoral version, Acetabular version, Outcome

EHS23-2327
Hip arthroscopy

Oral

EARLY OUTCOMES OF HIP ARTHROSCOPY FOR FEMOROACETABULAR IMPINGEMENT: A STUDY OF 6,736 CASES USING THE NAHR DATASET

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Objectives: This study used a national registry to assess the outcomes of hip arthroscopy (HA) for the treatment femoroacetabular impingement (FAI).

Methods: All HAs for FAI recorded in the UK Non-Arthroplasty Hip Registry (NAHR) between January 2012 and November 2022 were identified. Cases were grouped according to the index procedure performed for FAI (cam, pincer, or mixed). Patient outcomes captured included the International Hip Outcome Tool (iHOT)-12.

Results: 6,736 HAs were identified; 4,148 cam (61.6%), 567 pincer (8.4%), 2,021 mixed (30%). Mean age (36.0) was similar between groups. There was a greater proportion of females in the pincer group (76%) compared to cam (53%) and mixed (50%). A higher proportion of patients had a recorded cartilage injury in association with a cam lesion compared to pincer. The pincer group had significantly poorer mean pre-op iHOT-12 scores (29.5 [95%CI 27.8 to 31.2]; n=395) compared to cam (33.5 [95%CI 32.9 to 34.2]; n=3,573) and achieved significantly lower scores at 12 months (pincer = 53.9 (50.2 to 57.5); n=217, cam = 60.8 (59.4 to 62.1); n=1,618).

Overall, significant ($p < 0.0001$) iHOT-12 and EQ-5D improvement vs baseline pre-operative scores were achieved for all FAI subtypes at 6 months (overall mean iHOT-12 improvement +26.0 [95%CI 25.0 to 26.9]; n=2,657) and maintained out to 12 months (+26.2 [25.1 to 27.2]; n=2,392) at which point 66% and 47% of patients continued to demonstrate a score improvement greater than or equal to the minimum clinically important difference (≥ 13 points) and substantial clinical benefit (≥ 28 points) for iHOT-12 respectively.

Conclusion: This study demonstrates excellent early functional outcomes following HA undertaken for FAI in a large national registry.

Keywords:

i-hot-12, hip arthroscopy, outcomes, minimum clinically important difference and substantial clinical benefit

EHS23-2264
Hip arthroscopy

Oral

Utility of Biomarkers for Femoroacetabular Impingement: A Systematic Review

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Objectives: The aim of this systematic review was to summarise and evaluate the utility of the biomarkers related to the pathophysiology of femoroacetabular impingement (FAI).

Methods: A systematic review using the PRISMA guidelines was conducted to investigate the relationship between biomarkers and FAI. Literature search was performed using three databases: Embase, MEDLINE, and the Cochrane Library. The initial search yielded 507 articles of which 16 relevant articles were included for final analysis.

Results: Data of a total of 2,134 participants with a mean age of 42.8 years were analysed. The source of the sample of the biomarkers in these participants included synovial fluid, articular cartilage and bone, serum or urine, and the labrum. 68 biomarkers in relation to FAI were identified and measured in the 16 studies analysed. From a diagnostic point of view, 19 different biomarkers were identified of which only eleven (ABAT, PPARg, DMNT1, DMNT3A, IL-6, COL10A1, ALP, COMP, CRP, OPG and NITEGE) could significantly detect a difference between patients with FAI and healthy controls. Secondly, 43 biomarkers predicting the association of FAI with hip OA or late FAI were identified, of which only 21 biomarkers were shown to be statistically significant. Of all the biomarkers studied, only ABAT and PPARg showed potential from both a diagnostic and predicting progression perspective.

Conclusion: Biomarkers can help with diagnosis and identifying disease progression of FAI. DMNT1, DMNT3A, IL-6, COL10A1, ABAT, PPARg, ALP, COMP, CRP, and OPG and NITEGE are useful for detecting early changes in FAI and there are 21 biomarkers which could help with predicting progression to OA. ABAT and PPARg can be useful from both a diagnostic and predicting progression perspective.

Keywords:

Biomarkers; Femoroacetabular Impingement; Hip osteoarthritis

EHS23-2345
Hip arthroscopy

Oral

COMPARISON OF EARLY OUTCOMES FOLLOWING ARTHROSCOPIC ACETABULAR CHONDROPLASTY AND MICROFRACTURE: A STUDY USING THE U.K. NON-ARTHROPLASTY HIP REGISTRY DATASET

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Objectives: Chondral injuries of the hip are frequently seen in association femoroacetabular impingement (FAI) and arthroscopic treatments are becoming common. The aim of this study is to compare outcomes of arthroscopic acetabular chondral procedures using the UK Non-Arthroplasty Hip Registry (NAHR).

Methods: All adult hip arthroscopies recorded in the NAHR from 1st January 2012 to 31st May 2020 were extracted. Patients who underwent acetabular chondroplasty (n = 1,503), microfracture (n = 293) were identified after excluding patients with osteophytosis or a significant femoral chondral lesion. A cohort of patients who underwent no chondral procedure (n = 3,938) were used as a comparator group. The International Hip Outcome Tool 12 (iHOT-12) and EuroQol-5 Dimensions (EQ-5D) index questionnaires were collected preoperatively and at 6 and 12 months.

Results: Cam lesions were present in 83% and 93% of patients who underwent chondroplasty and microfracture respectively but only 65% of those who underwent no chondral procedure. There was significant improvement at 12 months versus baseline for both treatments in iHOT-12 [chondroplasty +28.6 (95%CI 26.3 to 31.0), microfracture +22.1 (17.4 to 26.7)] and EQ-5D Index scores, with 70% and 58% of patients had achieving the minimum clinically important iHOT-12 difference following chondroplasty and microfracture respectively. Significant improvement was seen even in high grade (Outerbridge Grade 4) chondral lesions or in older age (> 40 years) but were slow to improve.

Conclusion: Arthroscopic chondral treatments in the adult hip significantly improved in early functional outcome scores. Whilst patient selection is crucial, surgery should not be contra-indicated based upon age or chondral lesion grade in isolation.

Keywords:

i-hot-12, hip arthroscopy, outcomes, chondroplasty, microfracture

EHS23-2172
Hip arthroscopy

Oral

Survivorship and outcome of arthroscopic treatment of femoro-acetabular impingement at 10 years follow-up

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Objectives: This retrospective study aimed to investigate joint survivorship and the clinical results of patients who underwent hip arthroscopy (HA) for treatment of femoro-acetabular impingement syndrome (FAIS) at a minimum of 10-year follow-up.

Methods: Data were prospectively collected and reviewed from patients who underwent HA for FAIS, with no other further selection, between 2006 and 2012. At a minimum 10 years follow-up the long-term clinical outcomes have been assessed through the following Patient Reported Outcome measures (PROMs): visual analog scale, modified Harris Hip Score (mHHS), Non-Arthritic Hip Score, and Hip Outcome Score. Patient satisfaction was also analyzed. Conversion to Total Hip Replacement (THR) or the need for HA Revision (HAR) has been considered a failure.

Results: Of 146 eligible patients, 96 patients, with an average of 11-year follow-up were successfully reviewed. The survival rate was 74%. THR conversion and HAR rate were 22.9% and 3.1% respectively. Patients aged between 25 and 35 years old had a failure rate of 25.8% while patients older than 35 years old had a failure rate of 30.4%. The procedures significantly associated with an increased risk of failure were microfractures ($p=0.005$) and labral debridement ($p=0.04$). 70.3% achieved MCID for mHHS and significant improvements in all PROMs. 88.7% of patients reported being satisfied with the condition of their hip even without reaching the MCID.

Conclusion: This study suggests that even after more than 10 years from surgery, Hip Arthroscopy for FAIs provides good hip survivorship with consistent and lasting benefits. Overall patients' satisfaction was high even in patients not achieving MCID.

Keywords:

Hip arthroscopy, long-term, survivorship, clinical outcome, femoro-acetabular impingement, FAI

EHS23-2346
Hip arthroscopy

Oral

Comparison of early outcomes of arthroscopic labral repair or debridement : a study using the UK Non-Arthroplasty Hip Registry dataset

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Objectives: This study uses prospective registry data to compare early patient outcomes following arthroscopic repair or debridement of the acetabular labrum.

Methods: Data on adult patients who underwent arthroscopic labral debridement or repair between 1 January 2012 and 31 July 2019 were extracted from the UK Non-Arthroplasty Hip Registry. Patients who underwent microfracture, osteophyte excision, or a concurrent extra-articular procedure were excluded. The EuroQol five-dimension (EQ-5D) and International Hip Outcome Tool 12 (iHOT-12) questionnaires were collected preoperatively and at six and 12 months post-operatively. Due to concerns over differential questionnaire non-response between the two groups, a combination of random sampling, propensity score matching, and pooled multivariable linear regression models were employed to compare iHOT-12 improvement.

Results: A total of 2,025 labral debridements (55%) and 1,659 labral repairs (45%) were identified. Both groups saw significant ($p < 0.001$) EQ-5D and iHOT-12 gain compared to preoperative scores at 12 months (iHOT-12 improvement: labral repair = +28.7 (95% confidence interval (CI) 26.4 to 30.9), labral debridement = +24.7 (95% CI 22.5 to 27.0)), however there was no significant difference between procedures after multivariable modelling. Overall, 66% of cases achieved the minimum clinically important difference (MCID) and 48% achieved substantial clinical benefit at 12 months.

Conclusion: Both labral procedures were successful in significantly improving early functional outcome following hip arthroscopy, regardless of age or sex. Labral repair was associated with superior outcomes in univariable analysis, however there was no significant superiority demonstrated in the multivariable model.

Keywords:

i-hot-12, hip arthroscopy, outcomes, labral repair, labral debridement

EHS23-2031
Hip arthroscopy

Oral

Anterior Center-Edge Angle is Less Reliable than Anterior Wall Index to Predict Anterior Coverage of the Femoral Head

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Case Study: Objectives: To determine the correlation between anterior centre-edge angle (ACEA) and anterior wall index (AWI) with validated measurements of anterior acetabular coverage: Hip2Norm's® total anterior coverage (TAC) and computed-tomography (CT) equatorial anterior acetabular sector angle (eAASA).

Methods: We retrospectively reviewed 77 hips (mean age, 62±22 years old) with radiographs and CT-scans obtained for non hip-related pain. Two observers measured LCEA, AWI, Tönnis angle, ACEA, CT-pelvic tilt, and CT-acetabular version, with all Bland-Altman plots within 95% agreement. Correlation between measurements was estimated with Pearson's R coefficients. Linear regression tested the ability of radiographic measurements to predict TAC and eAASA.

Results: R coefficients were 0.164 (ACEA vs TAC), 0.170 (ACEA vs eAASA), 0.58 (AWI vs TAC), and 0.693 (AWI vs eAASA). Linear regression model I showed that AWI (B=17.8, 95%CI 5.7-29.9, p=0.004), CT-acetabular version (B=-0.44, 95%CI -0.68 to -0.2, p=0.0001) and LCEA (B=0.33, 95%CI 0.2-0.47, p=0.0001) were useful to predict TAC. Linear regression model II revealed that AWI (B=25, 95%CI 15.67-34.4 p=0.001), CT-acetabular version (B=-0.48, 95%CI -0.67 to -0.29, p=0.0001), CT-pelvic tilt (B=0.26, 95%CI 0.12-0.4, p=0.0001) and LCEA (B=0.21, 95%CI 0.1-0.3, p=0.000) accurately predicted equatorial eAASA. 95%CI-estimates using 2,000 bootstrap samples from the original data were 6.16-28.6 and 15.1-34.25 for AWI in models I and II, respectively.

Conclusions: There was a moderate-to-strong correlation between AWI and both TAC and eAASA, while ACEA was not useful to accurately quantify anterior acetabular coverage. LCEA, acetabular version and pelvic tilt also helped predict anterior coverage.

Keywords:

anterior wall index; anterior centre-edge angle; anterior acetabular wall coverage; hip dysplasia; femoro-acetabular impingement

EHS23-2328
Joint preservation

Oral

EARLY TO MID-TERM OUTCOMES OF PERIACETABULAR OSTEOTOMY FOR DEVELOPMENTAL HIP DYSPLASIA AND FEMOROACETABULAR IMPINGEMENT: A STUDY OF 1,087 CASES USING THE NAHR DATASET

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Objectives: Periacetabular osteotomy (PAO) is an established treatment for developmental hip dysplasia (DDH) in young adults and can also be utilised in the management of femoroacetabular impingement (FAI) with acetabular retroversion. This study used a national registry to assess the outcomes of PAO for DDH and FAI.

Methods: PAOs recorded in the UK Non-Arthroplasty Hip Registry between 2012 and November 2022 were identified along with recorded patient and surgical characteristics. Cases were grouped according to the primary pathology (DDH or FAI). Patient reported outcome measures (PROMs) captured included the International Hip Outcome Tool (iHOT)-12 (primary outcome) and the EuroQol-5 Dimensions (EQ-5D) index preoperatively and at 6 months, 1, 2, and 5 years post-operatively.

Results: 1,087 PAOs were identified; 995 for DDH (91%), 98 for FAI (9%). Most patients (91%) were female. The DDH group were significantly older (mean 31.7 years) than the FAI group (25.4 years) but had similar body mass index (mean 25.7kg/m²). Overall, significant (all $p < 0.0001$) iHOT-12 and EQ-5D improvement (delta) vs baseline pre-operative scores were achieved at 6 months (mean iHOT-12 improvement +27.4 (95%CI 25.3 to 29.5); $n=515$) and maintained out to 5 years (+30.0 (21.4 to 38.6); $n=44$ [9.8% of those eligible for follow-up at 5 years]), at which point 71% and 55% of patients continued to demonstrate a score improvement greater than or equal to the minimum clinically important difference (≥ 13 points) and substantial clinical benefit (≥ 28 points) for iHOT-12 respectively.

Conclusion: This study demonstrates excellent functional outcomes following PAO undertaken for DDH and FAI in the short to medium term in a large national registry.

Keywords:

i-hot-12, hip arthroscopy, outcomes, minimum clinically important difference and substantial clinical benefit

EHS23-2030
Joint preservation

Oral

Unilateral Bernese periacetabular osteotomy - what happens to the pelvic tilt over time?

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Objectives: In this retrospective longitudinal study, we investigated the hypothesis that patients with developmental dysplasia of the hip (DDH) present with reactively increased anterior pelvic tilt to compensate for reduced anterior femoral head coverage. We asked: (1) What was the preoperative pelvic tilt before unilateral Bernese PAO? (2) How does pelvic tilt evolve during long-term follow-up of unilateral Bernese PAO compared to before surgery?

Methods: We assessed pelvic tilt of patients undergoing unilateral PAO for DDH preoperatively, immediately postoperatively, and at long-term follow-up using standardized AP pelvis radiographs with the previously validated noncommercial HipRecon software. This software uses a 2D-3D deformation reconstruction method and, after creating a patient-specific 3D pelvic model based on the AP pelvis radiograph, allows calculation of the pelvic orientation in relation to the anterior pelvic plane (APP). The mean radiographic follow-up was at 12 (8-30) years postoperatively.

Results: Mean pelvic tilt decreased significantly from $4,7 \pm 2,3^\circ$ (range -4.3° to 15.0°) before the intervention to $1,7 \pm 2,3^\circ$ (range -5.0° to 14.0°) at long-term follow-up ($p=0,001$).

Conclusion: We observed a statistically significant decrease in pelvic tilt of three degrees when comparing pelvic orientation on AP pelvis radiographs preoperatively and at long-term follow-up after unilateral Bernese PAO in patients with DDH. However, considering the interindividual differences in pelvic orientation, this decrease does not seem to be of major clinical relevance. This leads us to believe that, rather than being compensatory for the lack of anterolateral coverage in DDH, pelvic tilt more likely represents a patient-specific, individual morphologic feature.

Keywords:

Bernese periacetabular osteotomy, PAO, pelvic tilt, hip, pelvis, long-term, follow-up

EHS23-2003
Joint preservation

Oral

How does sports activity change after periacetabular osteotomy? - A qualitative and quantitative analysis

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Objectives: Patients undergoing PAO for symptomatic DDH are usually young and active. Little evidence exists regarding postoperative activity level and changes in sports activity.

The aim of this study was to determine the change in qualitative and quantitative sports activity after PAO.

Methods: 202 consecutive patients who underwent PAO for DDH between 01/2015-06/2017 were evaluated. A total of 123 cases with complete data were included in the final analysis.

UCLA activity score, iHOT-12 and Subjective Hip Value (SHV) as well as practiced sports, frequency, duration. Changes in practiced sports and reasons for changes were recorded.

Results: Mean age at time of surgery was 27.7 ± 7.3 y. 85% of patients were female. Mean follow-up was 63 ± 10 months. UCLA score (5.1 ± 2.4 vs. 7 ± 1.7 ; $p < 0.001$), iHOT-12 (41.4 ± 22.2 vs. 72.6 ± 22.9 ; $p < 0.001$) and SHV (42.8 ± 24.3 vs. 80.6 ± 17.8 ; $p < 0.001$) increased. More patients participated in low-impact sports postoperatively (32% vs. 52%; $p = 0.001$). Participation in high-impact sports decreased (42% vs. 36%; $p = 0.361$). Overall sports participation increased (79% vs. 91%; $p = 0.008$). Quantitatively, sports frequency in times per week ($p < 0.001$) and length of exercise per session ($p = 0.007$) increased. 42% changed sports postoperatively. 28% reported having stopped previously practiced sports, while 14% reported having started new sports. Reasons were hip- and non-hip-related. In only two cases physician's advice was given as reason for changing sports.

Conclusion: Activity level increases after PAO. While patients can increase their quantitative sporting activity, qualitatively there is a shift towards low-impact sports. Reasons for changing sports are various and include hip-related and non-hip-related reasons.

Keywords:

Developmental dysplasia of the hip, Periacetabular osteotomy, Return to Sports, Patient outcomes

EHS23-2110
Joint preservation

Oral

Acetabular sector angles in asymptomatic and dysplastic hips - Defining Dysplasia and thresholds to guide management

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Objectives: This study aims to determine ASA values at different axial levels in a cohort of (1) asymptomatic, high-functioning hips without underlying hip pathology (controls); and (2) symptomatic, dysplastic hips that underwent periacetabular osteotomy (PAO). Thereby, we aimed to define thresholds for hip dysplasia.

Methods: This is an IRB-approved, cross-sectional study of 51 high-functioning, asymptomatic controls (102 hips) (Oxford Hip Score >43), without osteoarthritis (Tönnis<1), who underwent pelvic CT scan (age: 52.1±5.5years; 52.9% females); and 66 patients (72 hips) with symptomatic hip dysplasia treated with peri-acetabular osteotomy (PAO) (age: 29.3±7.3years; 85.9% females). Anterior and posterior acetabular sector angles (AASA & PASA) were measured at three CT axial levels to determine equatorial, intermediate, and proximal ASA. Thresholds for dysplasia were determined using Receiver Operating Characteristic (ROC) curve analysis, including area under the curve (AUC).

Results: The dysplastic group had significantly smaller ASAs compared to the Control Group; differences were most pronounced with proximal- and intermediate-PASA. Controls had proximal-PASA of 162°±17°, with a threshold for dysplasia of 137° (AUC: 0.908). Intermediate-PASA of controls was 117°±11°, with a threshold of 107° (AUC 0.904). Threshold for anterior dysplasia was 133° for proximal-AASA (AUC 0.859) and 57° for equatorial-AASA (AUC 0.868). Threshold for posterior dysplasia was 102° at intermediate-PASA (AUC 0.933).

Conclusion: Measurement of ASA is a reliable tool to identify dysplastic hips with high accuracy, aiding diagnosis and management. Posterior ASA less than 137° at the proximal level, and 107° at the intermediate level should alert clinicians of the presence of dysplasia.

Keywords:

Hip, Dysplasia, Retroversion, Acetabular sector angle, Computed tomography, Peri-Acetabular Osteotomy

EHS23-2112
Joint preservation

Oral

Patients with hip dysplasia have frequent femoral torsion deformities and combined version on preoperative MRI

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Objectives: Frequency of femoral torsion(FT) is unclear for patients with hip dysplasia. The purpose of this study was to investigate frequency of increased or decreased FT or acetabular version (AV) and combined version on preoperative MRI.

Methods: This retrospective comparative study involved 419 hips of symptomatic patients with hip dysplasia undergoing periacetabular osteotomy(age 28 years, 88% female, mean preoperative LCE angle 11°). All patients had preoperative MRI for evaluation of cartilage and labrum lesions and for dGEMRIC. Preoperative hip MRI was evaluated for assessment of FT, AV and combined version on axial T1-weighted images. Combined version equals the sum of FT and AV. FT was measured according to the Reikeras method. Field of view of the CT scan and MRI included pelvis and knee.

Results: Mean FT of 419 hips was 16°(-20-57°), and mean central AV was 19° (3-35°) and mean combined version was 35° (-8-78°).

44% of hips had FT between 10-25°, 23% had FT>25° and 32% had FT< 10°.

FT >35° was found in 6% and FT< 0° was found in 8%.

The combination of normal FV and AV was present in 36%, while 19% have increased FT >25° and normal AV and 27% have decreased FT<10° and normal AV.

Decreased combined version< 20° was present in 12%, increased combined version >50° was present in 14%.

Conclusion: Only one third of patients with hip dysplasia have normal FT combined with normal AV. Almost a third of patients have decreased FV< 10°, while 23% have increased FT >25°. Preoperative hip MRI allows assessment of FT and detection of deformities of FT such as increased or decreased FT for patients with hip dysplasia and hip pain. This is important for preoperative planning of hip preservation surgery (periacetabular osteotomy or femoral derotation osteotomy).

Keywords:

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EHS23-2301
Joint preservation

Oral

The Management of Patients with Femoroacetabular Impingement and Concomitant Tönnis Grade 2 or Greater Hip Osteoarthritis: An International Expert-Panel Delphi Study

List of authors:

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Objectives: In the context of contradictive evidence regarding the management of femoro-acetabular impingement (FAI) with concomitant hip osteoarthritis (OA) Tönnis grade 2 or more, it was our purpose to gather world-leading expert opinion to achieve consensus for management guidelines.

Methods: Three rounds of questionnaires were delivered via an online platform (Online Surveys UK). Comments were collected from the experts during each round of the survey and amendments were performed. Between each round, the authors acted as a steering committee, providing the experts with a summary of results and synthesising the next questionnaire. The expert panel was comprised of 27 members from 18 countries: 21 (78%) orthopaedic surgeons, 5 (18%) physiotherapists and 1 (4%) dual orthopaedic surgeon and sport and exercise medicine physician. Consensus was considered to be achieved for statements with a minimum agreement of 80%.

Results: Based on inconclusive and contradictory findings of previous scoping and systematic reviews, an initial questionnaire with 17 questions was developed. The experts achieved a complete participation (100%) in all four rounds of the Delphi study. After three Delphi rounds with appropriate informed amendment, a final 10-item consensus list was formulated.

Conclusion: This study describes a 10-item list with consensus statements regarding the management of FAI with concomitant Tönnis hip OA grade 2 or greater. No agreement for the need of three-dimensional imaging based solely on the Tönnis classification could be achieved.

There is a clear clinical equipoise in terms of the best management for FAI with Tönnis grade 2 or greater and therefore, a need for performing a randomized controlled trial.

Keywords:

FAIS; Femoroacetabular Impingement Syndrome; Consensus; Delphi

EHS23-2239
Hip Instability

Oral

Dual-Mobility Constructs Are Not a Panacea in Revision Total Hip Arthroplasty for Recurrent Dislocation: Mid-term results from a Single-Center Series

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Objectives: Dual-mobility constructs (DMC) are gaining in popularity to mitigate dislocation in revision total hip arthroplasty (THA). Purpose of this study was to report on a consecutive series of DMC used for recurrent dislocation and to identify risk factors for failure.

Methods: Between 2012 and 2019, 100 patients underwent revision due to dislocation, of which 45 patients received DMC. Average age was 74 years (51-88) and patients had a mean of 1.6 prior revisions (0-7). Re-dislocation, re-revision for dislocation, and overall re-revision rates were evaluated. Cox regression was used to analyze demographic variables and biomechanical parameters as potential risk factors for re-dislocation. Modified Harris hip scores (mHHS) were calculated. Mean follow-up was 53 months (1-103).

Results: The re-dislocation rate was 11.1% and the median time between revision and re-dislocation was 10 months (0-47). The re-revision rate for dislocation and for any reason were 6.7% and 17.7%, respectively. Risk factors for re-dislocation were a lower patient age (HR 1.10; $p=0.020$), a lower CCI (HR 2.38; $p=0.031$), pelvitrochanteric insufficiency (HR 14.42; $p=0.021$), smaller head sizes (HR 1.25; $p=0.041$), and cementation of DMC into a well-fixed cup (HR 8.23; $p=0.022$). In all patients with re-dislocation, the DMC was outside the Lewinnek zone (HR 78.05; $p=0.238$); no other associations were found for any biomechanical parameter. Mean mHHS improved from 43.8 before revision to 65.8 points at last follow-up ($p<0.01$).

Conclusion: This study demonstrates that the use of DMC alone does not reliably treat instability. All measures must be taken to reconstruct an impaired abductor integrity as well as to correct any component malposition to effectively prevent further dislocation.

Keywords:

dislocation, instability, revision THA, dual mobility

EHS23-2080
Hip Instability

Oral

An Evaluation of Outcomes in G7 Dual Mobility Cup for Primary Total Hip Arthroplasty: a Single Centre Retrospective Study

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Objectives: This study aims to analyse the use of G7 Dual Mobility Cup (G7 DMC) in patients with varying risk of dislocation, to compare rates of hip instability, as well as their short and long term post-operative outcomes.

Methods: Between 2017 and 2021, 187 patients received a G7 DMC for primary THA. These were retrospectively divided into three groups: elective surgery with low risk for dislocation (control group), elective surgery with high risk of dislocation or THA for trauma.

The primary outcome measure was dislocation rate. Secondary analysis compared Oxford Hip Score (OHS), short- and long-term complications and revision surgery. Statistical analysis was made using Student's T-test and chi-squared test.

Results: 57 patients (30.5%) comprised the control group, 53 (28.3%) were deemed high-risk and 77 (41.1%) received G7 DMC for trauma. BMI and ASA was higher in the high-risk group.

1 traumatic dislocation (1.9%) was seen in the high-risk group, while no dislocations were seen in the control or trauma groups. No patients required revision surgery for hip instability.

OHS was significantly lower in the high-risk group (39.4 +/- 8.9) compared with the control group (43.5 +/- 6.5) (p=0.012). No significant difference was seen against the trauma group (41.5 +/- 7.8) (p=0.221). High-risk patients had a higher rate of the short-term complications, however long-term complications were similar in all three groups.

Conclusion: Despite higher rates of short-term complications and poorer OHS seen in the high-risk group of patients, no spontaneous dislocation was seen in any of the three groups. We conclude that G7 DMC is effective at reducing hip instability in high risk and trauma patients.

Keywords:

hip instability; dual mobility cup, primary total hip arthroplasty

EHS23-2236
Hip Instability

Oral

Acetabular morphology predicts the risk of dislocation following hemiarthroplasty for femoral neck fractures in the elderly

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Objectives: Hip hemiarthroplasty dislocation is a devastating complication. Among other preoperative risk factors, acetabular morphology has been rarely studied. The purpose of the study was to evaluate the influence of preoperative native acetabular morphology on hemiarthroplasty dislocation.

Methods: We retrospectively reviewed 867 patients who underwent hip hemiarthroplasty for femoral neck fracture between January 1, 2014 and January 1, 2019. The 380 patients were treated with an anterior-based muscle-sparing approach. Central-Edge Angle (CEA) and Acetabular Depth-to-Width Ratio (ADWR) of the fractured hip were measured pre-operatively on the antero-posterior (AP) pelvic view. Receiver Operating Characteristic (ROC) curves were performed to analyze the optimal cut-off for CEA and ADWR. Hemiarthroplasty dislocation occurred in 18 patients (4.7%) and the remaining 362 were used as the control group.

Results: No significant differences in terms of sex, age, dementia, neuromuscular disease, and body mass index (BMI) were found between the 2 groups. The 18 patients who had a hip dislocation had significantly smaller mean CEA than the control group ($p=0.0001$) (mean $36.1\pm 7.5^\circ$ and $43.2\pm 5.6^\circ$, respectively) as well as ADWR (mean 34 ± 6 vs 37 ± 4 , respectively) ($p=0.001$). Using the ROC analysis, we report significant cut-offs of 38.5° for CEA ($p=0.0001$) and 34.5 for the ADWR ($p=0.017$).

Conclusion: Higher rates of hemiarthroplasty dislocation were observed in patients who had a preoperative CEA of less than 38.5° and an ADWR of less than 34.5 . Patients who have preoperative acetabular morphological risk factors for dislocation might be better candidates for a total hip arthroplasty.

Keywords:

Acetabular Depth-to-Width ratio; Center-Edge angle, Dislocation, Femoral neck fracture, Hemiarthroplasty, Preoperative Radiographs, Risk factor

EHS23-2247
Hip Instability

Oral

The relevance of iliofemoral and pubofemoral ligaments for Total Hip Arthroplasty stability. A cadaveric study.

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Objectives: The ligaments of the human hip joint are considered to be the main mechanical stabilizers preventing hip dislocation. The Modified Anterolateral Approach for Stable Hip (MAASH technique) was developed in order to prevent ligament section during total hip arthroplasty (THA). The aim of this cadaveric study was to evaluate the stability of a THA placed with MAASH technique, and how this stability was modified as iliofemoral and pubofemoral ligaments were subsequently sectioned.

Methods: Four hips from two body donors were used. MAASH technique was used to implant a THA, thus preserving iliofemoral and pubofemoral ligaments. Stability testing was done. 20 kg traction test and shuck test were performed, and Xray images were obtained. The distance between tear drop and minor trochanter was measured on the Xray image. After sectioning subsequently pubofemoral and iliofemoral ligaments, stability testing was repeated.

Results: The distance between tear drop and minor trochanter increased 9.7 mm when the pubofemoral ligament was first sectioned, and 5.8 mm when the iliofemoral ligament was first sectioned. When both ligaments were sectioned, the mean increase was 11.8 mm. The section of the pubofemoral ligament would affect the stability of the THA on external rotation with hip extension.

Conclusion: The preservation of iliofemoral and pubofemoral ligaments during an anterolateral approach for THA increases the stability of the hip, and decreases the need for higher offset to avoid positive shuck testing or dislocations.

Keywords:

Total hip replacement; Arthroplasty; Ligament preservation; Leg length discrepancy; Hip dislocation

EHS23-2179
Hip Instability

Oral

The Position of the Femoral Fovea Measured by Delta Angle Represents a Viable Parameter for the Assessment of Hip Instability and Lesions of the Ligamentum Teres of the Hip

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Objectives: Lesions of the Ligamentum Teres of the hip (LT) are frequently detected in borderline acetabular dysplasia and may be influenced by the position of the femoral fovea. MRI arthrography with leg traction puts the hip joint in a subluxated position and improves the visualization of articular structures. The condition of the LT can be assessed in detail.

This study aims to evaluate radiographic measurements for acetabular dysplasia and hip instability with traction MRI arthrography of the hip and to correlate them with the condition of the LT.

Methods: From 2017 to 2022 patients underwent a radiological and clinical investigation in the presence of hip pain. 68 patients, 74 hips, were included in this study. Radiographs and MRI arthrography with leg traction and rotational MRI of the lower extremities were performed. Lateral center edge angle (LCEA), Femoro-Epiphyseal Acetabular Roof (FEAR) index, Gothic Arch Angle (GAA) and the Delta angle, measured in radiographs and MRI, were assessed. The condition of the LT was assessed in MRI.

Results: There was a significant difference in FEAR index ($p < .001$), GAA ($p < .001$) and LCEA ($p < .001$) in the presence and absence of LT ruptures.

Further a significant difference of the Delta angle on radiographs ($p < .001$) and MRI ($p < .001$) in the presence of LT ruptures could be detected.

The Delta angle showed a significant correlation with the FEAR index ($p < .001$), the GAA ($p < .001$) and the LCEA ($p < .001$).

Conclusion: Measured by Delta angle in MRI and in radiographs this study shows a significant correlation of the foveal position with established radiographic parameters. The presence of LT ruptures was significantly influenced by the Delta angle.

Keywords:

Hip instability, Borderline Dysplasia, Ligamentum teres

EHS23-2044
Hip Instability

Oral

Decentration of the femoral head: Is it associated with osseous deformities predisposing to hip instability and the need for periacetabular osteotomy

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Objectives: Hip instability is a challenge in surgical decision making for joint preserving hip surgery. To assess the prevalence of "decentration of the femoral head" - a new diagnostic sign on hip MR arthrography (MRA) on (1) different imaging planes, (2) its association with deformities predisposing to hip instability and (3) subsequent periacetabular osteotomy (PAO).

Methods: IRB-approved retrospective diagnostic study of 351 patients (48% men, mean age 31 years) with hip pain undergoing radiography and hip MRA with sagittal-, axial-, and radial- images. Presence of decentration was defined as a layer of contrast agent between the posterior cartilage layers. (1) Prevalence of decentration sign was compared on sagittal-, axial-, and radial images and between (2) hips with/ without hip dysplasia (lateral center edge angle < 25°), increased femoral torsion (>39°) and valgus hips (CCD >139°). (3) Among the 171 hips (49%) undergoing joint preserving surgery association between positive decentration sign and PAO was assessed.

Results: (1) Decentration was detected with the highest ($p < 0.001$) frequency on radial- (28%) followed by axial- (13%) and sagittal- (5%) images.

(2) Hips with decentration were associated (all $p < 0.001$) with hip dysplasia (56% vs 17%, OR of 6.4) high femoral torsion (18% vs 5%, OR of 4.2) and valgus deformity (24% vs 8%, OR of 3.8) compared to hips without.

(3) Hips with a decentration sign had a 11.6 higher odds ($p < 0.001$) of undergoing PAO.

Conclusion: Decentration sign was most frequently on radial MRA and was associated with deformities predisposing to hip instability. Hips with decentration sign were more likely to undergo PAO for hip dysplasia emphasizing its potential for surgical decision making.

Keywords:

Decentration, hip instability, periacetabular osteotomy, joint preserving surgery

EHS23-2131

Oral

Miscellaneous topics

Will the positioning of right and left-sided acetabular cups differ for a right-handed surgeon operating through a direct lateral approach?

List of authors:

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Objectives: The current study aimed to evaluate the difference between the right and left side acetabular cup placement during primary THA by a right-handed surgeon operating through a direct lateral approach and using manual instruments.

Methods: A retrospective evaluation of the last 400 THAs performed by a senior right-handed arthroplasty consultant with over 20 years of experience; all hips were operated through a direct lateral approach in a lateral decubitus position using manual instruments, aiming at cups positioned within the Lewinek safe zone. After excluding revision THAs, complex primary THAs, and bad-quality radiographs, 224 THA [117 left (group A) and 107 right (group B)] radiographs were included. Cup inclination angle and anteversion were evaluated on plain AP pelvis radiographs

Results: There were no significant differences regarding gender, diagnosis, and cup fixation (49.1% cemented cups vs. 50.9% cementless). The mean inclination angle in group A and group B was $37.9^\circ \pm 5.6$ and $39.4^\circ \pm 5.5$, respectively, and the difference was significant, $p < 0.05$. The mean anteversion was $24.3 \pm 6.2^\circ$ for group A, and $21 \pm 6.4^\circ$ for group B $p < 0.05$. 90.6% and 95.3% of the cups were within the safe zone for abduction in group A and group B, respectively. While for anteversion, 65% and 54% of the cups were within the safe zone for group A and group B, respectively. No difference was found regarding cup position related to the type of fixation.

Conclusion: Cup positioning in the left or right hip seems to be affected by the surgeon's handedness, even in the hand of an experienced surgeon. Further correlation to functional outcomes and dislocation rates is mandatory.

Keywords:

Surgeon handedness; acetabular cup position; Lewinek safe zone

EHS23-2059
Miscellaneous topics

Oral

Real World Validation of an Machine Learning Algorithm Predicting Treatment Strategy for Hip Osteoarthritis.

List of authors:

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Objectives: Artificial Intelligence (AI) is becoming more powerful but is barely used to counter the growth in health care burden. AI applications to increase efficiency in orthopedics are rare. We questioned if (1) we could train machine learning (ML) algorithms, based on answers from digitalized history taking questionnaires, to predict treatment of hip osteoarthritis (either conservative or surgical); (2) such an algorithm could streamline clinical consultation.

Methods: Multiple ML models were trained on 600 annotated (80% training, 20% test) digital history taking questionnaires, acquired before consultation. Best performing models, based on balanced accuracy and optimized automated hyperparameter tuning, were build into our daily clinical orthopedic practice. Fifty patients with hip complaints (>45 years) were prospectively predicted and planned (partly blinded, partly unblinded) for consultation with the physician assistant (conservative) or orthopedic surgeon (operative). Tailored patient information based on the prediction was automatically sent to a smartphone app. Level of evidence: IV.

Results: Random Forest and BernoulliNB were the most accurate ML models (0.75 balanced accuracy). Treatment prediction was correct in 45 out of 50 consultations (90%), $p < 0.0001$ (sign and binomial test). Specialized consultations where conservatively predicted patients were seen by the physician assistant and surgical patients by the orthopedic surgeon were highly appreciated and effective.

Conclusion: Treatment strategy of hip osteoarthritis based on answers from digital history taking questionnaires was accurately predicted before patients entered the hospital. This can make outpatient consultation scheduling more efficient and tailor pre-consultation patient education.

Keywords:

Hip osteoarthritis, Treatment prediction, Machine Learnin, Outpatient clinic

EHS23-2154
Miscellaneous topics

Oral

Topographical anatomical landmarks for intraoperative identification the Gibson interval: a study of 617 hips.

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Objectives: (1) What is the distance between the anterior border of the gluteus maximus and five palpable anatomical landmarks? (2) Are there differences in the location of the Gibson interval dependent on age, sex and femoral torsion? (3) What is the location of perforating vessels (PV) of the inferior gluteal artery with regard to the innominate tubercle?

Methods: Single center retrospective study of 370 patients (617 hips) who underwent a CT scan of the hip and proximal femur between 2019 - 2021. We defined 5 anatomical markers: (A) Anterior superior iliac spine, (B) mid distance between A and C, (C) trochanter tip, (D) center of trochanter, (E) innominate tubercle. The distance to the Gibson interval was assessed in the axial plane, the distance of the PV to the innominate tubercle was measured in the coronal plane in a CT-scan. We compared the following subgroups for each landmark: male vs. female, young vs. old (cut-off age at 40yo), categorical age (< 20; 20 to 40; 40 to 60; >60), categorical torsion (< 10; 10 to 25; 25 to 35; >35). Cluster analysis and linear regression analysis were also performed.

Results: (1) Mean location of the parameters A-E was at -8.1 cm, 1.1 cm, 1.8 cm, 1.3 cm and 0.4cm. (2) In men the Gibson interval was more posteriorly than in female patients. In younger patients the interval was more anteriorly than in older patients. Comparing categorical age, the interval lies more posterior in patients over 60 years of age. Comparing categorical torsion, the interval lies more posterior with increasing femoral torsion. (3) 50% of the PV are found between 5 and 9 cm proximal to the innominate tubercle.

Conclusion: We provide useful anatomical landmarks for reliable identification of the Gibson interval with regards to sex, torsion and age.

Keywords:

Gibson interval; descriptive study; perforating vessel; gluteus maximus

EHS23-2302

Oral

Miscellaneous topics

Prehabilitation in patients undergoing Orthopaedic surgery- A systematic review and meta-analysis of Randomised Control Trials

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Objectives: The objective of this review was to evaluate the effectiveness of prehabilitation for patients undergoing orthopaedic surgery versus standard care.

Methods: Bibliographic databases (MEDLINE, CINAHL, AMED, Embase, PEDro and Cochrane CENTRAL) for published and ISI Web of Science, SIGLE and EU clinical trials registry for unpublished trials were searched from 2000 to June 2022. Data were pooled using a random-effects model. Recommendations are made using GRADE. Primary outcome measures were pain, function, muscle strength and health related quality of life.

Results: Forty-eight trials involving 3570 participants were analysed. Pre-operatively, moderate certainty evidence favouring prehabilitation was reported for patients undergoing knee replacement (TKR) for: function (SMD -0.70, 95% CI -1.08, -0.32); muscle strength- flexion (SMD 1.00, 95% CI 0.23, 1.77); for patients undergoing hip replacement (THR) for: HRQoL on SF-36 (WMD 7.35, 95% CI 3.15, 11.54); muscle strength- Abduction (SMD 1.03, 95% CI 0.03, 2.02); and high certainty evidence for patients undergoing lumbar surgery for back pain (WMD -8.20, 95% CI -8.85, -7.55) and moderate certainty evidence for HRQoL (SMD 0.46, 95% CI 0.13, 0.78). Post-operatively, moderate certainty evidence was reported for function: TKR at 6 weeks (SMD -0.51, 95% CI -0.85, -0.17); and lumbar surgery at 6 months (SMD -2.35, 95% CI -3.92, -0.79).

Conclusion: Prehabilitation was associated with moderate improvement in several preoperative outcomes. However, the evidence was inconsistent and the quality of evidence for postoperative outcomes was low to very low. RCTs with low risk of bias investigating preoperative and postoperative outcomes for all orthopaedic surgical procedures are required.

Keywords:

prehabilitation, orthopaedic, meta analysis

EHS23-2338

Miscellaneous topics

Oral

Does performing spinal anesthesia in the operating room for hip arthroplasty reduce the operating room's efficiency?

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Objectives: The care protocols are evolving, including the type of anesthetic management for a rapid and early recovery for lower limb arthroplasties. The aim of this study was to compare the influence of the type of anesthesia, general anesthesia (GA) vs spinal anesthesia (SA), on the OR occupancy time during total hip arthroplasty (THA).

Methods: A retrospective single-surgeon, single-center study was performed on prospectively collected data between 2018 and 2020 from consecutive patients after ethics committee approval. We determined the perioperative times, in particular the OR occupancy time divided into two subgroups: GA and SA.

Results: The analysis involved 277 THA procedures. The overall OR occupancy time was longer for SA than GA (123 ± 26 min vs 117 ± 23 min; $P = 0.015$). The total anesthesia time did not differ between groups (35 min ± 15 vs 34 min ± 14 ; $p = 0.0740$) and made up 28-29% of a patient's OR occupancy time. The "entry-incision" time was significantly longer in the SA group than the GA group (49 ± 13 vs. 53 ± 14 , $p=0.001$) while the "end-exit" time was significantly shorter in the SA group than the GA group (14 ± 7 vs. 8 ± 5 , $p<0.001$). The care time in the PACU was nearly 37% longer in the SA than the GA group (186 min ± 89 vs 118 min ± 60 ; $p < 0.001$). The longer SA time was offset by faster patient discharge.

Conclusion: The OR occupancy time was significantly longer for THA patients who received SA.

Keywords:

Orthopedic operating room, Perioperative management, Type of anesthesia, Total hip arthroplasty

EHS23-2079

Miscellaneous topics

Oral

The learning curve of the direct anterior approach is 100 cases. An analysis based on 15,875 total hip arthroplasties, using the Dutch Arthroplasty Register

List of authors:

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Objectives: We investigated the learning curve and survival rate of the direct anterior approach (DAA) in primary total hip arthroplasty (THA), using data from the Dutch Arthroplasty Register (LROI).

Methods: We identified all patients who received a primary THA using the DAA in 6 high-volume centers in the Netherlands between 2007-2019 (n=15,903). Procedures were ordered per surgeon, using date of operation. Using the procedure number, operations were divided into 6 groups based on the number of previous procedures per surgeon (first 25, 26-50, 51-100, 101-150, 151-200, >200). Data from different surgeons in different hospitals was pooled together. Revision rates were calculated using a multilevel time-to-event analysis.

Results: Patients operated in group 1-25 (hazard ratio (HR) 1.6 (95%CI 1.1-2.4)) and 26-50 (HR 1.6 (1.1-2.5)) had a higher risk for revision compared to patients operated in group >200 THAs. Between 50-100 procedures the revision risk was increased (HR 1.3 (0.9-1.9)), albeit not statistically different. From 100 procedures onwards the HR for revision was respectively 1.0 (0.6-1.6) and 0.8 (0.5-1.4) for patients in operation groups 101-150 and 151-200. Main reasons for revision were loosening of the stem (29%), periprosthetic infection (19%) and dislocation (16%).

Conclusion: We found a 64% increased risk of revision for patients undergoing THA using the DAA for the first 50 cases per surgeon. Between 50-100 cases, this risk was 30% increased, but not statistically different. From 100 cases onwards, a steady state had been reached in revision rate. The learning curve for DAA therefore is around 100 cases.

Keywords:

learning curve, total hip arthroplasty

EHS23-2146

Oral

Miscellaneous topics

The history of the straight stem in hip arthroplasty

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Objectives: Since the middle of the 20th century, total hip arthroplasty (TEP) has become a very successful treatment method for all end stages of hip joint disease. Charnley's "low friction torque arthroplasty" was the beginning of an extensive development up to the models currently available. This review presents the major developments of regular straight stems in hip arthroplasty.

Methods: With the help of the often sparse written documentation and in collaboration with various engineers from the individual prosthesis companies, the most important steps in the development of the straight stems were recorded. This makes it possible to trace the origins of the prosthesis models that are still successful today.

Results: The drawn genealogical tree shows the development and ancestry of the most common types of stems in Europe today. Many developmental steps were not well documented at the time or are not known.

Conclusion: Charnley's hip TEP was based on the successful solution of the problem of anchoring the prosthesis components in the bone with bone cement made of polymethyl methacrylate (PMMA).

In the field of cemented anchorage of the stem, three principles have emerged over the years that show good long-term survival rates: the principle of force closed ("taper-slip"), the principle of shape closed ("composite-beam") and the principle of direct bone contact ("line-to-line").

A family of uncemented stems evolved from Müller's cemented straight stem. Many of these designs were later redesigned for cemented fixation. The design of the stem is based on the principle of direct bone contact ("line-to-line"), which requires high primary stability and a roughened surface. Different stem designs and surface configurations were developed for this purpose.

Keywords:

Hip arthroplasty; femoral stem; history; development

EHS23-2066

Oral

Postop complications

Direct superior approach (DSA) associated with lower short-term revision risk for total hip arthroplasty compared to posterolateral approach. Early nationwide results based on the Dutch Arthroplasty Register (LROI)

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Objectives: The direct superior approach (DSA) is a modification of the classic posterolateral (PL) approach for total hip arthroplasty (THA), in which the iliotibial band and short external rotators are spared. The revision rate of the DSA has not been investigated previously using arthroplasty registry data. We examined the reasons and risk of revision of the DSA, compared to the anterior (DAA) and PL approach.

Methods: We retrospectively included 175,543 primary THAs performed between 2014 and 2020 (PL: n=117,576; DAA: n=56,626; DSA: n=1,341) using the Dutch Arthroplasty Registry (LROI). Competing risk survival analysis and multivariable Cox proportional hazard analyses, adjusted for potential confounders, were performed.

Results: After 3 years, crude revision rates due to any reason were 2.1% (95% CI 1.3-3.3) for DSA, and 2.9% (2.8-3) for PL approach. Crude revision rates for dislocation were 0.3% (0.1-0.8) for DSA, versus 1.0% (0.9-1.0) for PL approach. Dislocation revision rate for DSA did not differ from DAA (0.3% (0.2-0.3)). Multivariable Cox regression analysis demonstrated statistically significant lower overall revision rates for the DSA (HR 0.6 (0.4-1.0)) compared to the PL approach. Also a lower risk of revision due to dislocation was found in patients operated through the DSA (HR 0.3; (0.1-0.9)) compared to the PL approach (HR=1.0).

Conclusion: Early nationwide results suggest that the DSA for total hip arthroplasty seems to show a tendency towards a lower risk of revision for dislocation and hence overall revision compared to the PL approach.

Keywords:

DSA, transpiriformis, muscle sparing

EHS23-2037
Periprosthetic fractures

Oral

INCIDENCE OF PERIOPERATIVE PERIPROSTHETIC FRACTURES IN UNCEMENTED SHORT STEM TOTAL HIP ARTHROPLASTY

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Objectives: A single surgeon case series was investigated to evaluate the results of the Profemur® Preserve stem, emphasising on perioperative fracture rate.

Methods: We report on the results of a consecutive series of 443 cases in 416 patients. All procedures were performed by a single surgeon, in a single centre, using either a PATH® or SuperPATH® approach.

Immediate full weight bearing was allowed, without protective use of crutches. Descriptive and comparative statistics and additional subgroup analysis were calculated for patient, procedural and implant characteristics, focusing on the PPF rate. This was defined as fractures occurring either intra-operatively, or early postoperatively (6 weeks).

Results: The study revealed a total PPF rate of 2.26% (10 cases), with an intra-operative and early postoperative incidence of 0.45% and 1.81% respectively. The survival rate in this series was 95.26% at a mean postoperative FU of 5.6 years, including other reasons for revision. Subgroup analysis showed a significantly increased incidence of PPF in female patients (8 cases), cases using the PATH® approach (9 cases) and in older patients (mean age of 74.2 years in the cases with PPF). There was a tendency for higher incidence of PPF in cases with Dorr type A femurs and when smaller stem sizes were used. There were no other significant risk factors for early PPF. At final FU all stems were well ingrown; no cases of progressive subsidence of the stem were observed.

Conclusion: This short stem for uncemented THR shows promising results, but there is an unacceptably high perioperative fracture rate in the setting of a fast recovery program in female patients and in patients with higher age.

Keywords:

short stem THR; periprosthetic fracture

EHS23-2294

Oral

Postop complications

Elastic compression dressing reduces leg swelling and initial postoperative blood loss after total hip arthroplasty

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Objectives: Minor postoperative complications after total hip arthroplasty, including lymphedema, postoperative blood loss, and leg swelling compromise patient comfort during minimally invasive fast-track surgery. Compression dressings are commonly used in surgical practice to reduce swelling or blood loss. However, the use of compression dressings after primary THA to reduce these minor complications is controversial and prospective studies are lacking.

Methods: We conducted a prospective, single-center, two-arm, parallel-group, randomized controlled trial (RCT) of patients undergoing THA for primary osteoarthritis. A total of 324 patients were enrolled. 18 patients were excluded, and 306 patients were finally analyzed. Blood loss was estimated using the Nadler and Liu formulas. Leg swelling was measured pre- and postoperatively with a rotating 3D infrared body scanner.

Results: Postoperative leg swelling was significantly lower in the compression group ($p = 0.014$), even after adjustment for covariates ($p = 0.04$). Estimated blood loss was also lower in the compression group on the first ($p = 0.05$) and third ($p = 0.039$) postoperative days, and leveled off on the fifth postoperative day.

Conclusion: Compression dressing after primary total hip arthroplasty may help to minimize minor postoperative complications such as leg swelling and initial perioperative blood loss.

Keywords:

elastic compression dressing; swelling; blood loss; THA

EHS23-2192

Postop complications

Oral

Reduction of postoperative fever in proximal femur fractures during the COVID-19 Pandemic due to PPE and Cautions.

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Objectives: In the first period of quarantine for SARS-CoV-2 with the use of PPE and patients visits restricted we observed an empirical decreased incidence of post-operative fever in patients admitted. The aim of this study is to compare the prevalence of fever in this period with the same period in 2019 in patients admitted for proximal femur fracture (PFF)

Methods: We analyzed the presence of post-operative fever in 43 patients admitted in 2020 and 48 admitted in 2019 for PFF. Postoperative fever was considered with a cut off over 37.5°C, we recorded the duration of post-operative fever, time of surgery and hospitalization length

Results: In the 2020 group, fever was observed in the first post-op period in 13.6% patients, while after 4 days, fever was observed in 8.2% patients. In the 2019 group, 35.6% of the fever cases were in the first post-op period, while 23.3% were after 4 days. In addition, the average duration of post-operative fever in 2020 was significantly shorter than in 2019 by 1.4 days $p = 0.0004$

Therefore, during 2020 we observed a reduction in global post-op fever (21.8% vs 58.9%), a reduction in post-op fever 4 days after surgery: from 23.3% of patients in 2019 to 8.2% in 2020 $p = 0.002$. However, the prevalence of infective complications remained unchanged over the two years, 8.5% in 2019 vs. 6.3% in 2020; $p = 0.528$. Considering the infective complications occurred in patients who had post-operative fever after 4 days of surgery, the proportion increases statistically significantly in 2020 36.7% in 2019 vs 77.8% in 2020; $p = 0.030$

Conclusion: The results show a significant decrease of the prevalence and duration of post-operative due to the use of PPE and limitation in external access to the hospital decrease postoperative fever in patients with PFF.

Keywords:

: postoperative fever; fractured patients; Proximal femur fractures; PPE; COVID-19; SARS-CoV-2

EHS23-2224

Postop complications

Oral

Allogenic Blood Transfusion in the age of Tranexamic Acid - Who Needs a Type and Screen before Total Hip Arthroplasty?

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Objectives: Total hip arthroplasty (THA) is a common surgical procedure to treat refractory hip osteoarthritis, but is associated with a risk of transfusion. Understanding the risk factors associated with transfusion following THA is important to minimize the need for blood transfusions and optimize preoperative management.

Methods: This was a retrospective study of patients who underwent primary, unilateral THA from January 2014-January 2023 at a single tertiary care academic institution, and who had an available preoperative hemoglobin (Hgb) value. Patient data was collected from the electronic medical record and analyzed using chi square analysis and multiple binary logistic regression. ROC analysis and Youden's J statistic were utilized to determine an optimal Hgb level predictive of transfusion. A total of 7,919 patients were included in the final analysis.

Results: The overall transfusion rate was 5.1%. A preoperative hemoglobin value <12 g/dL was independently associated with a higher rate of transfusion ($p < 0.001$). In addition, operative time >120 minutes ($p < 0.001$) was independently associated with a higher rate of transfusion, while TXA use ($p < 0.001$) and higher body mass index ($p < 0.001$) were associated with a lower rate of transfusion. ROC analysis demonstrated an optimal Hgb cutoff of 12.05 g/dL (AUC 79.0%, 95% CI 76.4%-81.5%) using Youden's J statistic (Sensitivity 60%, Specificity 85%) for predicting transfusion following THA. Transfusion rate below a Hgb level of 12.05 g/dL was 17.7%, and above was 2.5%.

Conclusion: The findings of this study suggest that a type and screen is indicated for patients with a preoperative Hgb of <12 g/dL when planning for surgery or in patients who experience operative times above 90 minutes.

Keywords:

Total Hip Arthroplasty, Transfusion, Complications

EHS23-2070

Postop complications

Oral

Incidence and Risk Factors for Stroke after Hip Fracture: A meta-analysis

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Objectives: To determine the overall incidence and risk factors of stroke in patients with hip fracture.

Methods: A systematic search of the literature using PubMed, EMBASE, Scopus, and the Cochrane Collaboration Library database was carried out. Studies that reported the incidence of stroke in hip fracture patients older than 50 years of age, whether operated or not, were included. Data were extracted following the PRISMA guidelines to ensure accuracy. Data was extracted from published reports and combined using Review Manager 5.4. A random effects model was adopted if significant heterogeneity was observed. The primary outcome was the incidence of stroke in patients with hip fracture. Secondary outcomes of interest included influence on the incidence of demographic factors, associated conditions, habits and analytical parameters.

Results: Of 635 initially retrieved studies, 18 studies were included, with 256197 patients. The mean age ranged from 55 to 84 years. The overall incidence of stroke in hip fracture patients was 6.72%, 95%CI 4.37%-9.07%. The incidence of stroke by region was highest in the American continent (8.09%, 95%CI 3.60%-12.58%; $P > .001$). Regarding associated conditions diabetes significantly increased the risk of stroke (OR 1.80, 95%CI 1.41-2.30). Respect to patient characteristics, BMI greater than 24.4 and female gender did not significantly increase the risk of stroke: (OR 1.07, 95%CI 0.74-1.56) and (OR 1.15, 95%CI 0.91-1.46). Lastly, lower albumin concentrations were a risk factor for stroke in patients with hip fracture (MD -3.18, 95%CI -4.06 to -2.31).

Conclusion: The incidence of stroke after hip fracture was 6.72%. The incidence of stroke increases over time, and the closely associated risk factors were diabetes and lower albumin levels.

Keywords:

Hip fracture; stroke; cerebrovascular; meta-analysis

EHS23-2340
New technologies

Oral

Mako robotic-arm assisted system in total hip arthroplasty for Japanese patients: Single surgeon's initial 100 cases.

List of authors:

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Objectives: Mako is the first robotic-arm surgical support system approved and covered by insurance in the field of orthopedics in Japan in June 2019. Clinical results in Japan, where DDH is relatively common, are not yet known in detail. The aim of this study is to evaluate the early effectiveness and summarize the initial experiences of Mako Total Hip for Japanese patients.

Methods: 95 patients (15 males, 80 females, 102 hips) were treated with Mako robotic-arm assisted THA between January 2020 and July 2021. The target for cup placement was set at a radiographic angle of 40° inclination and 20° anteversion (group 4020, 55 patients) or 40° inclination and 15° anteversion (group 4015, 47 patients). Surgeries were performed using a posterolateral approach, and a robotic-arm was used in acetabular reaming and cup placement. Trident HA PSL cups were used in all cases, and adjuvant screws were used in 9 cases. Postoperative X-ray images and CT images were used in software to measure and evaluate the cup placement angles.

Results: In the X-ray measurement, RI: $39.3 \pm 2.8^\circ$ and RA: $16.3 \pm 2.9^\circ$ in the 4020 group, and RI: $40.3 \pm 2.5^\circ$ and RA: $12.8 \pm 2.5^\circ$ in the 4015 group. The CT measurements showed RI: $39.2 \pm 2.1^\circ$ and RA: $18.8 \pm 2.8^\circ$ in the 4020 group and RI: $39.5 \pm 1.6^\circ$ and RA: $14.1 \pm 2.8^\circ$ in the 4015 group. All cases were in Lewinnek's safe zone. The 36 mm head was used in 70 patients (68.6%) and 32 mm in 32 patients (31.4%). No cup dislocation was observed during the first postoperative year.

Conclusion: The 3D planning and intraoperative support of Mako enabled accurate cup placement and the use of a larger head in the clinical practice for Japanese patients. However, the long-term effectiveness needs to be confirmed by further research.

Keywords:

Robotics, THA, Mako, dislocation, 36mm

EHS23-2168

Oral

Outcomes / proms in Hip surgery

Does Kaplan-Meier analysis overestimate the risk of revision in young patients undergoing total hip arthroplasty? A six- to 16- year follow-up study

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Objectives: Time to revision after total hip arthroplasty (THA) is necessary to evaluate the quality of the procedure. Kaplan-Meier (KM) analysis is useful to detect implant failure, however, competing risk (CR) methods are more appropriate to estimate the risk of revision as it depends on THA failure and mortality.

Methods: We asked whether KM analysis overestimates the risk of revision in patients under the age of 70 years undergoing THA at a mean follow-up of 12 years.

478 ceramic-on-ceramic THAs operated from 2006 to 2016 at a large tertiary Institution were identified from our prospective database. The mean age was 53.8 years (range 18 to 70). Survival analysis was calculated using both KM and CR analyses with 95% confidence intervals (CI). The estimated risk of revision surgery was obtained with the KM estimator, and the cumulative incidence function (CIF) for revision in the presence of the competing event of death was estimated at the same end-points.

Results: 18 hips were revised: 4 cups and 3 stems for aseptic loosening, 5 for periprosthetic fractures, 3 for iliopsoas impingement, 2 for infection, and 1 for dislocation. No ceramic fractures or osteolysis were found. 38 patients died due to unrelated cause to THA. The 12-year CIF (1-KM) for revision for any reason was 8.9 (4.9 to 14.3, 144 hips at risk) and for loosening 2.9 (1.1 to 6.1, 182 hips at risk). The 12-year CIF in the presence of the competing event of death for revision for any cause was 8.1% (4.5 to 12.9) and for loosening 2.7% (1.1 to 5.6). The KM analysis overestimated the failure rate for revision by 9.4%. and for loosening by 7.4%.

Conclusion: KM analysis overestimates the risk of revision for any cause and loosening in young patients undergoing THA at a mean follow-up of 12 years.

Keywords:

survival analysis, competing risk, revision

EHS23-2233
New technologies

Oral

Robotic Arm Assisted Total Hip Replacement: an Assistant and a Mentor

List of authors:

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Objectives: Acetabular cup placement is vital to minimizing dislocation and ensuring implant longevity in total hip arthroplasty(THA). Robotic arm assistance allows precise cup placement. This prospective study aimed to compare the accuracy of cup placement using manual technique verified by robotic software for surgeons in different phases of training.

Methods: This prospective study was performed in the first 25 consecutive robotic THA performed by a single surgeon using posterior approach. Three surgeon, fellow and resident, who were novel to robotic THA but had varying degrees of exposure to conventional THA completed the study. During trial, each of them were then asked to manually position an acetabular trial aiming to produce an inclination of 40 degrees and anteversion of 20 degrees, blinded and without robotic guidance. The measurements were recorded and compared for consistency and learning curve phenomenon.

Results: 75 manual trial cup positioning attempts were made by the surgical team in 25 consecutive robotic THA.. Manual cup positioning yielded a mean inclination of 40 degrees(sd= 6.98) while mean anteversion was only 16.2 degrees(sd=8.1) despite aiming for 20. Both the surgeon and fellows improved in accuracy beyond the learning curve.

Intraoperative verification of cup position correlated strongly with preoperative planning in both inclination($r=0.67$, $p=0.0003$) and anteversion($r=0.75$, $p=0.0002$).

Conclusion: Manual acetabular cup positioning tends to produce small anteversion and robotic arm is an excellent teacher to improve accuracy. Robotic assistance also guarantees accurate cup position according to plan.

Keywords:

robotic total hip replacement, robotic surgery

EHS23-2219
New technologies

Oral

The effect of spinopelvic parameters on the placement of the acetabular component in robotic arm-assisted total hip prosthesis in patients with developmental hip dysplasia

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Objectives: Robotic arm-assisted total hip replacement is important for accurate and reproducible component placement, especially in patients with developmental hip dysplasia(DDH). However, in this application, spinopelvic parameters are not taken into account in determining the anteversion and inclination of the acetabular component preoperatively.

Methods: Between 2021-2022, 41 hips of 31 patients who underwent robotic arm-assisted total hip replacement due to DDH were included in the study. In the preoperative planning, the acetabular component was placed in the false acetabulum with 20 degrees anteversion and 40 degrees inclination in all cases by the MAKO total hip arthroplasty segmentation team in the USA and sent to us. However, we placed the acetabular component in the real acetabulum with new planning in all cases. The acetabular anteversion and inclination angles were grouped according to the Stefl classification, taking into account the compatibility of spinopelvic mobility, and the acetabular component was placed by changing the inclination and anteversion angles within these dimensions. Inclination and anteversion were measured on postoperative AP pelvic radiographs.

Results: According to the Crowe classification, 5 patients were type 1, 10 patients were type 2, 3 patients were type 3, and 13 patients were type 4. According to the Stefl classification, 8 patients were type 1, 15 patients were type 2, 4 patients were type 3, and 4 patients were type 4. The mean postoperative inclination angle was 39.1 and anteversion angle was 19.2.

Conclusion: We believe that considering spinopelvic movement classification in pre-surgical planning will help to obtain a functional hip by reducing the risk of postoperative dislocation and wear.

Keywords:

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EHS23-2251
Hip resurfacing

Oral

Prosthetic Impingement Risk Factors and Impact on Patient Outcomes in Hip Resurfacing Arthroplasty.

List of authors:

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Objectives: A phenomenon that may occur post resurfacing is prosthetic impingement (PI), defined as cortical bone loss at the head-neck junction as a result of acetabular cup to bone collision. This study aims to determine the significance of impingement on patient outcomes and identify potential risk factors that may mitigate its occurrence.

Methods: We studied a consecutive series of 135 patients (133 Male, 2 Female) with a primary hip resurfacing arthroplasty under a single surgeon. Mean radiographic follow up was 66 months (range 24 to 147). Anteroposterior radiographs were evaluated for signs of impingement then analysed using radiographic measurements such as head-neck ratio, lateral cup protrusion and cup position. Clinically, patient reported outcome measures (PROMs), numeric pain scales and range of motion were assessed.

Results: Radiographic signs of impingement were present in 15.6% of patients. Median post-operative Harris Hip Score (HHS) in the impingement group (93 points) was lower than the non-impingement group (96 points), $p = 0.04$. Groin pain was higher in the impingement group with both activity and rest. Forward stepwise logistic regression shows an increased risk of prosthetic impingement with head-neck ratio (odds ratio 2.23, $p = 0.03$), and abduction (odds ratio 1.08, $p = 0.01$). These variables in combination with lateral cup protrusion and radiographic inclination using receiver operating characteristic (ROC) curves provides an excellent model of prediction with an area under the curve of 0.81.

Conclusion: Prosthetic impingement can cause significant post-operative pain and impact patient reported outcomes. Head-neck ratio and abduction are two important risk factors which should be considered in HRA pre-operative planning.

Keywords:

resurfacing, impingement, hip, groin pain

EHS23-2183
New technologies

Oral

Guiding prosthetic femoral version using 3D-printed patient-specific instrumentation (PSI): A pilot study

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Objectives: We performed a pilot study to better understand whether the intra-operative use of a novel PSI guide, designed to deliver a Prosthetic Femoral Version PFV of 20°, results in the target range of PFV in primary cemented THA.

Methods: We analysed post-operative Computed-Tomography (CT) data of two groups of patients who underwent primary cemented THA through posterior approach; 1. A group of 11 patients (11 hips) for which the surgeon used an intra-operative 3D-printed stem positioning guide (experimental) 2. A group of 24 patients (25 hips) for which the surgeon did not use the guide (control). The surgeon aimed for a PFV of 20°, and therefore the guide was designed to indicate the angle at which the stem was positioned intra-operatively. PFV angles were measured using the post-operative 3D-CT models of the proximal femurs and prosthetic components in both groups. Our primary objective was to compare the PFV in both groups. Our secondary objective was to evaluate the clinical outcome.

Results: Mean (\pm SD) value for the PFV was 21.3° (\pm 4.6°) and 24.6° (\pm 8.2°) for the experimental and control groups respectively. In the control group, 20% of the patients reported a PFV outside the intended range of 10° to 30° anteversion. In the experimental group, this percentage dropped to 0%. Satisfactory clinical outcome was recorded in both groups.

Conclusion: The intra-operative use of a PSI PFV guide helped the surgeon avoid suboptimal PFV in primary cemented THA. Further studies are needed to evaluate if the PS guide directly contributes to a better clinical outcome.

Keywords:

Primary total hip arthroplasty, Prosthetic femoral version, 3D-Printed patient-specific guides

EHS23-2285
Hip resurfacing

Oral

Pre-Surgical Planning of Hip Resurfacing Arthroplasty Using Digital Radiographs, EOS Imaging, and CT Converted 3D Models

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Objectives: Adequate sizing and orientation of hip resurfacing arthroplasty (HRA) is crucial for long term success. To date, a digital radiograph is still the golden standard despite its limitations. However, more recently developed EOS imaging and CT converted 3D models have been given promising results.

This study aims to compare the pre-surgical HRA planning accuracy using three different modalities as well as identifying the accuracy and reliability of relevant landmarks.

Methods: 77 HRA were performed at the same facility by one experienced surgeon. Blinded measurements were completed by three observers on the three different modalities (digital radiograph, EOS imaging and CT converted 3D model). After sizing the femoral head, two angular measurements (neck-shaft angle and calcar-shaft angle) were obtained. Statistical analysis was performed to determine the planning accuracy and inter, intra-observer reliability.

Results: Digital radiograph, EOS and 3D techniques could predict 35%, 70%, and 97% within one size off target, respectively. There was a mean absolute error of 1.82 ± 1.55 size off target for the digital radiograph, 0.87 ± 0.69 for the EOS, and 0.38 ± 0.36 for the CT converted 3D models. None of the angular measurements showed a statistical significant difference between modalities. There were good intra-observer reliabilities and moderate to good inter-observer reliabilities.

Conclusion: The optimum strategy for femoral head sizing in HRA planning is to use CT converted 3D models. Any other form of imaging can be used for the angular parameters. Better defined landmarks targeting smaller bone contours while simultaneously minimising subjective space could further improve the measurement reproducibility.

Keywords:

Hip resurfacing arthroplasty, preoperative planning, pre-surgical planning, landmarks

EHS23-2277
New technologies

Oral

Robotic surgery with functional evaluation 3D software for total hip replacement mitigate spinopelvic mobility effect on impingement

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Objectives: The aim of the present study is to investigate whether the use of a 3D software for Functional Component Positioning Assessment (FCPA) in robotic arm assisted THR could influence the effect of spinopelvic mobility on prosthetic and bony impingement.

A secondary aim is to evaluate the reproducibility of prosthetic and bone impingement patterns with final component positioning.

Methods: This is a retrospective study. 136 consecutive patients treated for Robotic Arm-Assisted THA with the same implant type were enrolled.

Sacral Slope in standing and sitting position was used to set pelvis orientation.

FCPA virtual 3D tool allows to simulate hip motion in flexion/extension, adduction/abduction and internal/external rotation, evaluating variation during pelvic tilting from sitting to standing positions. Any impingement occurring during hip motion was assessed.

Postoperatively, FCPA was performed virtually to evaluate bone or prosthetic impingement that might occur during 5 activities of daily living: maximum flexion, maximum extension, rising from a low sitting, shoe tying, rolling over. Type of impingement was classified as: Prosthesis on Prosthesis (PP) , Prosthesis on Bone (PB) and Bone on Bone (BB).

Results: In rise from seated position impingement occurred in 9% of cases, in 7% of cases it was BB.

In seated shoe tying impingement occurred in 6% of cases, in 5% of cases it was BB.

In rolling over impingement occurred in 35% of cases, in 20% it was PP.

Spinopelvic mobility did not correlate neither with bony nor with prosthetic impingement.

Conclusion: Robotic arm assisted surgery in THA using a FCPA software appears to mitigate spinopelvic mobility effect on impingement

Keywords:

RTHA, spinopelvic motion, THA.

EHS23-2197
Hip arthroscopy

Oral

Minimum 10 Year Outcome and Conversion Rate to THA After Hip Arthroscopy for the Treatment of Femoroacetabular Impingement

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Objectives: The aim of this study was to evaluate satisfaction and hip survival at a minimum 10-year follow-up in patients following hip arthroscopy for FAI.

Methods: A total of 290 patients (mean age, 38.8 ± 10.9 years; range 15-69 years) operated for FAI were included. Prospectively collected data of these patients who followed for a minimum of 10 years were retrospectively analyzed. 205 (70.7%) had mixed type where 72 (24.8 %) had cam and 13 (4.5%) had pincer type FAI. Patient demographic, Tonnis grade for osteoarthritis, and intraoperative findings were reviewed. Outcome measures of interest included reoperations (re-arthroscopy, conversion to THA), patient-satisfaction and factors associated with conversion to THA.

Results: The mean follow-up was 11.4 (10 to 16 years). 13.8% required conversion to THA, with a mean time to THA of 5.3 ± 2.6 years. Mean age of the patients requiring THA was 48.7 ± 7.63. 15 (5.1%) patients required re-arthroscopy. 237 (81.7%) patients did not undergo any revision surgery or other treatments. 168 (57.9%) patients were completely satisfied with the results, where 23 (7.9%) patients were very satisfied and 20 (6.9%) patients were satisfied. Overall satisfaction rate was 72.8%. Age over 40 years ($p < .001$), a Tonnis grade >1 ($p < .001$), and a full-thickness acetabular chondral lesion ($p < .001$), cam and mixed type FAI ($p = .025$) were identified as factors for failure and conversion to THA.

Conclusion: Hip arthroscopy for FAI resulted in high satisfaction of patients who did not eventually require THA. Higher rates of conversion to THA were seen in older patients, patients treated with higher Tonnis grade, full-thickness acetabular chondral lesions, cam and mixed type FAI.

Keywords:

Femoroacetabular impingement, hip preserving surgery, long-term follow up

EHS23-2266
Hip resurfacing

Oral

The first 200 ceramic-on-ceramic hip resurfacing implants at minimum 2-year follow-up.

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Objectives: Hip resurfacing arthroplasty (HRA) is a bone conserving alternative to total hip arthroplasty.

We present the early 2-year clinical and radiographic follow-up of a novel ceramic-on-ceramic (CoC) HRA in an international multi-centric cohort.

Methods: Patients undergoing HRA between September 2018 and January 2021 were prospectively included. Patient-reported outcome measures (PROMS) in the form of the Forgotten Joint Score (FJS), HOOS Jr, WOMAC, Oxford Hip Score (OHS) and UCLA Activity Score were collected preoperatively and at 1- and 2-years post-operation.

Serial radiographs were assessed for migration, component alignment, evidence of osteolysis/loosening and heterotopic ossification formation.

Results: 200 patients were identified to have reached 2-year follow-up. Of these, 185 completed PROMS follow-up at 2 years. There was significant improvement in HOOS ($p < 0.001$) and OHS ($p < 0.001$) and FJS ($p < 0.001$) between the pre-operative and 2-year outcomes.

Patients reported improved pain ($p < 0.001$), function ($p < 0.001$) and reduced stiffness ($p < 0.001$) as measured by the WOMAC score. Patients had improved activity scores on the UCLA Active Score ($P < 0.001$) with 53% reporting return to impact activity at 2 years.

There was no osteolysis and the mean acetabular cup inclination angle was 41deg and the femoral component shaft angle was 137deg.

No fractures were reported over but there was one sciatic nerve palsy with partial recovery. Two patients were revised; one at 3 months for pain due to a misdiagnosed back problem and another at 33 months for loosening of the acetabular component with delamination of the titanium ingrowth surface.

Conclusion: CoC resurfacing at 2-years post-operation demonstrate promising results with satisfactory PROMS and implant survival.

Keywords:

resurfacing, ceramic, activity, hip

EHS23-2291

Oral

Outcomes / proms in Hip surgery

Outcomes and return to dance of six active professional ballet dancers aged under 40 at total hip arthroplasty by direct anterior approach with custom stems

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Case Study: Background: There are very few published studies on outcomes of total hip arthroplasty (THA) in dancers, none of which included 'active' professional ballet dancers, that elected to undergo THA to resume professional ballet.

Methods: The authors studied a consecutive series of 6 active professional ballet dancers aged under 40, that underwent THA with the intention to resume ballet. All patients were operated by muscle-sparing direct anterior approach and received custom femoral stems. The outcomes collected were: return to dance, Oxford hip score (OHS), and forgotten joint score (FJS). A numeric rating scale (NRS) was used to assess satisfaction with surgery and pain at the spine and all lower limb joints. Postoperative computed tomography (CT) scans were acquired 2 days after surgery to assess implant positioning and correction of architectural deformities.

Results: The cohort comprised four females and two males, aged 15-39 years at index THA. At a follow-up of 2.5-5.1 years, all patients returned to professional ballet dance. Time to return to pain-free ballet was 3-4 months for three patients and 12-14 months for the three other patients. Clinical scores were excellent, except for FJS in one patient who had considerable pain at her spine and ipsilateral foot. All patients were most satisfied with surgery (NRS=10). There were no complications, reoperations or revisions. Radiographic assessment confirmed that the stem and cup were correctly positioned for all patients.

Conclusions: THA by muscle-sparing direct anterior approach using custom stems grants excellent clinical outcomes and return to dance at a minimum follow-up of 2 years in young active professional ballet dancers.

Keywords:

professional ballet dancer; total hip arthroplasty; direct anterior approach; custom femoral stem; return to dance; clinical scores

EHS23-2055
Periprosthetic fractures

Oral

Comparable revision rate after cemented or cementless femoral revisions for periprosthetic femoral fractures in total hip arthroplasty. Analysis of 1.879 revision hip arthroplasties in the Dutch Arthroplasty Register.

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Objectives: Periprosthetic femoral fractures (PPF) after total hip arthroplasty (THA) are devastating complications, as they are often result in severe functional deficits. There is no consensus about the optimal fixation method in femoral stem revisions after PPF. In addition, it is unknown whether an additional cup replacement is beneficial. Aim of this study was to perform a direct comparison in reasons and risk of re-revision between cemented and uncemented revision THAs following PPF using arthroplasty registry data.

Methods: We retrospectively identified 1,879 patients registered in the Dutch Arthroplasty Registry (LROI) who underwent a first time revision surgery for PPF between 2007-2021 (cemented stem: n=555; uncemented stem n=1,324). Competing risk survival analysis and (time-dependent) multivariable Cox proportional hazard analyses were performed.

Results: 5-, and 10 year crude cumulative incidence of re-revision following revision for PPF was similar between cemented and uncemented revision THAs (resp. 12.6%(CI 9.9-16.1) and 17.9%(13.4-23.9)) vs 11.2%(9.5-13.2) and 13.2%(11.1-15.8)). Multivariable Cox regression analysis, adjusting for potential confounders, showed a similar risk of revision for uncemented revision stems compared to cemented revision THAs. Finally, we found no difference in risk of re-revision between a total revision (HR 1.2 (CI 0.6-2.4)) compared to a stem revision only within the first year.

Conclusion: Cemented and uncemented femoral stems following PPF resulted in a comparable risk for revision arthroplasty, and hence can both be used for the treatment of PPFs. Additional cup revision was not superior to stem revision only.

Keywords:

Vancouver B2, Vancouver B3, Re-revision

EHS23-2282
Femoral revisions

Oral

16-years outcomes of a fully modular femoral stem in revision total hip arthroplasty ARTHROPLASTY

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Objectives: The purpose of this study is to report long-term outcomes of patients treated with a fully modular cementless revision stem.

Methods: A retrospective analysis from a single center was conducted for 200 patients implanted with a modular revision stem between 2004 and 2017 (minimum FU of 5 years). Patients with periprosthetic and subtrochanteric fractures were excluded. Post-operative re-revisions were recorded and analyzed by a Kaplan-Meier test to determine survivorship. During follow-up phone calls, patients were asked to report discomfort, and HOOS JR scores were analyzed.

Results: The 200 patients (59% female) had a mean age of 73 ± 10.4 years and a BMI of 24.5 ± 3.1 at the time of surgery. The mean follow-up time was 7.6 ± 4.4 (range, 0.01-16.9) yy. Thirty-one re-revisions were reported for aseptic cup loosening (n=4), dislocation (n=17), greater trochanteric fracture (n=3), infection (n=1), modular neck fracture (n=1), stem fracture (n=2), and aseptic stem loosening (n=3). At 16 years, the Kaplan-Meier survivorship is 83.6% (CI 78.3-88.9%) with the endpoint of any revision and 93.7% (CI 90.0-97.3%) with the endpoint of stem removal. In addition, 89% of patients reported no thigh pain or discomfort, and the mean HOOS JR score was 83.4 ± 16.9 with 73% of patients achieving the PASS threshold of 76.7.

Conclusion: In this retrospective study, the modular revision stem demonstrated good survivorship, surpassing the acceptable revision rate of 8.0% at 15 years reported by the Orthopedic Data Evaluation Panel. Moreover, patient-reported outcomes indicate improvements in postoperative pain and functions of daily living. Taken together, these findings suggest that this stem is safe and effective for revision THA with favorable long-term outcomes.

Keywords:

stem revision; THA revision; modular stem; modular neck;

EHS23-2177
Femoral revisions

Oral

ARTIFICIAL INTELLIGENCE CAN IDENTIFY FAILING TOTAL HIP REPLACEMENTS BEFORE RADIOGRAPHIC FEATURES OR A DROP IN PATIENT OUTCOME SCORES

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Objectives: Over 8000 total hip arthroplasties (THA) in the UK were revised in 2019, half for aseptic loosening. It is believed that Artificial Intelligence (AI) could identify or predict failing THA.

The aim of this study is to investigate whether Artificial Intelligence based machine learning (ML) / Deep Learning (DL) techniques can train an algorithm to identify and/or predict failing uncemented THA.

Methods: Consent was sought from patients followed up in a single design, uncemented THA implant surveillance study (2010-2021). Oxford hip scores and radiographs were collected at yearly intervals. Radiographs were analysed by 3 observers for presence of markers of implant loosening/failure: periprosthetic lucency, cortical hypertrophy, and pedestal formation. DL was trained according to revision status and radiographic features. Data augmentation and cross validation were used to increase the available training data, reduce bias, and improve verification of results.

Results: 184 patients consented to inclusion. 6 (3.2%) patients were revised for aseptic loosening. 2097 radiographs were analysed: 21 (11.4%) patients had three radiographic features of failure.

166 patients were used for training and testing the ML algorithm. Using radiographic features, had an AUC of 73%, but 5/6 patients who had been revised were identified.

This algorithm also predict failure 2-8 years before revision, before all radiographic features were visible and before a significant fall in the Oxford Hip score. True-Positive: 0.77, False Positive: 0.29.

Conclusion: ML algorithms can identify failing THA before visible features on radiographs or before PROM scores deteriorate. This is an important finding that could identify failing THA early.

Keywords:

artificial intelligence, machine learning, hip, revision. arthroplasty

EHS23-2138
Periprosthetic fractures

Oral

The Role Of The Acetabular Evaluation And Treatment In Vancouver B2 Postoperative Periprosthetic Fractures. A Standardized And Reproducible Surgical Technique Gives Better Outcomes And Lower Complication Rates

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Case Study: Introduction

Periprosthetic femoral fractures (PPFF) are serious issues of increasing trend, often burdened by unfavorable outcomes, with significant mortality rates, reoperation rates, and disability. Aim of this study is to retrospectively review results and complications of our standardized surgical technique addressed exclusively to Vancouver B2 PPFF.

Methods

From January 2006 to July 2016, we treated 235 consecutive patients, 47 males and 188 females, mean age at surgery of 71 ± 10 years, with periprosthetic B2 fractures. Patients were assessed clinically and radiographically following our standard protocol at the last available follow-up. The mean follow-up time was 6.4 years. Radiographic evaluation was performed according to Beals and Tower's criteria and clinical evaluation was performed using the Harris Hip Score.

Results

From the starter cohort of 235, 207 patients (88.1%) were fully evaluated, while 28 were lost to follow-up. According to Beal and Tower's criteria, we found excellent results in 72 patients (34.8%), good results in 133 patients (64.3%), and poor results in 2 patients (0.9%). Mean HHS was 75 ± 9 points, with a statistically significant correlation between good functional results and better radiographic assessment ($p = 0.001$). The use of support plate ($p = 0.008$) and the acetabular revision ($p = 0.002$) showed a statistically significant distribution with worse radiographic results.

Conclusions

Our experience suggests that using a standardized and reproducible surgical technique, as our technique proposed, can surely reduce surgical time, the complication rate, and the mortality rate. During acetabular evaluation, the choice of performing a cup revision must be weighed on overall patient's assessment.

Keywords:

Total Hip Arthroplasty, Total Hip Revision, Periprosthetic Fractures, Complications

EHS23-2056
Femoral revisions

Oral

Revision hip arthroplasty with Zweymuller stem :clinical and radiological outcomes at medium term.

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Objectives: Stem loosening can be associated with a wide spectrum of bone loss and deformity that represent key factors for choosing the most appropriate revision implant. The aim of this study was to evaluate the clinical outcomes and the survivorship of a consecutive series of THA revisions using a taper rectangular cementless stem for primary implants (Alloclassic® Zweymuller®, Zimmer Warsaw US) at medium-term fu.

Methods: We retrospectively evaluated 113 patients (115 revisions) who underwent femoral revision with Zweymuller stem with a preoperative Paprosky I(86) or II(29) defects from 2011 to 2021. The mean fu was 6 years(2-10). The median age at time of surgery was 71(41-93) with 60 males and 53 females. Clinical assessment was performed by means of Harris Hip Score (HHS) and Visual Analogic Scale (VAS), whereas for the radiological analysis we used conventional x-rays of the hips. The statistical analysis was performed using Graphpad Prism v5.0 and data distribution was assessed by Shapiro-Wilk test, and Wilcoxon matched paired test was used to test the differences between preoperative and postoperative score.

Results: 9 patients were lost to fu (deceased or not available), 104 (106 hips) were evaluated. The mean HHS and VAS significantly improved at final fu, going from 33,84 and 5,78 preoperatively to 66,42 and 2,05 postoperatively, respectively. 28(25%) patients showed a progressive radiolucent lines with no other radiological or clinical signs of loosening. One patient had recurrence of the infection. The survivorship with stem revision as endpoint was 100%.

Conclusion: Alloclassic Zweymüller stem showed excellent or good results during revision surgery for aseptic loosening, or second stage of two stage procedures. The survival rate of the stem was satisfactory.

Keywords:

hip, revision, loosening, periprosthetic fractures, pji

EHS23-2102
Proximal femoral fractures

Oral

THE OUTCOMES OF CONSTRAINED TOTAL HIP ARTHROPLASTY FOR RECURRENT DISLOCATION OF HIP HEMIARTHROPLASTY

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Objectives: The aim of the study is to assess whether conversion of dislocated hemiarthroplasty to total hip replacement improve functional and one year mortality.

Methods: The data for the study was obtained from NHFD (National Hip Fracture Database) and internal hospital computer systems (Medway, Theatre notes and PACS) between Dec 2016 and Dec 2021. The number of patients who had dislocations were identified and the treatment methods were analysed. Patient demographics including age, sex AMTS score, functional assessment and mortality at one year were documented.

Results: A total of 3994 patients were admitted during the study period of which 1735 (43.4%) patients had hemiarthroplasty. Fifty-six (3.23%) patients had dislocation of hemiarthroplasty. The average AMTS score was 5.3. All 56 patients had closed manipulative reduction under anaesthesia within in 12 hours of admission. Thirty-one patients (55.4%) went on to have recurrent dislocations of which 18 patients (58.4%) had total hip replacement using captive cup. All 18 patients who had total hip replacement with constrained captive for followed up to a minimum of two years (range 2- 12 years). There were no cases of dislocation or periprosthetic fractures in the follow up period. The Harris Hip scores improved from 61.8 preoperatively to 78 post-operatively ($p < 0.001$). There was no mortality at the end of two years of follow up in this group, two-year mortality for the patients with alternative management for dislocated hemiarthroplasty was 76.67%, ($p < 0.001$).

Conclusion: This study shows that aggressive treatment of recurrent hemiarthroplasty dislocation by revising to a total hip replacement with a constrained liner gives good functional and mortality outcomes

Keywords:

Constrained, Total Hip Arthroplasty, Outcomes, Recurrent Dislocations, Hemiarthroplasty

EHS23-2019
Hip resurfacing

Oral

NO TABLE DAA FOR HIP RESURFACING: The Importance of full capsular release

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Objectives: An anterior approach for hip resurfacing may preserve the femoral head blood supply and avoid injury to the external rotators. Adequate exposure can be challenging to achieve without a special table. We hypothesize that a full circumferential proximal capsulotomy can provide exposure with minimal torque on the surrounding soft tissues. We aimed to study the torque changes after segmental capsular release to provide adequate exposure during hip resurfacing through a direct anterior approach.

Methods: Eight fresh-frozen hip joints were approached using the DAA. A 6-axis force/torque sensor and a 6-axis motion tracking sensor were attached to the tibial and femoral diaphysis. Following dislocation, the torques generated to visualize the acetabulum and elevate the femur were assessed after sequential release of segments of the capsule and the zona orbicularis, followed by the external rotators. "Adequate" visualization was determined as the positions where the proximal femur and the acetabulum could be prepared

Results: ZO release decreased the extension torque by 21%. Releasing the ischiofemoral portion decreased the external rotation torque by 30%. Full capsulotomy decreased the average extension and external rotational torques by 2.1 Nm (40%) and 2.9 Nm (49%) respectively. The external rotators had minimal contribution to the torque generated during visualization.

Conclusion: In cadaveric specimens, following full proximal circumferential capsular release, the forces needed to deliver adequate exposure of the hip joint through the anterior approach reduced well below any threshold of muscle damage - with minimal torque, without a traction table or any special attachments and without the need for conjoint or piriformis tendon release.

Keywords:

Anterior Approach, DAA, Hip Resurfacing, Hip Capsule

EHS23-2258
Femoral revisions

Oral

De-escalation in Revision Hip Arthroplasty (how far could we go with downsizing of the femoral stem)

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Objectives: Downsizing of the femoral stem is a feasible option in revision hip arthroplasty. However, this principle was applied for exchange of loosened locked revision stems to a primary standard stem design. While short stem femoral components are currently widely used in Total hip arthroplasty (THA), according to recent studies, there is no survival difference in cementless THA between comparable groups of short and conventional stems. Comparative biomechanical studies have shown a superior rotational stability of a short stem, which presents a considerable option in certain conditions of revision hip arthroplasty for failed standard stems.

Methods: seven patients with failed standard stems underwent revision using a metaphysical fitting short stem in a single center. The mean follow-up was 2 years.

Results: Excellent clinical and radiological outcomes with improved WOMAC and VAS, as well as no signs of subsidence or aseptic loosening.

Conclusion: In certain Indications, de-escalation using short stem THA for revision of failed standard components presents a considerable treatment option.

Keywords:

short stem, revision, stability

EHS23-2051
Femoral revisions

Oral

Fifteen years' stem survival analysis after femoral impaction bone grafting with Exeter stem in revision hip arthroplasty at a regional general hospital in Japan

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Case Study: Objectives: Femoral impaction bone grafting (IBG) was introduced since the late 1990s in Japan. The aim of this study was to analyze retrospective 15-year stem survival after revision femoral replacement with IBG using Exeter stem by a single surgeon in Japan.

Methods: We investigated the radiographic and clinical records in 47 hips of 45 patients who underwent femoral revision with IBG by a single surgeon (T.I.) between 2001 and 2011. The mean age was 69 years (36-85 years) and the follow-up period was 2 to 21 years (mean: 10 years). The Merle d'Aubigne' and Postel hip score was used for clinical assessment, and re-operations for any reason were recorded. The survival curve was estimated using Kaplan-Meier method, and the endpoints were any type of femoral re-operation, re-operation for infection, re-operation for periprosthetic femoral fracture (PPFX), and re-operation for aseptic stem loosening at 15 years.

Results: The mean Merle d'Aubigné and Postel hip score improved from 11.0 points to 15.0 points at the final follow-up.

Re-operations were undertaken in 6 hips including for infection in 4 hips, for aseptic cup loosening in one hip, and for PPFX in one hip. The stem survival rates at 15 years were 82.6% with any type of re-operation as the endpoint, 90.6% with re-operation for infection as the endpoint, 93.8% with re-operation for PPFX as the endpoint, and 100% with re-operation for aseptic stem loosening as the endpoint, respectively.

Conclusions: The present study showed long-term favorable stem survival rate after femoral IBG by a single surgeon, with many stems surviving beyond 15 years without loosening even in the cases of early stage of IBG technique introduction to Japan.

Keywords:

impaction bone grafting, femur, revision hip arthroplasty, survival analysis

EHS23-2023
Hip resurfacing

Oral

Cardiac function is compromised in patients with elevated blood cobalt levels secondary to metal-on-metal hip implants

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Objectives: Elevated blood cobalt secondary to metal-on-metal (MoM) hip arthroplasties has been shown to be a risk factor for developing cardiovascular complications including cardiomyopathy. Published case reports document cardiomyopathy in patients with blood cobalt levels as low as 13µg/l. Clinical studies have found conflicting evidence of cobalt-induced cardiomyopathy in patients with MoM hips. The extent of cardiovascular injury, measured by global longitudinal strain (GLS), in patients with elevated blood cobalt levels has not previously been examined.

Methods: Sixteen patients with prospectively collected blood cobalt ion levels above 13µg/l were identified and matched with eight patients awaiting hip arthroplasty with no history of cobalt implants. Patients underwent echocardiogram assessment including GLS.

Results: Patients with MoM hip arthroplasties had a mean blood cobalt level of 29µg/l compared to 0.01µg/l in the control group. There was no difference or correlation in EF, left ventricular (LV) end systolic dimension, LV end diastolic dimension, fractional shortening, ventricular wall thickness or E/e' ratio. However, GLS was significantly reduced in patients with MoM hip arthroplasties compared to those without (-15.2% v -18%, (MoM v control) p= 0.0125). Pearson correlation demonstrated that GLS is significantly correlated with blood cobalt level (r= 0.8742, p=0.0009).

Conclusion: For the first time, this study has demonstrated reduced cardiac function in the presence of normal EF as assessed by GLS in patients with elevated cobalt above 13µg/l. As GLS is a more sensitive measure of systolic function than EF, routine echocardiogram assessment including GLS should be performed in all patients with MoM hip arthroplasties and elevated blood cobalt.

Keywords:

Metal-on-metal, cardiomyopathy

EHS23-2195
Femoral revisions

Oral

REVISION HIP REPLACEMENT IN PATIENTS WITH INACCURATE OFFSET

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Objectives: Although total hip arthroplasty (THA) is a highly successful treatment option for end-stage osteoarthritis, restoration of biomechanics such as offset is crucial for optimal function and long-term outcome after THA. Failure of correct offset restoration is associated with impingement, reduced hip abductor strength, altered gait kinematics and even higher wear of the artificial hip joint. The aim of this study is to evaluate the functional and radiological results of patients who underwent revision hip replacement only because of the offset problem.

Methods: Between January 2015 and 2020, 11 patients (5 females - 6 males) with a mean age of 56,8 (44-77) who underwent revision hip arthroplasty were included in the study. The mean postoperative follow-up period was 5,4 years (3-8). Harris Hip Score (HHS) was used for functional evaluation. Preoperative and postoperative radiological A-P pelvic X-rays were taken.

Results: Harris hip score was 67 (56-75) preoperatively and 89.3 (77-95) postoperatively. The horizontal femoral offset difference was 5.37 mm (4-17.2) preoperatively and 1.1 mm (0,3-3) postoperatively. The vertical femoral offset difference was 3.2 mm (0.2-7.3) preoperatively and 1.5 mm (0,1-5) postoperatively. No complications were observed in any of the patients.

Conclusion: Correct placement of the acetabular and femoral components, as well as offset restoration, is critical for optimal function and long-term good results in total hip replacement. Worsening of muscle function after total hip replacement is associated with abnormal femoral-acetabular offset. We are in the opinion that the offset problem can be solved with good pre-operative planning and the use of prosthesis at different offsets suitable for the anatomy of the person.

Keywords:

inaccurate offset, revision hip

EHS23-2107

Oral

Joint preservation

Does Pelvic Tilt Change with a Peri-Acetabular Osteotomy?

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Objectives: Change in pelvic tilt (PT) during and after peri-acetabular osteotomy (PAO) is important for surgical planning. The aims of this study were to 1. Determine how PT varies throughout the course of treatment in patients undergoing PAO; 2. Test what factors influence change in PT; and 3. Assess whether changes in PT influenced achieved correction.

Methods: This is an IRB-approved, retrospective, single-centre, consecutive case-series of 111 patients treated with PAO for global- (n=79), posterior- (n=49) or anterior dysplasia (n=6) (mean age: 27.3±7.7 years; 85% females). PT was determined on supine, anteroposterior pelvic radiographs pre-, intra-, 1-day, 6-weeks and 1-year post-operatively, using the Sacro-Femoral-Pubic (SFP) angle; a validated, surrogate marker of PT. Optimal acetabular correction was based on lateral center-edge angle (25°-40°), acetabular index (-5°-10°) and cross-over ratio (<20%).

Results: There was a significant difference between pre- (70.1°±4.8°), 1-day (71.7°±4.3°; p< 0.001) and early post-operative SFP (70.6°±4.7°; p=0.004). Difference in SFP between pre-operative and 1-year post-operative was -0.5° ±3.1, with 9% of cases having a difference >5°. Difference in SFP did not correlate with age, sex, BMI, type of dysplasia or achievement of optimal acetabular correction (p=0.1-0.9).

Conclusion: In the early post-operative period, PT is reduced, leading to a relative appearance of acetabular retroversion, which gradually corrects and is restored by annual follow-up. The degree of change in PT during PAO did not adversely affect fragment orientation. PT does not significantly change in most patients undergoing PAO and therefore does not appear to be a compensatory mechanism.

Keywords:

Peri-acetabular osteotomy, Dysplasia, Retroversion, Pelvic Tilt, Sacro-Femoral-Pubic Angle

EHS23-2222
Joint preservation

Oral

Can Gadolinium Contrast Agents be Replaced with Saline for direct MR arthrography of the hip? A pilot study with arthroscopic comparison

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Objectives: To compare image quality and diagnostic performance of preoperative direct hip magnetic resonance arthrography (MRA) performed with gadolinium contrast agent and saline-solution.

Methods: IRB-approved retrospective study of 140 age and sex matched symptomatic patients with femoroacetabular impingement, who either underwent intra-articular injection of 15-20 ml gadopentetate dimeglumine (GBCA) 2.0 mmol/l ("GBCA-MRA" group, n =70) or 0.9% saline-solution ("Saline-MRA" group, n =70) for preoperative hip MRA and subsequent hip arthroscopy. 1.5T hip MRA was performed including leg traction. Two readers assessed image quality using a 5-point Likert scale (1-5, excellent-poor), labrum- and femoroacetabular cartilage lesions. Arthroscopic diagnosis was used to calculate diagnostic accuracy which was compared between groups with Fisher's exact tests. Image quality was compared with Mann Whitney U tests.

Results: Mean age was 33 years \pm 9, 21% female patients. Image quality was excellent (GBCA-MRA mean range, 1.1-1.3 vs 1.1-1.2 points for Saline-MRA) and not different between groups (all p >0.05) except for image contrast which was lower for Saline-MRA group (GBCA-MRA 1.1 \pm 0.4 vs Saline-MRA 1.8 \pm 0.5; p < 0.001). Accuracy was high for both groups for reader 1/ reader 2 for labrum- (GBCA-MRA 94%/ 96% versus Saline-MRA 96%/ 93%; p >0.999/ p =0.904), acetabular cartilage- (GBCA-MRA 86%/ 83% versus Saline-MRA 89%/ 87%; p =0.902/ p =0.901) and femoral cartilage lesions (GBCA-MRA 97%/ 99% versus Saline-MRA 97%/ 97%; both p >0.999).

Conclusion: Diagnostic accuracy and image quality of Saline-MRA and GBCA-MRA is high in assessing chondro-labral lesions underlining the potential role of non-gadolinium-based hip MRA.

Keywords:

MRI, arthrography, hip, contrast agent, arthroscopy

EHS23-2215
Joint preservation

Oral

Trochanteric Reduction Osteotomy (TRO) as a rescue treatment for refractory Greater Trochanteric Pain Syndrome (GTPS). Review of clinical and functional outcomes.

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Objectives: GTPS is a prevalent condition that generates a large number of consultations with the orthopedic surgeon. There are, approximately, a 20% of patients who need surgical rescue. For them there is no consensus on the most appropriate technique to use.

Goavert et al. reported, in 2003, the surgical technique of TRO but there is no evidence about the effectiveness and results of this technique.

The objective of this work was to evaluate the clinical results of TRO as rescue for refractory GTPS.

Methods: It is a retrospective study of a 10 cases series. Demographic data was collected. Clinical variables used to assess the results were pain (VAS), WOMAC and NAHS. Complications were also registered. Moreover, all patients were asked about their satisfaction and if they would get the surgery again. In cases when postoperative data was missing the patient was contacted.

Results: Of the 10 cases 8 were women and 1 was a man. One woman was operated on from both hips. The average age was 61.66 years (48-76) and the symptoms evolution time 61,7 months (12-108). The minimum follow-up was 13 months and the average 37,2. The pain improved an average of 3.8 points, from 7.7 to 3.9. The mean NAHS improved 29.24 points (30.46-59.7). The WOMAC improved an average of 34.59. When we asked the patients if they would have the surgery again only one of them answered no. A high rate of complications was observed, one subtrochanteric fracture in the immediate postoperative and three cases of non-union of the osteotomy which required a reoperation. In all cases the screws were removed after the consolidation of the osteotomy.

Conclusion: Trochanteric reduction osteotomy could be an option to recalcitrant GTPS, with good clinical results despite a high rate of complications.

Keywords:

GTPS, trochanteric reduction osteotomy

EHS23-2032
Joint preservation

Oral

Pelvic tilt in different pathomorphologies of the hip - a relevant factor?

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Objectives: We investigate the relationship between pelvic tilt and previously described subgroups of acetabular and femoral morphology in patients with symptomatic hip pain and evaluate the influence of age and sex on pelvic tilt in this cohort.

Methods: 377 patients (408 hips) that were treated for symptomatic hip pain at our institution between 2011 and 2015 were reviewed. Pelvic tilt was determined on AP pelvis radiograph for all patients using the previously validated software HipRecon. Patients were then divided into twelve morphologic subgroups based on radiographic hip parameters. The pelvic tilt for each subgroup was compared to a control group of asymptomatic patients. We performed a stepwise multiple regression analysis to assess the overall and within-group influence of the variables age and sex on pelvic tilt.

Results: The mean pelvic tilt of the control group was $1,1 \pm 3,0^\circ$ (range $-4,9^\circ$ to $5,9^\circ$). None of the femoral morphologic subgroups had a significant different mean pelvic tilt in comparison to the control group. In the acetabular morphologic subgroups, Acetabular retroversion and Overcoverage showed a significantly increased pelvic tilt.

Regression analysis showed a significant influence of sex on pelvic tilt (men $0,4 \pm 3,0^\circ$ [range $-6,9^\circ$ to $13,2^\circ$] vs. women $3,2 \pm 3,1^\circ$ [range $-6,8^\circ$ to $11,7^\circ$]). Age did not show any significant influence on pelvic tilt.

Conclusion: Pelvic tilt does not seem to be associated with different femoral pathomorphologies, nor to be age-dependent. The observed differences between some of the acetabular pathomorphologies in comparison with the control group, as well as the observed differences between genders, while statistically significant, are relatively low and of questionable clinical importance.

Keywords:

pelvic tilt, FAI, femoroacetabular impingement, path-morphology, hip

EHS23-2097
Joint preservation

Oral

Rotational Femoral Osteotomies and cam resection improve hip function and internal rotation for Patients with Anterior Subspine FAI due to low Femoral Torsion

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Objectives: Treatment of patients with femoro-acetabular impingement (FAI) combined with reduced femoral version (FV) is unclear.

Aims: To assess (1) hip pain and ROM, (2) subjective satisfaction, (3) subsequent surgeries and complications of FAI patients that underwent rotational femoral osteotomies to increase FV.

Methods: A retrospective case series of 18 patients (23 hips, 2014-2018) with anterior hip pain that underwent rotational femoral osteotomies for treatment of FAI was performed. Mean age was 25±6 years (57% male) with a minimum 1-year followup (mean 2±1 years).

All patients had a positive anterior impingement test, limited internal rotation (IR) in 90° of flexion (mean 9°±11) and in extension (mean 22°±11), anterosuperior chondrolabral damage in MR arthrography and low FV (mean 5°±3, Murphy method, CT) and no osteoarthritis (Tönnis Grade 0). Rotational subtrochanteric femoral osteotomies were combined (91%) with a surgical hip dislocation (SHD) for cam resection.

Results: 1) The positive anterior impingement test decreased significantly ($p < 0.001$) from 100% to 9%. IR in 90° of flexion increased significantly ($p < 0.001$) from preoperative 10±8° to 31±10°.

(2) Subjective satisfaction increased significantly ($p < 0.001$) from preoperatively 33% to postoperatively 77%. The mean Merle d'Aubigné and Postel score increased significantly ($p < 0.001$) from 14±2 points to 17±1 (13-18, $p < 0.001$) points. Most of the patients (85%) reported at followup, that they would undergo surgery again.

(3) At followup, no conversion to THA was performed.

Conclusion: Rotational femoral osteotomies to increase FV combined with cam resection improve hip pain and internal rotation at short term followup. Anterior impingement test was mostly eliminated.

Keywords:

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EHS23-2310
Joint preservation

Oral

What are the outcomes of hip preservation surgery in patients with a pre-operative quality of life 'worse than death'? A study using the NAHR dataset

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Objectives: This study aims to describe the characteristics and outcomes of patients who reported their pre-operative quality of life (QoL) was 'worse than death' ('WTD') prior to hip arthroscopy (HA) or peri-acetabular osteotomy (PAO).

Methods: Adult patients who underwent HA or PAO between 1/1/12 and 31/10/20 were extracted from the UK Non-Arthroplasty Hip Registry. International Hip Outcome Tool 12 (iHOT-12) and EuroQol-5 Dimensions (EQ-5D) index questionnaires were collected pre-operatively and at 6 and 12 months. WTD was defined as an EQ-5D score of less than zero. Chi-squared and t-tests were used to compare categorical and continuous variables respectively.

Results: 8493 procedures (6355 HA, 746 PAO) were identified in whom 7101 (84%) returned pre-operative EQ-5D questionnaires. 283 HA and 52 PAOs declared their pre-operative QoL to be 'WTD'. Patients reporting 'WTD' function prior to HA were more likely to be female (66% vs 59%, $p = 0.013$), of higher body mass index (mean 27.6 kg/m² (SD 5.9) vs 25.7 kg/m² (4.5), $p < 0.0001$). There were no significant demographic differences for PAO.

For HA, iHOT-12 scores in WTD patients were significantly poorer pre- [10.8 (95% CI 9.6 to 12.0) vs 33.3 (32.8 to 33.8)] and 12 months post-operatively [34.9 (29.0 to 40.8) vs 59.3 (58.2 to 60.4)] compared to controls. A significantly smaller proportion achieved the minimum clinically important difference for iHOT-12 by 12 months (51% in the WTD group vs 65% in the control group). Similar trends were observed for PAO.

Conclusion: Patients with WTD quality of life may benefit less from hip preservation surgery and should be counselled accordingly regarding expectations. Although the scores improve, only 51% achieve scores beyond MCID.

Keywords:

i-hot-12, worse than death, hip arthroscopy, outcomes

EHS23-2151
Joint preservation

Oral

Psychological factors as risk contributors for poor hip function after periacetabular osteotomy

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Objectives: Psychological factors have been increasingly recognized to affect surgical outcomes. Thus, we aimed to investigate the correlation between specific psychological factors (depression, anxiety, somatization, general health perception and emotional wellbeing) and the outcome of periacetabular osteotomy (PAO) for the reorientation of the acetabulum in patients with hip dysplasia (HD) or acetabular retroversion (AR).

Methods: We analyzed 110 of 248 PAO patients from 2020-2021. Strict inclusion criteria were employed, requiring full follow-up questionnaire completion (mean follow-up: 21 months). Psychological aspects were assessed using the Brief Symptom Inventory (BSI) and the 36-Item Short Form Survey (SF-36). Pre- and postoperative modified Harris Hip Scores (mHHS) were recorded. Pearson's correlation coefficient was used to correlate the five psychological items with mHHS.

Results: Our study included 76.8% females, with a mean age of 30.1 years (14.36 to 48.89) and a mean BMI of 25.43 kg/m² (20.46 to 43.82). "General health perceptions" showed a significant positive correlation with postoperative mHHS scores for both HD ($r=0.66$, $p<0.0001$) and AR ($r=0.66$, $p=0.0010$). "Depression" had the strongest negative correlation for HD patients ($r=-0.68$, $p<0.0001$). For AR patients, "depression" showed only a moderate negative correlation, while "somatization" had a strong negative correlation ($r=-0.70$, $p=0.0003$).

Conclusion: Our findings emphasize the importance of considering psychological factors in the management of patients undergoing PAO. Future, prospective studies should continue to investigate the impact of different psychological factors and explore possibilities to incorporate psychological support into routine postoperative care for these patients.

Keywords:

hip dysplasia; PAO; PROMs; psychological factors; outcome

EHS23-2292

Oral

Outcomes / proms in Hip surgery

High satisfaction and return to dance in current or former professional ballet dancers following total hip arthroplasty by muscle-sparing direct anterior approach using custom stems

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Objectives: Professional ballet dancers have high expectations after total hip arthroplasty (THA), particularly if they intend to resume dance as performers or teachers. We aimed to report clinical outcomes and return to dance after THA by muscle-sparing direct anterior approach (DAA) using custom stems in a sizeable cohort of current or former professional ballet dancers.

Methods: We studied 23 patients (26 hips) identified as current or former professional ballet dancers, from a consecutive series of 1699 primary THAs operated by two surgeons, who routinely implanted custom stems by a muscle-sparing DAA in all active and/or high-demanding patients. Patients completed a questionnaire on pre- and post-operative dance capabilities, hip pain (0-10), satisfaction with surgery (0-10), Oxford Hip Score (OHS) and Forgotten Joint Score (FJS).

Results: The initial cohort comprised 19 women and 4 men, aged 50.5 ± 14.9 years, with 38.0 ± 14.4 years of dancing experience. One patient was revised for leg length discrepancy, leaving 22 patients (25 hips) for assessment at 3.4 ± 1.4 years. Patients satisfaction was 9.8 ± 0.6 and hip pain was 0.5 ± 1.0 . Postoperative OHS and FJS were 46 ± 2.4 and 92 ± 15 . Sixteen patients resumed ballet dance at 5.1 ± 3.9 months, 3 resumed other types of dance, while 3 did not resume dance. None of the 6 patients that did not resume ballet dance indicated the reason to be operated hip pain.

Conclusion: In current or former professional ballet dancers, THA by muscle-sparing DAA using custom stems yields excellent clinical outcomes at minimum 2 years, with 88% reporting the highest satisfaction score of 10 points and 72% being totally pain-free. Furthermore, 73% of patients resumed ballet dance, and 86% resumed dance in general.

Keywords:

total hip arthroplasty; custom femoral stem; professional ballet dancer; direct anterior approach; clinical outcomes

EHS23-2029
Joint preservation

Oral

Pseudotumors of the acetabular labrum and medial retinaculum of the hip

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Case Study: Background:

While various tumors of the hip joint have been described, to date there is no description of pseudotumors of the acetabular labrum and/or medial retinaculum in patients with symptomatic femoroacetabular impingement (FAI).

Purpose:

We report the clinical, radiologic, macroscopic, and histologic presentation of these lesions. In addition, we outline appropriate treatment and discuss possible pathomechanisms.

Methods:

We performed a retrospective analysis of all cases treated at our institutions and review outcomes.

Results:

Three young adult patients presenting with FAI and tumor-like lesions of the acetabular labrum and/or medial retinaculum were reviewed. Presenting findings were groin pain, decreased internal rotation, and positive FADIR on clinical examination. MRI revealed a well-demarcated intra-articular lesion adjacent to the labrum or medial retinaculum. One case showed a diffusely enlarged labrum with cystic foci. All three patients underwent surgical hip dislocation with tumor resection and FAI-correction. The lesions were directly adjacent to the area of impingement and appeared grossly as flat, lobular, and whitish tumors. Histological analysis revealed fibromatosis-like degeneration. No evidence of malignancy was seen in any of the cases. During the mean follow-up period of 2.3 years, all patients were free of recurrence.

Conclusion:

In symptomatic FAI patients, pseudotumors of the acetabular labrum or medial retinaculum may be encountered. Repetitive trauma at the impingement site with entrapment of the labrum/retinaculum seems to be the most likely cause. Treatment for these lesions includes tumor resection and correction of the underlying pathologic impingement.

Keywords:

hip, FAI, labrum, tumor, femoroacetabular impingement, retinacula of Weitbrecht

EHS23-2181

Oral

Outcomes / proms in Hip surgery

Direct Anterior Approach or Posterior Approach Total Hip Arthroplasty - Is there a difference in long-term revision rates and 10-year Patient Reported Outcome Measures?

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Objectives: The Posterior and Lateral approaches are most commonly used for Total Hip Arthroplasty (THA) in the United Kingdom (UK). Fewer than 5% of UK surgeons routinely use the Direct Anterior Approach (DAA). Whether DAA offers long-term clinical benefit is unclear.

Methods: We undertook a retrospective analysis of prospectively collected 10-year, multi-surgeon, multi-centre implant surveillance study data for matched cohorts of 250 patients whose operations were undertaken by either the DAA or posterior approach. The implants were different for the two surgical approaches. We report the pre-operative, and post operative six-month, two-year, five-year and 10-year Oxford Hip Score (OHS) and 10-year revision rates.

Results: The 10-year revision rate for DAA THA was 3.2% (4/125) and 2.4% (3/125) for posterior THA. The difference in revision rate was not statistically significant. Both DAA and Posterior THA pre-operative OHS were comparable at 19.85 and 19.12 respectively. At the six-month time point, there was an OHS improvement of 20.89 points for DAA and 18.82 points for Posterior THA and this was statistically significant (P-Value <0.001). At the two, five and 10-year time-points the OHS and OHS improvement from the pre-operative review were comparable. At the 10-year time point post-op the OHS for DAA THA was 42.63 and 42.10 for posterior THA. There was no statistical difference when comparing the OHS or the OHS mean improvements at the two, five and 10-year point.

Conclusion: Whilst, there was greater improvement and statistical significance during the initial six month time period, as time went on there was no statistical significant difference between the outcome measures or revision rates for the two approaches.

Keywords:

Anterior Approach, DAA, Posterior, Arthroplasty, Improvement, Oxford Hip Score

EHS23-2016

Oral

False easy primary hips

Is elective Total Hip Arthroplasty Safe In Nonagenarians? - An Analysis From The German Arthroplasty Registry

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Objectives: More elderly patients become candidates for total hip arthroplasty (THA). Evidence regarding safety of THA in nonagenarians is conflicting.

Aims: To evaluate mortality & morbidity after THA in nonagenarians and underlying risk factors. Hypothesis: Nonagenarians undergoing elective THA show 1) higher morbidity than younger patients 2) higher mortality than nonagenarians in the general population.

Methods: Using data from the German Arthroplasty Registry (EPRD), 263967 THAs (n=1859 nonagenarians) were eligible. Exclusion criteria: Age at admission <60y, non-elective or hemi-arthroplasties. Comorbidities representing independent risk factors for postoperative complications and death were identified via logistic regression model. Mortality rates were compared with the general population with data from the Federal Statistical Office. Endpoints of interest were postoperative major and minor complications and death.

Results: Among highest risk factors were congestive heart failure, pulmonary circulation disorders, insulin dependent diabetes, renal failure, coagulopathy, fluid/ electrolyte disorders. Compared to younger patients, risk for complications/ death was significantly higher in nonagenarians. Mortality increased when major complications occurred. After one year, survival rate without major complication was 94.4% compared to 79.8% with a major complication. Mortality rates of studied nonagenarians were lower than in the general population.

Conclusion: Comorbidities favor complications after elective THA in nonagenarians and thus postoperative morbidity. In case of complications, mortality is also increased. The fact that mortality is lower than within the general population shows that this aspect can be controlled by careful patient selection.

Keywords:

Total hip arthroplasty, postoperative complications, nonagenarians, arthroplasty registry

EHS23-2248

Paediatric hip problems

Oral

Total hip arthroplasty in teenagers; a systematic literature review

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Objectives: Total hip arthroplasty (THA) in teenagers is generally avoided. Nevertheless, recent THA procedures in the very young patient are evaluated very well, with improved functional outcomes and implant survival, resulting in lower revision rates. This review aims to present an overview of the available literature on THA in teenagers and to provide evidence to inform caregivers in their consideration.

Methods: In this systematic review, studies required a primary THA method and a teenage patient population. Studies must report at least one of the following outcome measures; functional outcomes, implant survival, complications. In addition, demographic and surgical data were collected.

Results: Sixteen studies were analyzed, including 2,040 patients and 2,379 hips with an average 7.7-year follow-up. The mean patient age was 18 years with an average revision rate of 11.7 percent. The overall average relative improvement of the two most frequently used patient-reported (functional) outcome measures (PROMs) were 84.3 and 92.3 percent at follow-up. Prosthesis or liner loosening was the cause of revision in 50.2% of the cases. This was also the most frequent complication (14.8%), together with prosthesis/liner wear (14.8%). Cementless fixation (70.7%), ceramic-on-ceramic articulation (34.7%), and the posterior surgical approach (82.3%) were applied the most.

Conclusion: The PROMs after THA in teenagers improved at follow-up. The average revision rate is relatively high, especially in the pre-1995 studies, with post-1995 studies reporting similar rates to the adult patient group. Multiple revisions are anticipated for teenagers during their lifetime. Therefore, research to further improve implant survival as well as ease of revisions in teenagers is needed.

Keywords:

Systematic review, total hip arthroplasty (THA), teenagers, children

EHS23-2263

Paediatric hip problems

Oral

Formation of type II AN of the proximal femur in children

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Objectives: to study the variants of development of type II avascular necrosis (AN) in children and to determine the symptoms of an unfavorable course of this disease.

Methods: X-rays of 800 patients after conservative treatment of congenital hip dislocation (1988-1994) were studied. Type II AN developed in 46 patients (49 hip joints). All patients were followed up until the end of bone growth. Lateral center-edge angle, Sharp's angle, degree of bone coverage, neck shaft angle, acetabular index, femoral head centering and congruence of articular surfaces, CT and MRI data were assessed. Statistical analysis was performed using STATISTICA 7.0 (StatSoft Inc, USA).

Results: The "classic" variant of deformity formation proceeds slowly and develops on average by the age of 9 years 3 months. The "aggressive" variant occurs in 20.4% of cases and is characterized by the rapid formation of severe deformities; it can be detected by the age of 3-5 years. By the age of 12, the outward inclination of the epiphysis was detected in 78.3% of cases. In 64.3% of cases, it was accompanied by hip subluxation. Multiplanar deformity of the proximal femur developed in 43% of cases. The average age of deformity detection was 11 years 4 months.

X-ray computed tomography and magnetic resonance imaging of the hip joints can reveal type II AN at the age of 3-5 years. Symptom "Z-shaped line of the growth zone" and cystic restructuring of the physeal plate are its early signs.

Conclusion: Symptoms of the "Z-line" and cystic remodeling of the physeal plate are early signs of type II AN. Every fifth patient with type II AN has a poor prognosis.

Keywords:

type II avascular necrosis, proximal femur in children

EHS23-2268

Paediatric hip problems

Oral

Femoral varus derotation osteotomy and posterior rotational osteotomy in the treatment of type II AN

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Objectives: to evaluate the effectiveness of using femoral varus derotation osteotomy (VDRO) and posterior rotational femoral osteotomy (PRO) in the treatment of type II avascular necrosis (AN) in children in different age groups.

Methods: We performed 39 VDRO and 27 PRO in children aged 2 to 16 years with type II AN. X-ray control was carried out 3, 6, 12 months after the operation, and then once a year. Assessment of clinical results of treatment was carried out according to the modified McKay scale, radiological - according to the modified Severin classification. The postoperative follow-up period averaged 11 years 8 months. All patients were followed up until the end of bone growth. Lateral center-edge angle, Sharp's angle, degree of bone coverage, neck shaft angle, acetabular index, femoral head centering and congruence of articular surfaces, CT and MRI data were assessed. Statistical analysis was performed using STATISTICA 7.0 (StatSoft Inc, USA).

Results: Decentration of the femoral head was in 98.5% of cases, incongruence of articular surfaces in 30.3% of cases, multiplanar deformation of the proximal femur in 65.2%.

Radiological outcomes of treatment after VDRO by the end of the follow-up period showed 5.8 times more poor outcomes (Severin 3 and 4) than after PRO. Clinical outcomes of treatment with intervention up to 10 years were 2 times better after PRO, but comparable to VDRO with surgical treatment after 10 years.

Conclusion: Posterior rotational femoral osteotomy is the operation of choice for type II AN in all age groups.

Keywords:

type II avascular necrosis, proximal femur in children, varus derotation osteotomy, posterior rotational osteotomy

EHS23-2015
Joint preservation

Oral

Periacetabular Osteotomy With A Modified Fixation Technique Using K-Wires Shows Comparable Results To Classic Screw Fixation At Mid-Term Follow-Up

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Objectives: The optimal fixation technique in Periacetabular osteotomy (PAO) remains controversial. Modified fixation with K-wires was described as a feasible and safe alternative. However, clinical follow-up of patients treated with this technique is lacking.

Aims: To compare clinical results of the K-wire fixation technique with screw-fixation at midterm follow-up. Hypothesis: K-wire fixation would not have inferior outcomes compared to the classic technique using screws.

Methods: Analysis of 202 consecutive PAOs between 01/2014 and 06/2017. 123 cases with complete datasets were included. PAOs with K-wire fixation (n=63) were compared with screw fixation (n=57). Mean follow-up was 63±10 months. Functional outcome was assessed by the International hip outcome tool (iHOT 12), Subjective Hip value (SHV), UCLA activity score (UCLA). Pain and patient satisfaction (NRS) were evaluated. Joint preservation was defined as non-conversion to total hip arthroplasty (THA).

Results: Preoperative baseline joint function in both groups was similar. In both groups PROMs ($p < 0.001$) and pain ($p < 0.001$) improved after PAO. Postoperative function was similar in both groups with no significant difference for postoperative PROMs: iHOT 12 (71.8 ± 25.1 vs. 73 ± 21.1 ; $p = 0.789$), SHV (77.9 ± 21.2 vs. 82.4 ± 13.1 ; $p = 0.192$), UCLA (6.9 ± 1.6 vs. 6.9 ± 1.9 ; $p = 0.909$), Pain (2.4 ± 2.1 vs. 2.0 ± 2.1 ; $p = 0.302$). Patient satisfaction did not differ (7.6 ± 2.6 vs. 8.2 ± 2.2 ; $p = 0.170$). Conversion rate to THA was low in both groups (2 vs. none; $p = 0.497$).

Conclusion: Periacetabular osteotomy with K-wire fixation provides excellent clinical results at mid-term follow-up, comparable to those of screw fixation. The technique can therefore be considered a viable option when deciding on the fixation technique in PAO.

Keywords:

Developmental dysplasia of the hip, Periacetabular osteotomy, surgical technique, fixation options

EHS23-2148
Joint preservation

Oral

Possibilities of joint preserving surgery in patients with the developing dysplastic coxarthrosis

List of authors:

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Objectives: The significance of pelvic and femoral osteotomies in the condition of developed arthrosis is still disputable. Early osteoarthritis and dis-congruency of the articular surfaces are evaluated by many specialists as contra-indication for the joint preserving operation.

Methods: Treatment outcomes of 35 patients with dysplastic coxarthrosis were analyzed. Mean age at intervention was 18 years (14-42). The grade of arthrosis in joints were assessed according to Tonnis: I - 22, II - 10, III - 3. The type of congruence of articulare surfaces were assessed according to Coleman: I- 12, II-9, III -8, IV - 6. All subjects underwent extraarticulare hip reconstruction with the Ilizarov apparatus included pelvic and femoral osteotomies.

Results: Outcomes were followed from 3 to 12 years. Functional outcomes according to Merle d'Aubigne-Postel were: Pain $4,7 \pm 0,1$ points. ROM - $4,1 \pm 0,2$ points. Walking ability - $4,6 \pm 0,1$ points. Radiographic findings according to Severin were: II### - 20, IIb - 11, III - 4. The congruence of articular surfaces improved in 14 joints, remained unchanged in 20 joints, worsened in one joint. Distribution of joints by type of congruence: I - 18, II-1, III - 14, IV - 2. The grade of arthrosis was unchanged in 25 cases, progressed one grade in 3 joints, reduced in 4 cases. Considering clinical and radiological picture the positive outcomes made up 82%.

Conclusion: application of reconstructive operations with Ilizarov frame allows to extend fairly the indications for extra-articular reconstructive invasions in dysplastic coxarthrosis. Improved congruence of the articular surfaces in conditions of osteoarthritis in most cases leads to a slowing of progression.
Level 4.

Keywords:

pelvic osteotomy, displastic coxarthrosis, ilizarov frame

EHS23-2193
Joint preservation

Oral

VALGUS OSTEOTOMY IN PROXIMAL FEMORAL DEFORMITY, LONG-TERM RESULTS

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Objectives: The widening of indications and increased success in prosthetic surgery should not diminish the indications and value of non-prosthetic surgical treatment options in hip osteoarthritis (OA). Different joint-preserving surgical methods are applied to relieve pain and dysfunction resulting from changes in hip anatomy. Proximal femoral valgus osteotomy aims to improve hip mechanics and achieve better hip joint congruity in a deformed proximal femur and/or aspherical femoral head.

Methods: Between January 2000 and 2010, fifteen hips of 14 patients (10 females - 4 males) with a mean age of 27.2 (18-55) who underwent proximal femoral valgus osteotomy were included in the study. The mean postoperative follow-up period was 16.4 years (13-23). Harris Hip Score (HHS) was used for functional evaluation. Preoperative and postoperative radiological A-P pelvic X-rays were taken. The Tönnis classification was used to determine the degree of osteoarthritis.

Results: Harris hip score was 53 (39-69) preoperatively and 86.3 (70-95) postoperatively. The femoral head and neck angle was 109.3 (90-130) preoperatively and 138.5 (120-150) postoperatively. No nonunion was observed in the osteotomy line in any of the patients. Total hip prosthesis was applied to 4 hips of 3 patients after an average of 14.2 (10-20) years.

Conclusion: Proximal femoral valgus osteotomy reducing the head-shaft offset, there is reduction on the joint reactive forces acting across the hip joint. This delays the onset of developing degenerative arthritis. Appropriate patient selection and successful application of the surgical procedure are effective on clinical outcome.

Keywords:

proximal femoral osteotomy, joint preservation surgery

EHS23-2109
Joint preservation

Oral

Defining the "optimum" acetabulum - Thresholds to guide practice

List of authors:

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Objectives: This study aims to (1) define "optimal" acetabular morphology in a cohort of asymptomatic, high-functioning controls; (2) compare morphology to patients of various pathology (dysplasia, retroversion, and cam-FAI), and (3) assess parameters and thresholds that most accurately differentiate patients and controls.

Methods: This case-control study compared high-functioning, non-degenerate, middle-aged, controls (Oxford Hip Score >43; Tönnis grade >1) (n=78) [age: 54.7 years-old (range:45.0-60.0); 48.7% women], with patients treated with hip arthroscopy or peri-acetabular-osteotomy (n=111) [age: 31.1 years-old; 54.1% women]. Detailed radiographic- and CT- assessments were performed to determine acetabular- and spinopelvic- parameters.

Results: Controls had greater cartilaginous articular surface, compared to patients with dysplasia [70% vs. 67%; p<0.001]. All patients had lower subtended angles, with differences most pronounced posteriorly (p<0.001). Controls had greater anatomical- (relative to anterior-pelvic-plane-angle; 24.2° vs. 18.7°; p<0.001) and functional- (relative to horizontal; 22.2° vs. 13.1°; p<0.001) anteversion, and greater pelvic tilt [10.5° vs. 7.5°; p=0.056] compared to patients. High discriminatory ability was found for radiographic parameters, especially LCEA (<28°), anterior- (<0.4) and posterior (<0.9) wall indices.

Conclusion: The optimum acetabulum provides sufficient femoral head cover (especially poster-superiorly), with optimal functional anteversion and pelvic tilt for impingement-free range of movement. Radiographic measurements have equal diagnostic accuracy to complex 3D CT-based values and provide excellent thresholds for identifying the presence of sub-optimal/deficient acetabular morphology amongst young-adult patients.

Keywords:

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EHS23-2081

Acetabular revisions

Oral

Revision surgery for limb-length discrepancy after total hip arthroplasty.

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Objectives: Limb-length discrepancy (LLD) is a leading cause of patient dissatisfaction and litigation after total hip arthroplasty (THA). The surgical treatment of this complication is controversial. The aim of this study was to investigate the clinical and radiographic results of revision surgery for symptomatic LLD.

Methods: Patients who underwent total or partial revision for symptomatic LLD were enrolled. Radiographic assessment was performed by measuring LLD, femoral offset (FO), acetabular offset (AO), global offset (GO), height of the center of rotation (CORL) and calculating the difference with the contralateral side and with the post-operative measurements. Clinical assessment was performed using Harris Hip Score (HHS) and 12-item Short Form Survey (SF-12), which comprises a Physical Component Summary (PCS-12) and a Mental Component Summary (MCS-12). Type and incidence of post-operative complications were also collected.

Results: 26 patients (M:F=7:19) with an average age of 60±11 years underwent total (n=16) or cup (n=5) or stem revision (n=5) for hypermetry. The minimum follow-up was 4 years. LLD, GO and CORL significantly reduced after revision. The average HHS was 45.9±10.7 preoperatively, and 91.9±13 postoperatively (P<0.0001). The average PCS-12 and MCS-12 were 26.3±5 and 37.8±5.2 preoperatively, and 50.7±8 and 54±3.6 postoperatively (P<0.0001). No postoperative hip dislocation or subluxation were reported. One patient underwent further revision for a Vancouver A-type periprosthetic fracture.

Conclusion: Revision surgery may be a viable treatment with a high probability of clinical improvement, and low risk of postoperative instability and complications for carefully selected cases of LLD.

Keywords:

hip, limb length discrepancy, hypermetry, arthroplasty, revision.

EHS23-2153
Acetabular revisions

Oral

Changes to the Innominate Bone Following Large Acetabular Reconstruction

List of authors:

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Objectives: In the surgical management of massive acetabular defects, early implant migration can reportedly occur without eventual implant loosening and failure. In such defects, it is difficult to determine the degree to which the implant is moving or the bone is changing around the implant. We aimed to measure changes in the innominate bone morphology.

Methods: This retrospective study used the immediate and 1-year post-operative CT scans of 19 patients with Paprosky type IIIB defects, treated with 3D printed custom acetabular implants.

The CT scans were rendered using specialised software to produce 3D reconstructions of the patients' bony pelvis for relative comparison of the two imaging timepoints. When change in bone morphology was too great (i.e., root mean square error RMSE), we then performed implant-to-implant registration, to quantify the anatomical changes of the innominate bone together with implant migration.

Further software analysis allowed us to understand the relative movement of the 3 components of the innominate bone (ilium, ischium and pubis).

Results: The mean centroid distance between the position of the innominate bone relative to one another was 2.6 mm (range = 0.6-4.7 mm).

The mean RMSE of the innominate bone co-registration was 0.98 (range = 0.54-1.50).

The shape of the innominate bone changed in 7 cases (37%). The pubis showed greatest changes, followed by the ischium.

4 of these cases presented with pre-operative pelvic discontinuity.

Periprosthetic bony change could not be confidently quantified due to metal artefacts.

Conclusion: When performing CT implant monitoring in patients with large acetabular defects, changes of the innominate bone can occur. It is challenging to accurately quantify implant migration when the bone is changing.

Keywords:

Implant Migration, Custom Implants, Acetabular Defect, Paprosky IIIB Defect, Bony Change, Bone Remodelling

EHS23-2262
Acetabular revisions

Oral

Reconstruction of Paprosky 3B acetabular defects with porous tantalum shells and augments in revision total hip arthroplasty using the Footing-Technique

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Case Study: Objectives

The use of trabecular metal (TM) shells supported by two TM augments in the footing technique has been described as a potential option for the treatment of Paprosky 3B acetabular defects. The aim of this study was to assess the mid implant survivorship and radiological and clinical outcomes after acetabular revision using this technique.

Methods

We undertook a retrospective, double-centre series of 39 hips in 39 patients (15 male, 24 female) treated with the footing technique using a TM shell supported by two TM augments, for severe acetabular bone loss between 2007 and 2020. The mean age at the time of surgery was 62,9 (28 to 86) years. The mean follow-up was 5,4 (1,5 to 15) years.

Results

The cumulative mid survivorship of the implant with revision for any cause was 89%. 3 hips (7,6%) required further revision due to aseptic loosening, and 1 (2,8%) required revision for infection. The mean Harris Hip Score improved significantly from 48 (29 to 65) preoperatively to 79 points (62 to 98) at the latest follow-up ($p < 0.001$).

Conclusions

The reconstruction of Paprosky 3B acetabular defects with TM shells and two augments in footing-technique showed excellent mid-term results. This technique appears to be a viable option for treating these defects.

Keywords:

Acetabular bone loss; Acetabular reconstruction; Revision total hip arthroplasty; Trabecular metal shell, Trabecular metal augments

EHS23-2234

Miscellaneous topics

Oral

Causes of total hip arthroplasty revision - are they changing?

List of authors:

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Objectives: This study aims to investigate main causes for revision in total hip arthroplasty (THA) in a peripheral hospital.

Methods: A retrospective study with a descriptive statistic was done. Data were collected regarding gender, age, co-morbidities, causes of revision, time between primary and revision surgery and procedure performed, in patients with THA revision surgery between 2020 and 2022.

Results: 41 patients were analyzed. 22 women and 19 men with a mean age of 75.1y.

Periprosthetic fractures (39%) was the main cause, followed by infection (24%), aseptic loosening (20%), persistent hip instability (12%) and pseudotumor (<1%). The 3 pathologies most associated with these patients were hypertension, dyslipidemia or psychiatric pathology, only 2 patients did not have one of these. 27% were hypocoagulated. The mean time between primary surgery and revision was 9 years. The procedures were stem revision (1 patient), stem revision + ORIF (5), acetabulum revision (6), acetabulum revision + ORIF (4), acetabulum and stem revision (6), acetabulum and stem revision + ORIF (1), mobile components exchanged (5), ORIF (8), spacer (3) and Girdlstone procedure (2).

Conclusion: In our hospital, the main cause for revision THA was periprosthetic fractures, which may be due to current demographic changes, and possibly a global trend.

Co-morbidities are increasing in these patients and so the challenges in treatment.

Keywords:

arthroplasty, revision, periprosthetic fractures, aseptic loosening

EHS23-2140
Acetabular revisions

Oral

Trabecular metal augments combined with impaction bone grafting for management of acetabular bone defect during THA.

List of authors:

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Objectives: The aim of this study was to evaluate the mid-term clinical and radiological results after reconstructing acetabular bone defects using Trabecular metal (TM) augments combined with impaction bone grafting (IBG) in difficult primary and revision THA.

Methods: This prospective, single-center study involved a consecutive series of 34 patients (18 revision and 16 complex primary THA) with a mean age of 48.2 years who underwent acetabular reconstruction using a TM augment, IBG, and a cemented cup. All defects were classified as type 3 defects according to AAOS classification. The mean follow up was 4.1 years with minimum 2-year follow up. Clinical outcome was assessed using Harris hip score (HHS). Radiological outcomes were assessed through measuring the hip center (HC) preoperatively, postoperatively and at the last follow up to detect hip center restoration and the last follow up migration. osteolysis in acetabular zones and osseointegration, according to Moore's criteria were also reported.

Results: HHS improved from 27 to 90.8. HC was corrected from 34.20 mm preoperatively to 15.1 mm postoperatively above the inter teardrop line. Incorporation of the augment with a mean change in acetabular component inclination of less than 1° and cup migration of less than 3 mm in both horizontal and vertical axes. At final follow up, twenty-seven patients had three or more signs of osseointegration (Moore's criteria) and 3 had one/two signs. Aseptic loosening occurred in one hip and Septic loosening occurred in three hips.

Conclusion: : Our mid-term results showed that combining TM augments with IBG was highly satisfactory in the management of type 3 AAOS acetabular defects.

Keywords:

trabecular metal augments, acetabular defects, hip revision, Acetabulum.

EHS23-2091

Poster

Postop complications

POLYETHYLENE LINER DISSOCIATION WITH THE DEPUY PINNACLE CUP : A REPORT OF 11 CASES.

List of authors:

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Objectives: Although rare, breakage of the polyethylene liner is a catastrophic complication following total hip replacement. This study describes a series of patients with this complication to identify potential risk factors and probable design flaws.

Methods: A total of 710 total hip arthroplasties were performed between 2013 and 2022. Over time, 11 patients experienced breakage of the Marathon polyethylene liner utilized with the DePuy Pinnacle acetabulum. Patient records, X-rays, and recovered components were analyzed.

Results: The signs and signals emerged spontaneously, without history of trauma, an average of 45 months (range: 48-145 months) after surgery. Anteroposterior and profile X-ray views of the pelvis showed eccentric positioning of the femur head in the upper region of the acetabulum, with well-fixed components. Analyzing the patient sample, we observed that seven of this group were outside the "safe zone" described by Lewinnek. Delays in surgical revision caused metallosis and moderate osteolysis, and a pseudotumor was observed in one patient. In two cases, the treatment consisted of cementing the polyethylene in the fixed acetabulum; in the other nine cases, the components were replaced with new implants.

Conclusion: Unsatisfactory positioning of the acetabular component associated with the greater fragility of the polyethylene is believed to have resulted in breakage and consequent failure of the polyethylene/acetabulum complex. Strict positioning control is recommended when installing the acetabulum, along with routine precautions when positioning the polyethylene liner.

Keywords:

DePuy Pinnacle acetabulum; Marathon polyethylene; polyethylene breakage.

EHS23-2119

Acetabular revisions

Oral

Constrained acetabular liners - an effective alternative for instability after hip arthroplasty

List of authors:

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Objectives: Constrained acetabular liners (CALs) can be used in both primary and revision THA. However, CALs have a reportedly high complication rate and are mostly considered a valuable salvage procedure in complex patients affected by recurrent dislocation and implant instability. This study aims to evaluate overall re-revision rate and complications associated with CALs usage.

Methods: This retrospective study included all 162 patients who underwent primary or revision THA with CALs at our institution between 2012 and 2021 with a minimum follow-up of twelve-months.

Results: Mean age at surgery was 78.9 years-old. One-hundred fifteen CALs (70,9%) were implanted in revision hip arthroplasty (instability after THA or hip hemiarthroplasty). Forty CALs (24.6%) were used in primary THA (femoral neck fractures). Mean follow-up time was 27.4 months. The overall failure rate was 9,3% (N = 15). The most common complications observed were dislocation (N = 7), infection (N = 3) and aseptic acetabular component loosening (N = 2). Median time-to-failure was 17 months. Surgical indication for CALs usage (primary or revision) was not found to be a risk factor for re-revision rate or mechanism of failure ($p = 0,274$). At the last follow-up, about 90% of patients were able to walk with external support.

Conclusion: CALs can be a reliable option for primary and revision hip arthroplasty, especially as a salvage procedure in cases of recurrent hip instability or low-demand elderly patients where the potential risk of instability could lead to high morbimortality.

Keywords:

Constrained acetabular liners; Recurrent hip instability; Primary hip arthroplasty; Revision hip arthroplasty

EHS23-2339
New technologies

Oral

Finding the diameter of hip arthroplasty components with augmented reality-based navigation. A feasibility study

List of authors:

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Objectives: During total hip arthroplasty, defining the hip rotation center is important. We developed and validated an Augmented Reality (AR) based navigation to aid in finding the prosthetic hip rotation center at both the femoral and acetabular side.

Methods: We used an infra-red (IR) marked stylus and a head-mounted device (HoloLens, Microsoft) to define the surface coordinates of 10 prosthetic femoral heads and 10 cups with different diameters. Using a sphere-fitting algorithm, we determined the diameter of each object and compared it to their physical properties. The latter was defined by measuring the diameter of each femoral head using a caliper. The inner diameter of the cups was determined by proxy using the diameter of the best fitting femoral head. Two observers performed the measurements twice and the intra- and interobserver reliability was evaluated based on the intraclass correlation coefficient (ICC) and the Bland-Altman approach.

Results: For the heads, the mean difference and absolute difference between the real and the AR-determined diameter was 0.91 mm (SD: 1.29) and 1.23 mm (SD: 0.99). The intrarater and interrater ICC were between 0.901 and 0.993 ($p < 0.001$) and between 0.961 and 0.997 ($p < 0.001$) respectively. For the cups, the mean difference and absolute difference was 1.24 mm (SD: 0.94) and 1.40 mm (SD: 0.68) respectively. The intrarater and interrater ICC varied between 0.983 and 0.999 ($p < 0.001$) and between 0.950 and 0.997 ($p < 0.001$).

Conclusion: AR based surface scanning with an IR marked stylus is an accurate method for determining the diameter of both spheres and cups. It is characterized by an excellent intrarater reliability and a good interrater reliability with a mean error and mean absolute error below 1.5 mm.

Keywords:

Total hip arthroplasty, augmented reality, intra-operative navigation, femoral hip rotation center, acetabular hip rotation center

EHS23-2204
New technologies

Oral

Development of a supervised learning algorithm that incorporates spinopelvic mobility for predicting impingement in patients undergoing Total Hip Arthroplasty.

List of authors:

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Case Study: Objective

Instability is a terrible complication in primary Total Hip Arthroplasty (THA) and the most frequent indication for early revision. Implant positioning and impingement are key contributors for hip instability. We present the novel use of quantitative modelling to predict impingement including cup and stem positioning together with patient-specific spinopelvic parameters.

Methods

A prospective cohort study on 170 primary robotic arm-assisted THA (RA). Indication, previous surgery, pre-operative range of motion, and spinopelvic parameters (sacral slope, pelvic incidence) were collected. Using the latest robotic platform that includes a virtual range of motion (ROM) tool to dynamically assess impingement, we recorded the planned anteversion, inclination, and the type of impingement (bone-on bone, implant-on-implant, implant-on-bone).

Results

A multi-layer perceptron model was constructed using TensorFlow was used to analyse the relationship between these factors. The data was discretised using k-bins discretisation, normalised, and split into training and validation sets. The network was then trained and evaluated using 5-fold k-fold sampling. Finally, the model was able to predict, with an average accuracy of 71%, whether a patient would experience impingement, and if so, which type.

Conclusion

The multi-layer perceptron demonstrated high accuracy for predicting the presence and type of impingement based on a patient's phenotype. A prediction tool based on data collected during RA THA with dynamic virtual ROM testing was created, potentially improving clinical decision-making. External validation of this algorithm and testing at a larger scale is imperative prior to the adoption in the clinical setting.

Keywords:

Hip Instability, robotic THA, Artificial Intelligence, Spinopelvic THA

EHS23-2129
New technologies

Oral

Evidence of Partially Molten Titanium Particles on 3D Printed Acetabular Cups

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Objectives: To characterise the presence of partially molten particles on a series of unused 3D printed cups.

Methods: The porous structures of 14 unused 3D printed acetabular cups, from 8 manufacturers were imaged using scanning electron microscopy (SEM). These were examined for evidence of titanium particles on their surfaces that had not fully fused during the printing process. We measured (1) particle diameter, (2) the number of particles/mm² and (3) the percentage area on each scan that contained particles.

We compared these surface parameters across the different designs and also looked at any differences in the presence of particles on the outer surface and deeper within the porous structure.

Results: Partially molten particles were present in all cups examined; there was a large variability between designs in the size and number of particles ($p < 0.01$). Median particle diameters were between 26 and 107 μm ; the minimum and maximum diameter measured was 19 and 124 μm respectively.

There were between 1.4 and 710.5 particles/mm² and between 1 and 45% of scan areas contained particles. In 3 cups we found a significantly greater number of particles within the porous structures, compared with the surface.

Conclusion: This is the first study to quantify and compare the presence of partially molten titanium particles on the porous structures of final-production 3D printed acetabular cups. The evidence of these particles across all designs suggests that current post-processing methods have not fully addressed how to remove these. We recommend that the release of these particles in situ is monitored, potentially using blood titanium level testing.

Keywords:

3D Printing; Titanium; Acetabular Cup; Custom

EHS23-2293
New technologies

Oral

Outcomes of primary total hip arthroplasty using 3D image-based custom stems in unselected patients: a systematic review

List of authors:

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Objectives: To report clinical and radiographic outcomes of primary THA using 3D image-based custom stems.

Methods: This systematic review was performed according to PRISMA guidelines, and registered with PROSPERO (BLINDED). A search was conducted using MEDLINE, Embase, and Cochrane. Clinical studies were included if they reported clinical or radiographic outcomes of primary THA using 3D image-based custom stems. Studies were excluded if specific to patients with major hip anatomical deformities, or if not written in English.

Results: Fourteen studies were eligible for inclusion (n=1936 hips). There was considerable heterogeneity in terms of manufacturer, proximal geometry, coating, and length of custom stems. Revision rates ranged from 0-1% in the short-term, 0-20% in the mid-term, and 4-10% in the long-term, while complication rates ranged from 3% in the short-term, 0-11% in the mid-term and 0-4% in the long-term. Post-operative Harris hip scores ranged from 95-96 in the short-term, 80-99 in the mid-term, and 87-94 in the long-term. Radiographic outcomes were reported in eleven studies, although none reported 3D implant sizing or positioning, nor compared planned and postoperative hip architecture.

Conclusion: Primary THA using 3D image-based custom stems in unselected patients provides limited but promising clinical and radiographic outcomes. Despite excellent survival, the evidence available in the literature remains insufficient to recommend their routine use. Future studies should specify proximal geometry, length, fixation, material, and coating, as well as management of femoral offset and anteversion. The authors propose a classification system to help distinguish between custom stem designs based primarily on their proximal geometry and length.

Keywords:

primary total hip arthroplasty, custom stems, unselected patients, clinical outcomes, radiographic outcomes

EHS23-2316
New technologies

Oral

Psoas tendon relationships in patients with recurrent hip pain following periacetabular osteotomy

List of authors:

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Objectives: Recurrent groin pain following periacetabular osteotomy (PAO) is a challenging problem. Pre-operatively more than half of hip dysplasia patients have pain related to psoas tendon. The purpose of our study was to evaluate the position and dynamics of the psoas tendon as a potential cause for recurrent groin pain following PAO.

Methods: 387 PAO procedures were performed between January 2013 and January 2020. A total of 13 patients with 18 hips (4.7%) had recurrent groin pain with no other identifiable cause. All these patients underwent CT scans pre- and post-operatively, which was used to create 3D models with Mimics software (Materialise NV). A validated discrete element model using rigid body springs was used to predict psoas tendon movement during hip circumduction and walking. The distance of psoas tendon to and bony abnormality was calculated during circumduction and gender specific walking motion. All analysis was performed in a MATLAB.

Results: Five out of the 18 hips did not show any malformations at the osteotomy site. Thirteen hips (72%) showed malformation secondary to callus at the superior pubic ramus. These were classified into: (1) osteophytes (2) hypertrophic callus or non-union and (3) malunion at the osteotomy leading to a step in the pubic ramus. Mean minimal distance of the psoas tendon to osteophytes was found to be 6.24 mm (n=6) and to the osteotomy site was 14.18 mm (n=18).

Conclusion: Recurrent groin pain after PAO needs a thorough assessment. One need to have a high suspicion of psoas as a cause. 3D CT scan may be necessary to accurately identify causes related to healing of the pubic osteotomy. Dynamic ultrasound of the psoas tendon may help in evaluating for psoas impingement.

Keywords:

psoas impingement, peri-acetabular osteotomy, outcomes, minimally invasive surgery

EHS23-2227
New technologies

Oral

A novel dual-mobility hip system with an advanced bearing material: Outcomes from a prospective, multicenter trial

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Objectives: Our objective is to report the early results evaluating the safety and effectiveness of a novel modular DM system utilizing an advanced bearing material for primary total hip arthroplasty (THA).

Methods: In this prospective cohort study, patients undergoing primary THA using a novel DM system (OR30TM; Smith+Nephew, Memphis, TN, USA) were included at 11 international sites (ClinicalTrials.gov Identifier: NCT04941729). IRB approval was obtained before any study procedures were conducted. Patients have been followed for 1-year postoperatively. Study outcomes included patient demographics, Harris Hip Score (HHS), Hip Disability and Osteoarthritis Outcome Score for Joint Replacement (HOOS JR), Forgotten Joint Score (FJS), and Kaplan-Meier survivorship (endpoint of revision). Statistical significance of the improvement in postoperative scores at 6 weeks, 6- and 12-months from their preoperative values was calculated using p-values.

Results: Overall, 154 patients (mean age, 62.0 years [range 26-80]; 55.2% female) underwent primary THA with the DM construct. From preoperative assessment to 6 weeks, 6- and 12-months follow up, there were significant improvements in mean scores for total HHS (48.1, 77.6, 85.6, and 85.8, respectively; $p < 0.0001$), HOOS JR (49.1, 74.7, 82.2, and 86.2, respectively; $p < 0.0001$), and FJS (13.7, 52.0, 60.7, and 80.5, respectively; $p < 0.0001$). At 1 year, the implant survivorship was 98.7% and survivorship for DM bearing failure was 100%.

Conclusion: Short-term results of patients undergoing primary THA with this novel DM system indicate that they experience significant improvements in function and quality of life, with excellent performance and low failure rates.

Keywords:

total hip arthroplasty, dual-mobility, survivorship, patient-reported outcomes

EHS23-2254
New technologies

Oral

Accuracy of acetabular component alignment with surgical guidance systems during hip arthroplasty

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Objectives: Navigation in total hip arthroplasty has been shown to improve acetabular positioning and can decrease the incidence of mal-positioned acetabular components. The aim of this study was to assess two surgical guidance systems by comparing intra-operative measurements of acetabular component inclination and anteversion with a post-operative CT scan.

Methods: We prospectively collected intra-operative navigation data from 102 hips receiving conventional THA or hip resurfacing arthroplasty through either a direct anterior or posterior approach. Two guidance systems were used simultaneously: an inertial navigation system (INS) and optical navigation system (ONS). Acetabular component anteversion and inclination was measured on a post-operative CT.

Results: The average age of the patients was 64 years (range: 24-92) and average BMI was 27 kg/m² (range 19-38). 52% had hip surgery through an anterior approach. 98% of the INS measurements and 88% of the ONS measurements were within 10deg of the CT measurements. The mean (and standard deviation) of the absolute difference between the post-operative CT and the intra-operative measurements for inclination and anteversion were 3.0deg (2.8) and 4.5deg (3.2) respectively for the ONS, along with 2.1deg (2.3) and 2.4deg (2.1) respectively for the INS. There was significantly lower mean absolute difference to CT for the INS when compared to ONS in both anteversion ($p < 0.001$) and inclination ($p = 0.02$).

Conclusion: We found that both inertial and optical navigation systems allowed for adequate acetabular positioning as measured on postoperative CT, and thus provide reliable intraoperative feedback for optimal acetabular component placement.

Keywords:

hip, acetabular alignment, technology, navigation

EHS23-2287
New technologies

Oral

AN AUTOMATED IDENTIFICATION OF HIP ARTHROPLASTY IMPLANTS FROM TRANSFER LEARNING MODELS

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Objectives: In preoperative planning for a revision of a total joint arthroplasty, it is essential to identify the design of the failed implant. A study was conducted to determine whether deep learning could be used to automate the identification of implant manufacturers on hip radiographs following a total hip replacement.

Methods: To provide an unbiased and fully automated way to determine the design of total hip replacements, we applied transfer learning models and image classification to plain radiographs. Three hundred twenty-three hip implants from four manufacturers were trained, validated, and tested using anterior and lateral plain radiographs. The model was trained to recognize four types of hip implants as part of the training process. Models were prepared with 70% images, tested with 10% images, and evaluated with 20% images during the training phase. In order to benchmark the efficacy, the results of the transfer learning models were also compared to two fellowship-trained experienced high-volume arthroplasty surgeons who independently identified the type of hip implant manufacturer from radiographs.

Results: A total of seven models were evaluated based on their performance and network, and six were found to be accurate in identifying hip implants with > 90% accuracy. It was found that the DenseNet model had the highest accuracy, achieving 99.9%. The algorithm performed better than the two human experts, who exhibited an average 72% accuracy.

Conclusion: It has been concluded that identifying selected hip implant types in patients with THA was very accurate, with the highest accuracy being achieved with the DenseNet model at 99.9%. The goal is to develop a tool that will enable the automatic identification of hip implants from radiographs for revision hip.

Keywords:

Hip arthroplasty, Transfer learning, X-ray radiographs, Deep learning,

EHS23-2255
New technologies

Oral

ACCURACY OF CUP INCLINATION USING AN INERTIAL NAVIGATION SYSTEM COMPARED TO STANDARD LANDMARKS IN DAA THA

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Objectives: Correct acetabular component placement plays a critical role in dislocations in total hip arthroplasty. In order to overcome initial disadvantages with navigation, an imageless, easy to use inertial navigation system has been recently introduced. This study aims to analyze the accuracy of inclination with this inertial imageless navigation system compared to the standard anatomical landmarks (SAL).

Methods: 180 patients were retrospectively included after a THA was performed by the same surgeon via the direct anterior approach (DAA) at a single center. The first cohort (83 patients) used SAL in contrast to the second cohort (95 patients) where navigation was applied. Inclination was aimed at 38 degrees and anteversion was assessed by the transverse acetabular ligament (TAL) in both cohorts. Demographic data and contralateral hip information were collected. Postoperative radiographs, AP pelvis and cross table lateral, were fulfilled at 6 weeks.

Results: A mean inclination of 41.8 (+/- 6.8) degrees and 38.9 (+/- 4.4) degrees was found in the SAL and navigation cohort, respectively. There was a mean overall anteversion of 25.8 (+/- 3.1) degrees. There was no statistical difference in gender, age and BMI between the two cohorts. If the inclination was set within 10 degrees of the target (i.e. 38 degrees), 88% of the SAL cohort and 97% of the NAV cohort would be achieved. These decrease to 53% and 83% respectively if the target was narrowed down to 5 degrees.

Conclusion: Acetabular component inclination could be significantly more accurate if an inertial navigation device was used without having the limitations and disadvantages of current standard navigational techniques. This could avoid up to a quarter of complications leading to early revision in THA.

Keywords:

Total hip arthroplasty, navigation, cup position, transverse acetabular ligament

EHS23-2126
New technologies

Oral

AR Hip Navigation System's Flip Technique Minimizes the Effect of Surgical Position -Supine THA vs. lateral decubitus THA

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Objectives: Portable navigation using AR technology has been reported to be useful for cup placement in total hip arthroplasty (THA).

In this study, we investigated the effect of surgical position on the accuracy of THA cup placement using the AR Hip Navigation System (AR Navi, ZIMMER BIOMET, Inc.).

Methods: The subjects were 129 THA patients with 135 hips (111 women) who underwent THA with AR Navi from April 2021 to August 2022. The mean age at surgery was 69 years (23-95), and G7 cups (ZIMMER BIOMET, Inc.) were used in all patients. Surgery was performed via a supine anterolateral approach (group S; 49 hips) or a lateral decubitus posterior approach (group L; 86 hips). The evaluation items were radiographic inclination and radiographic anteversion/RA with intraoperative displayed Radiographic criteria. In addition, RI and RA were also measured from postoperative CT using the ZED HIP (LEXI, JAPAN). Finally, the two groups were statistically examined (Mann-Whitney's U test).

Results: The RI and RA of the intraoperative display of the entire 135 hips were $39.9^{\circ} \pm 1.1$ (mean \pm SD) and $20.5^{\circ} \pm 2.4$, and $39.7^{\circ} \pm 2.4$ and $20.0^{\circ} \pm 3.7$ in the postoperative CT, with absolute errors of $1.7^{\circ} \pm 1.5$ and $2.5^{\circ} \pm 2.2$. The absolute errors of RI and RA between the two groups were $1.6^{\circ} \pm 1.7$ and $2.3^{\circ} \pm 1.5$ for the S group and $1.8^{\circ} \pm 1.5$ and $2.7^{\circ} \pm 2.5$ for the L group, respectively, with no statistically significant difference in either RI (P=0.12) or RA (P=0.85).

Conclusion: The AR Navi is a tool that can minimize the effects of surgical positioning and achieve highly accurate cup placement in THA

Keywords:

portable Navigation , THA

EHS23-2024
Acetabular revisions

Oral

Long-term outcomes of acetabular reconstruction using a combination of structural allograft and various grain allograft sizes in cases of Paprosky type 3 bone deficiency

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Objectives: Evaluating the outcomes of a surgical technique involving the use of structural allografts and various sizes of grain allografts for revision total hip replacement in patients with acetabular defects classified as type 3 according to Paprosky's classification.

Methods: The study is a retrospective review of 103 hip reconstruction surgeries performed on 102 patients with major acetabular bone loss between 2008 and 2019. The patients had a mean age of 58.6 years and the cause of the bone loss varied, with the majority being due to aseptic loosening. The surgical procedure involved the use of structural allografts and bone grafts to reconstruct the acetabulum, and reinforcement with either a cemented or cementless cup. In one case, a hemipelvis allograft was also used and the pelvis was fixed using a reconstruction plate and screws.

Results: At a mean follow-up of 82.75 months (9 to 154), 78 hips (76%) had no complications. Among acetabular revisions for aseptic loosening, 84% (53/63) were stable at follow-up and all had good bone integration. The mean pre-operative Modified Harris Hip Score improved from 25.18 points (range 13-44) to 83.91 points (range 60-95) at the last follow-up

Conclusion: The combination of structural allografts and grain allografts of various sizes can be effective in achieving to restore bone stock and stability in primary or revision hip replacement surgeries.

Keywords:

various grain allograft, Long-term outcomes of acetabular reconstruction

EHS23-2088
Acetabular revisions

Oral

Preoperative accuracy of acetabular bone defect assessment based on 3D life-sized model: a case series.

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Objectives: In case of revision of total hip arthroplasty (R-THA) with high grade acetabular bone defect an accurate assessment of the defect is of outmost importance to plan the surgery. The objective of this study is to evaluate the accuracy of bony defect assessment between 3D printing and Xray or CT.

Methods: We enrolled 25 patients operated of R-THA between 2019 and 2021, that had at least a bone acetabular defect of IIC sec. Paprosky. Acetabular defects were classified on Xray and CT using four bone landmarks: Kohler's line integrity, ischial lysis, and superior defect with cranial migration of the center of rotation of the hip.

Results: Our group included 20 men and 5 women, 9 of which underwent a complete revision. The 4 reference bone landmarks were measured on the Xray, CT and 3D model for all 25 cases, and subsequently compared with surgical reports. On the 3D model, the medial wall was erroneously reported as intact in 1 case (0 for the Xray and CT evaluation) and misreported as affected in 2 cases (3 for the Xray and 5 for the CT) (K 3D: 0.75; K RX: 0.76; K TC: 0.61). Vertical migration was miscalculated in 2 cases (4 for the Xray and 2 for the CT) (K 3D: 0.83; K RX: 0.68; K TC: 0.83) and ischiatic lysis was incorrectly reported in 1 case (0 for the Xray and 4 for the CT) (K 3D: 0.91; K RX: 1; K TC: 0.68). We obtain useful information for the surgery from the 3D model, including bone thickness, presence of bone gaps and their size, presence of osteophytes and the size and orientation of the implants to be revised.

Conclusion: We think that the use of 3D life-sized models allow the surgeon to precisely evaluate the acetabular bone defect and consequently preoperatively plan the best strategy to face complex total hip revision.

Keywords:

Acetabular Bone Defect, Total hip revision, 3D model, trabecular metal

EHS23-2322

Acetabular revisions

Oral

A 9-year follow-up study of a cementless tripod dual-mobility cup in revision total hip arthroplasty

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Objectives: The aim of this study was to evaluate the survivorship of the NOVAE E (Serf) cementless dual mobility tripod cup in RTHA and complications at 10-year follow-up.

Methods: We performed a single-center retrospective study including acetabular revisions with a cementless dual-mobility tripod cup between 2009 and 2015. 115 RTHA were included in the study.

All the patients were evaluated at final follow-up with a functional score (HHS) and an AP radiograph of the pelvis. Kaplan-Meier survivorships and different complications were also analyzed.

Results: The mean follow-up was 9.4 years (range, 5 to 14 years).

The reasons for acetabular revision were: aseptic acetabular loosening (73 patients, 63%), infection (16 patients, 14%), aseptic bipolar loosening (13 patients, 11%), instability (5 patients, 4%), aseptic femoral loosening (3 patients, 3%), ALVAL (3 patients, 3%), ilio-psoas impingement (2 patients, 2%).

At final follow-up, a single episode of dislocation occurred (0.8%). the mean HHS improved from 60.1 points (range, 18-94 points) to 83 points (range, 37-100 points) ($P < .05$).

3 cases of aseptic loosening were diagnosed (2.6%).

4 infections required reoperation: 3 required a 2-stage bipolar revision; 1 was treated by DAIR procedure.

At the latest follow-up: the survivorship of the acetabular cup for aseptic loosening was 98% [95% CI (91-99)] and for any reason was 93% [95% CI (85%-97%)].

Conclusion: This study reports a low complication rate in favor of the use of cementless dual mobility tripod cups in acetabular RTHA with a satisfactory survivorship at 10 years follow-up.

Keywords:

dual mobility; revision; total hip replacement; dislocation

EHS23-2289
Acetabular revisions

Oral

Trabecular Titanium Acetabular Cups In Hip Revision Surgery: Analysis Of Mid-To Long Term Survivorship And Radiological Outcomes

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Objectives: The aim of the present study is to evaluate the clinical and radiographic outcome with a minimum 5-years follow-up of patients that underwent revision of the acetabular component in presence of severe bone defect with the use of trabecular titanium revision cup.

Methods: We conducted a retrospective analysis of patients that underwent revision of the acetabular component in presence of severe bone defects (Paprosky IIb or higher) in which a modular trabecular titanium cups were used between 2012 and 2017. We analyzed clinical outcome (preoperative and postoperative pain and Harris Hip Score HHS), radiographic outcome (osteolysis and implant integration) and the prevalence of postoperative complications.

Results: Complete data of 64 patients with an average follow-up of 6.8 years (range, 5-11 years) were analyzed. The average HSS improved from an average of 41.1 SD 11.8 to an average of 81.2 SD 10.8, the average pain scale improved from an average of 6.4 SD 3.1 to an average of 2.2 SD 1.3. Complications were reported in 8 patients (12.5%). The most frequent complication was dislocation in five cases (7.8%), in two of them revision of the modular component was necessary. We recorded two cases of aseptic loosening of the acetabular component (3.1%), and one of deep infection managed with a two-stage revision.

Conclusion: The use of modular trabecular titanium cups is a good option for the treatment of revision surgery in presence of complex bone defects. We reported a good clinical outcome and an acceptable rate of postoperative complications, mainly due to the modularity of the implants and the ability to obtain a stable primary fixation and successive osseointegration

Keywords:

cup revision; trabecular titanium; cup modularity;

EHS23-2331

Oral

Acetabular revisions

Minimum 10 years outcomes of acetabular revisions with titanium cage reconstructions

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Objectives: Management of severe acetabular defects have to simultaneously deal with the reconstruction of bone defects, adequate implant selection and stable fixation. Titanium cages are still viable option for revision total hip arthroplasty (rTHA). We aimed to evaluate long term outcomes of patients who underwent acetabular revision with titanium cages for reconstruction.

Methods: A retrospective cohort study of patients who received a titanium cage for rTHA with a minimum of 10 years of follow-up was conducted. Acetabular defects are classified according to Paprosky. Patients' clinical functions were evaluated using Harris Hip scores (HHS), and the radiological migration or loosening of cages was recorded after 3 months, 6 months, 1 year and then annually 3 years. Component survival was evaluated by Kaplan-Meier survivorship analysis, with failure defined as any revision for any reason.

Results: 65 patients (70 hips) aged between 29-82 (59.2 ± 15.7) years follow up for 14.5 years ± 5.55 (10-23.6 years). 12 patients underwent revision at a mean of 8.2 (0.13-16.5) years. At the last follow up, the mean HHS increased from 42 points preoperatively to 86 points ($p < 0.001$). The results showed that titanium cages without flanges had a lower 10-year survival at 73.7% compared to 94.12% with titanium cages flanges. The use of ischium screws improved the survival rate of titanium cages, which is inferior flange inserted into medullary canal of ischium without screws (78.75%), reaching a survival rate of 92.12% at 15 years.

Conclusion: Titanium cages reconstructions have favorable outcomes for severe acetabular defect at an average 14.5-year follow-up. The fixation technique of inferior flange to the ischium changes the survival of rTHA regardless of defect type.

Keywords:

titanium cages, revision, acetabular defect, long-term

EHS23-2275

Oral

Acetabular revisions

Inducible displacement CT increases the diagnostic accuracy of aseptic loosening in primary total hip arthroplasty

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Objectives: The diagnosis of aseptic loosening can be a challenge. Postponing intervention can simplify the diagnostic process, but can also degrade the prognosis and instil further pain. Dynamic CT with alternated rotations of the femur offers a visual and quantitative assessment of the mechanical situation. The aim of this study was to report in a clinical setting the accuracy and adaptability of this method.

Methods: This was a retrospective single centre study of 72 cases of suspected aseptic loosening were the surgeon after reviewing a standard planar X-ray saw a need for more information. The dynamic CT and planar X-ray were compared either to intraoperative findings or a 1-3 year follow up questionnaire for patients that did not have revision surgery. Patients reporting degradation in status since the time of the dynamic CT were called for a follow up planar X-ray. Sensitivity and specificity were assessed and user experience gathered.

Results: Out of 72 enrolled patients 15 were lost to follow up. Of the remaining 57, 17 were deemed by intraoperative findings or follow up to have had loosening. Dynamic CT had an accuracy, sensitivity, and specificity of 93%, 77%, and 100% respectively. For planar X-ray the corresponding values were 77%, 59%, and 85%. The tool was possible to adapt to clinical routine.

Conclusion: Dynamic CT with alternated rotations of the femur is a viable option to improve the diagnostic process for identifying aseptic loosening in clinical THA cases where more information is needed.

Keywords:

hip revision, diagnosis, CT

EHS23-2217
Acetabular revisions

Oral

16 year retrospective results of trabecular metal augments in revision Total Hip Arthroplasty (THA) with acetabular bone defects.

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Objectives: In Revision Hip Surgery (RHS) the main goals are to improve clinical results, good primary stability of the implant and restoration of the joint centre of rotation (COR). Osteolysis may undermine these goals. The authors present their results with the use of trabecular metal augments (TMA) in addressing the issue of acetabular bone loss (ABL) in RHS.

Methods: We reviewed our case series of RHS patients with ABL, operated on by the senior author between November 2005 and June 2021. They were radiologically assessed using the Paprosky classification and the post-operative (P.Op) position of the implants. We used digital x-rays and imaging software to calculate the final COR of the hip.

Results: We analyzed 42 RHS patients, 21 of which were treated using TMA and thus were included. 8 were male and 12 female. The mean follow-up was 41,5 months. Mean age at the time of procedure was 63,4 years old. 5 cases were Paprosky IIB, 2 were IIC, 8 were IIIA and 5 were IIIB. The mean P.Op acetabular cup angle was 43,6° (pre-operative mean 65,4°). The mean P.Op height of COR in relation to Hilgenreiner's line was 37,13mm (pre-operative mean 45,6mm) and average P.Op lateral distance to Kohler's line was 27,33 mm (pre-operative mean 37,6mm). All patients had resumed weight bearing and daily activities by their last outpatient appointment. Complications were migration of the COR greater than 5 mm in 1 hip and 2 superficial infections.

Conclusion: In our series a stable fixation of the cup and adequate COR position were attained using TMA with minimal complication rate. Given the scarcity of indications the total number of patients was limited. Our results suggest a useful role of TMA in RHS when there is a superior cup migration due to an unconfined acetabular defect.

Keywords:

augments, acetabular revision

EHS23-2187
Acetabular revisions

Oral

3D-printed custom-made implants for complex acetabular revision surgery: Preliminary results with a minimum 2-year follow-up

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Objectives: To analyze the survival and functional outcomes of 3D-printed custom-made acetabular components for complex acetabular revision surgery at a minimum follow-up of 2 years

Methods: We prospectively analyzed all patients who underwent complex acetabular revision surgery using custom 3D-made acetabular components between 2018 and 2021. Functional outcomes were analyzed with the Merle D'Aubigné score, whereas implant survival was calculated with the Kaplan-Meier estimate

Results: Twenty-one patients were included, of which 2 died before completing the minimum follow-up. Of the 19 patients analyzed, 10 were male (52%). Mean age was 66 years (± 13.5). The mean follow-up was 58 months (± 15). The main cause for complex acetabular revision surgery was aseptic component loosening in 10 patients (52.6%), followed by 6 sequelae of periprosthetic joint infection (3.6%), 2 sequelae of complex acetabular fractures (10.5%) and 1 periprosthetic fracture (5.3%). Acetabular defects were classified according to Paprosky et al, being 9 patients type 3A, 5 type 3B and 5 type 2B. The Merle D'Aubigné & Postel score improved from 5.8 (± 3.3) preoperatively to 15.3 (± 3.2) postoperatively ($p=0.036$). Three patients had surgery-related complications, including 1 recurrent instability, 1 peroneal nerve palsy and 1 deep infection; treated with early debridement, antibiotics and implant retention. Implant survival was 100% at the end of follow-up.

Conclusion: 3d-printed custom-made implants demonstrated encouraging preliminary results in terms of functional outcomes and implant survival in complex acetabular revision surgery.

Keywords:

Acetabular revision, 3d-printed, Custom-made, Total hip arthroplasty, Outcomes

EHS23-2152
Acetabular revisions

Oral

Statistical Shape Modelling of the Large Acetabular Defect in Hip Revision Surgery

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Objectives: The mirroring of the contralateral hemipelvis has been previously used to measure hip joint parameters. We used SSM as a tool to help derive landmarks that are often absent in hip joints of patients with large acetabular defects. Our aim was to compare the reconstructed pelvis with patients who have previously undergone hip revision.

Methods: This retrospective cohort study involved 38 patients with Paprosky type IIIB defects. An SSM was built on 50 healthy pelvises and used to virtually reconstruct the native pelvic morphology for all cases. The outcome measures were the difference in CoR between the SSM and 1) the diseased hip, 2) the plan and 3) the contralateral healthy hip.

Results: The median differences in CoR were 1) 31.17 mm (IQ: 44-20 mm), 2) 8.53 mm (IQ: 12.76 - 5.74 mm) and 3) 7.84 mm (IQ: 10.13 - 5.13 mm). In 7 cases, the surgeon chose a high CoR to maximise bony fixation. No statistical difference ($p > 0.05$) was found between the SSM vs plan and the SSM vs contralateral CoRs.

Conclusion: Our findings show that the SSM model can be used as an important tool to aid preoperative planning and implant design.

Keywords:

Statistical Shape Modelling, Hip Reconstruction Surgery, Paprosky 3B Defects, Custom Implants

EHS23-2180
Acetabular revisions

Oral

Custom 3D Printed Implants for Acetabular Reconstruction: Excellent Functional and Radiological Results

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Objectives: We aimed to assess the early clinical and radiological results of patients with large acetabular defects treated with custom 3D printed acetabular cups at the minimum follow-up time of 36 months.

Methods: We performed a retrospective review of the database for all patients who consecutively underwent acetabular reconstruction with custom-made 3D-printed titanium implants for the management of Paprosky type 3B defects, between 2016 and 2019. Radiological evaluation was performed immediately postoperatively, at 6 months and annually thereafter. The outcome measures were: 1) Implant survivorship, 2) Oxford Hip Score (OHS) pre- and post-surgery, 3) Complications, 4) Radiographic evidence of loosening, 5) Radiographic evidence of migration.

Results: A total of 26 patients with minimum follow-up of 36 months were identified, including 17 women. The median age was 69 years (range, 49 to 90). The median follow-up was 53 months (range, 36 to 77). 1. The cumulative implant survivorship was 100%. 2. The Oxford Hip Score improved significantly, from a median of 8 (range, 2 to 21) preoperatively to 32 (range, 14 to 47) postoperatively ($p=0.0001$). 3. One early dislocation resolved with a non-surgical treatment, One infection re-occurrence in a patient with a long history of infection, 0 fractures. 4. Radiographically, bone in-growth was observed at the bone/implant interface of 24 patients (92%), there were no cases of implant loosening; 5. No radiological migration was observed at the last follow up, year 3 and beyond.

Conclusion: The treatment of large acetabular defects with the use of custom 3D printed titanium implants is a viable option and offers a substantial improvement of symptoms and in the quality of life.

Keywords:

3D printing in orthopaedics, custom implants, acetabular defects, reconstructive surgery, surgical outcome, patient outcome.

EHS23-2245

Oral

Acetabular revisions

Early results of a new acetabular ultra-porous anti-protrusion reinforcement cage in revision arthroplasty

List of authors:

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Objectives: The Burch-Schneider reinforcement cage was developed in 1974 and is widely used. The stability of the implant is guaranteed by the flange, the nose, and the screws. Featuring an anatomical design, that simplifies implant introduction, and thanks to the innovative design of the dome and flanges, the Medacta 3D Metal B-Cage was designed to improve stability and fixation. This study aims to evaluate the clinical and radiographic outcomes of patients undergoing 3D Metal B-Cage implantation in two Italian centers.

Methods: A prospective study including patients undergoing acetabular revision in two Italian centers has been carried. Clinical and radiographic data were collected preoperatively, data relating to the surgery, and the clinical and radiographic conditions of the patients at follow-up. The following patient-reported outcome measures (PROMs) were assessed: preoperative Hip disability and Osteoarthritis Outcome Score Physical Function Shortform (HOOS PS) and follow-up HOOS PS and Forgotten Joint Score (FJS). Osseointegration was evaluated radiographically looking for signs of radiolucency and cup mobilization.

Results: A total of 16 patients were eligible for the study with a mean age of 76.6 years. Loss of acetabular bone was in most of the cases classifiable as Paprosky grade 3A. The average follow-up is currently one year. There was only one case of mechanical complication postoperatively with instability which led to the revision of the stem. Excellent clinical and radiographic results were obtained, with overall patient satisfaction.

Conclusion: Preliminary results are encouraging, with excellent results at a mean one year follow-up. However, it is necessary to expand the sample analyzed and the follow-up to confirm the data obtained.

Keywords:

cup revision, antiprotrusion cage, reinforcement cage

EHS23-2296

Oral

Hip-spine relationship

Prevalence and Reliability of routine screening parameters for Sagittal Spinal Deformity and Spinal Stiffness prior to Total Hip Arthroplasty.

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Objectives: Recent research supports a significant relationship between sagittal spinal deformity (SSD) and instability after total hip arthroplasty (THA). Systematically identifying SSD as well as spinal stiffness pre-operatively could have the potential to avoid dislocation and consequently revision. This study aims to confirm the high prevalence of SSD as well as to determine the most reliable parameters.

Methods: All elective THA patients in a single centre were preoperatively screened using three lateral radiographic views from the first lumbar vertebra (L1) to the pelvis in standing, relaxed seated and flexed seated position. The following parameters were measured: pelvic incidence (PI), lumbar lordosis (LL) in the standing and flexed seated position and sacral slope (SS) in the standing and relaxed seated view. SSD was defined as a standing PI-LL > 20°. Spinal stiffness was defined either as a difference in SS from standing to relaxed seated of < 10° or a change in LL from standing to flexed seated of < 20°.

Results: A total of 109 patients, mean 65 years, 54% female were investigated. SSD was diagnosed in 29% and spinal stiffness in 11% when using a difference in LL (<20°) or 45% based on change in SS (<10°). When combined, only 66% of patients were defined as low risk for dislocation.

Conclusion: Sagittal spinal deformity (SSD) and/or spinal stiffness is present in one third of THA patients. If known preoperatively, this could slightly change the desired cup orientation as well as the possible use of a dual mobility. Change in SS identified more stiff spines than change in LL suggesting that the SS method may over-diagnose spinal stiffness.

Keywords:

Hip-spine, sagittal spinal deformity, spinal stiffness, hip instability

EHS23-2257

Hip-spine relationship

Oral

Evaluating Alternative Registration Planes for Imageless, Computer-Assisted Navigation During Supine Total Hip Arthroplasty

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Objectives: Computer navigation improves acetabular cup position in total hip arthroplasty (THA), thereby reducing the risk of revision surgery for all causes as well as dislocation.

We aimed to evaluate the registration accuracy of 3 alternate registration planes in the supine surgical position for patients undergoing THA via a direct anterior approach (DAA).

Methods: A prospective, observational study was conducted with 63 primary THA for osteoarthritis in the supine position with two imageless navigation systems using 3 registration planes. Patient position was registered sequentially using an optical system and a sensor based system with 3 planes of reference: (Method 1) an anatomical plane using skeletal landmarks; (Method 2) a functional plane parallel to the ASISs and parallel to the table plane; and, (Method 3) a functional plane perpendicular to gravity and aligned with the longitudinal axis of the patient. The 3 measurements of acetabular cup inclination and anteversion were compared with measurements from postoperative computed tomography (CT) scans.

Results: For inclination, the mean absolute error was 3.75°, 2.74° and 1.80° for Methods 1, 2 and 3 respectively. ($p < .001$ for 1 vs 2, $p = .038$ for 2 vs 3).

For anteversion, the mean absolute error was 8.58°, 3.69° and 2.00° for Methods 1, 2 and 3 respectively. ($p < .001$ for 1 vs 2, $p = .004$ for 2 vs 3).

Conclusion: Patient registration using functional planes more accurately measured the acetabular cup position than registration using anatomic planes. Using the functional plane, patient registration using the table tilt method more accurately measured the acetabular cup position than functional registration using anatomical landmarks.

Keywords:

navigation, hip supine, anterior approach

EHS23-2165

Oral

Outcomes / proms in Hip surgery

Risk factors predicting complexity in primary total hip arthroplasty

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Objectives: To determine the risk factors that predict complex primary total hip arthroplasty (THA). Define those characteristics and create a score utilized for subspecialty referencing and resident surgical guidance.

Methods: Retrospective review of patients submitted to primary THA in a single center by a single expert surgeon using a mini-invasive posterolateral approach with routine capsule and external rotators preservation and repair. Patients submitted to simultaneous bilateral primary THA or primary THA due to proximal femur fracture were excluded. To measure complexity we evaluated surgical time, blood loss, length of stay (LOS), use of cup screws, acetabular abduction, stem alignment and complications.

Results: In total, 226 THA patients were identified, complete data collection was possible in 57 patients.

Age was correlated with LOS at the hospital (Spearman coefficient 0,316). Female patients had longer surgeries ($p=0,003$), were more likely to require the use of screws ($p=0,022$) and to have a more abducted cup ($p=0,048$). No difference was found regarding the stem alignment. Age, neck-shaft angle (NSA) and critical trochanteric angle (CTA) were correlated with stem alignment (Spearman coefficient -0,268, 0,451 and 0,315, respectively). Coxa profunda and protrusio acetabuli were associated with higher cup abduction ($p=0,009$). No risk factors for post-operative complications were identified.

Conclusion: The data suggest that special attention should be given to female and older patients, as well as hips with abnormal NSA, CTA or deep acetabular socket. Future studies should include more centers with a diverse surgeon expertise level to better identify the risk factors for complex THA in order to establish a scoring system.

Keywords:

risk factors, complexity, primary total hip arthroplasty

EHS23-2121

Hip-spine relationship

Oral

Differences in dynamic spinopelvic characteristics between patients with femoro-acetabular impingement and controls

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Objectives: Spinopelvic characteristics influence hip mechanics. Whether the degree of lumbar spine mobility is associated with the development of symptoms in the presence of femoro-acetabular impingement (FAI) morphology is unknown. This study aims to assess for differences in spinopelvic characteristics between FAI patients and controls to identify factors contributing to symptom development.

Methods: This is prospective, cross-sectional cohort study of 180 patients presenting to a young-adult hip clinic and 54 asymptomatic volunteers. Of those, 106 patients (59%) and 28 asymptomatic controls (52%) had features of FAI morphology. All participants underwent standing- and supine- anteroposterior pelvic and Dunn radiographs; lateral spinopelvic radiographs in the standing and deep-flexed seated positions to determine static (pelvic incidence, lumbar-lordosis, pelvic tilt, pelvic-femoral-angle) and dynamic parameters.

Results: There was no difference in the static standing spinopelvic parameters between symptomatic- FAI and controls ($p=0.4-0.6$). There was no difference in the total flexion arc between patients and controls (156° vs. 156° ; $p=0.9$). However, FAI patients had significantly greater hip- (99° vs. 94° ; $p=0.04$) and pelvic- (11° vs. 5° ; $p=0.04$) flexion and significantly smaller lumbar flexion (57° vs. 62° ; $p=0.2$) compared to controls.

Conclusion: Despite the presence of symptoms, patients with FAI morphology, exhibited greater hip flexion than asymptomatic volunteers. The increased hip requirements to achieve equivalent sagittal flexion is likely to contribute to the pathomechanics. Maintenance of spine health and mobility may prevent the development of symptoms in individuals with FAI morphology.

Keywords:

Hip-spine relationship, Femoro-acetabular impingement, Hip preservation surgery, Dysplasia

EHS23-2200

Hip-spine relationship

Oral

Kinematics changes in the lumbopelvic hip complex in symptomatic FAI patients and two groups of asymptomatic controls. A comparison in Dynamic tasks

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Objectives: CAM-type Femoroacetabular Impingement (FAI) is a motion-related disorder of the coxo-femoral joint characterized by groin pain. The relationship between symptom manifestation and the role of spinopelvic kinematics is still unclear.

Our objective is to investigate the spinopelvic angles and kinematic differences between FAI patients and two asymptomatic control groups in three variants of bipedal squats.

Methods: Data collection is ongoing. Nine male participants (age=26±4) were divided into three groups; symptomatic CAM, asymptomatic CAM and asymptomatic NO CAM based on alpha angle calculations (CAM>60°). Pelvic Incidence (PI) was calculated on standing x-ray scans. 3D Motion capture data were recorded for deep squats, weighted sumo squats and weighted Romanian deadlift squats. Kinematics of the trunk, pelvis and hip segments were analysed.

Results: Symptomatic and asymptomatic CAM groups demonstrate higher PI angles which positively correlate to higher anteversion values in the deepest phase of the free and sumo squat. This is not observed in the No CAM group. The symptomatic group shows a decrease in peak internal rotation and in the total range of motion(ROM) at the hip frontal and transverse planes in all three movements compared to the control groups.

Conclusion: Our preliminary analysis shows that subjects with CAM show a larger pelvic anteversion during high hip flexion, regardless of the presence of symptoms. This could point to the inability of subjects with CAMs to retrovert their pelvis adequately. Decreased hip transverse and frontal ROM seem to be a distinguishing factor between the symptomatic group and the two control groups.

Keywords:

FAI,CAM,hip Impingement , squat analysis

EHS23-2246

Oral

Outcomes / proms in Hip surgery

Dislocation after elective THA.

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Objectives: Dislocation after elective THA is a well-known complication and a common reason for revision surgery. Whilst registers report on revisions for dislocation, a true dislocation rate following THA is difficult to ascertain. In this study, we explored the dislocation rate, the association between bearing size and type, approach and dislocation, recurrent dislocation, and revision.

Methods: We designed a longitudinal cohort studying a linked joint register, including patients with a unilateral elective THA from 1999 to 2014. The total dislocation rate, proportion of patients having reoccurring dislocations, revision rate, and revision rate for instability were recorded. Kaplan-Meier survival analyses and Cox multivariable regression models were fitted to calculate hazard ratios(HR) for the complete cohort.

Results: 145,062 patients with elective unilateral THA and complete data were available for analysis. The dislocation rate was 2.0% after 1 year, while the revision rate due to dislocation was 0.3%. The dislocation rate was higher for posterior(PA) compared to lateral approach(LA)(2.6% versus 1.3% at 1-year). Among patients with PA, a lower risk of dislocation was associated with bearing sizes >32 mm(HR=0.62,CI 0.48-0.80) and dual mobility THA (DMC-THA)(HR=0.22,CI 0.11-0.42). 11.6% of patients with a confirmed dislocation were revised within 1 year with female and younger patients as well as those operated through a LA were more likely to be revised.

Conclusion: The dislocation rate after elective THA was expectedly considerably higher than the revision rate for this reason. When using a PA, a bigger bearing size and DMC-THA might be better choices. Among patients with dislocation, those revised within 1 year differed considerably from those non-revised.

Keywords:

dislocation, THA, register

EHS23-2111

Hip-spine relationship

Oral

What patient parameters influence lumbar stiffness in patients with hip pathology?

List of authors:

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Objectives: Lumbar stiffness leads to greater dependence on the hip to achieve sagittal flexion and increased instability after total hip arthroplasty (THA). We aimed to determine parameters that influence lumbar stiffness amongst patients with hip pathology.

Methods: This is a retrospective, consecutive case series from a tertiary referral center. Sixty-five patients underwent radiographic assessment in standing and deep-seated position to measure change in lumbar lordosis (deltaLL) (stiffness: deltaLL < 20°), hip flexion (deltaPFA: pelvic-femoral angle) and degree of degenerative-disc-disease (DDD) (facet osteoarthritis, disc height, endplate proliferative changes). Lumbar facet orientation and flexor- and extensor- muscle atrophy (Goutallier classification) was determined on MRI.

Results: Mean deltaLL was 45° (range: 11°-72°) and 4 patients (6%) exhibited spine stiffness. Patients with multilevel DDD (n=22) had less deltaLL than those with no/single level (n=43) DDD [34° (range: 11°-53°) vs. 51° (21°-72°); p<0.001]. Number of DDD levels correlated strongly with deltaLL (rho=-0.642; p< 0.001). Spinal stiffness was only seen in patients with ≥4 DDD-levels. There was no correlation between deltaLL and facet orientation (p>0.05). DeltaLL correlated strongly with extensor atrophy at L3-L4 (rho=-0.473), L4-L5 (rho=-0.520) and L5-S1 (rho=-0.473), and poorly with flexors at L4-L5 (rho=-0.134) and L5-S1 (rho=-0.227).

Conclusion: Lumbar stiffness is dependent on modifiable- (muscle atrophy) and non-modifiable- (extent of DDD) factors. This can guide non-operative management of hip pathology, emphasizing relevance of core muscle rehabilitation to improve posture and stiffness. Identification of ≥4 DDD-levels should alert hip surgeons of increased risk of THA instability.

Keywords:

hip-spine syndrome, THA, spinal stiffness, degenerate-disk disease, instability

EHS23-2332

Hip-spine relationship

Oral

Spinopelvic motion evaluation and patient specific target for acetabular cup placement.

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Objectives: Instability is a major reason for revision after total hip arthroplasty (THA) and acetabular cup placement in the "traditional" safe zone does not protect from dislocations. Spinopelvic mobility may play a role in impingement and dislocations after THAs. The aim of the study was to evaluate spinopelvic mobility and develop a patient specific target for acetabular cup placement.

Methods: Prospective evaluation of spinopelvic motion of 116 patients was performed during preoperative planning. All patients underwent radiologic assessment with an anteroposterior pelvis radiograph in standing and in supine position, and a lateral view of the lumbar spine and pelvis in standing and sitting position. Pelvic incidence, pelvic tilt, sacral slope, standing anterior pelvic plane tilt, sitting anterior pelvic plane tilt, and lumbar lordosis was measured and pelvic motion from standing to sitting was calculated.

Results: Average pelvic incidence was evaluated at 51.0 ± 13.1 degrees, sacral slope at 35.0 ± 10.3 degrees, pelvic tilt at 16.0 ± 13.3 degrees, standing anterior pelvic plane tilt at 3.4 ± 12 degrees backwards, and lumbar lordosis 39.5 ± 11.3 degrees. The mean spinopelvic mobility was 27.3 ± 13.4 degrees. Measurements had good to excellent interobserver and intraobserver reliability. Based on these measurements, we developed an algorithm for patient specific target for acetabular cup placement.

Conclusion: Evaluation of spinopelvic mobility has good to excellent interobserver and intraobserver reliability, and can be used for personalized acetabular placement.

Keywords:

hip-spine; patient specific; instability; safe zone; reliability

EHS23-2113

Oral

Hip-spine relationship

Roussouly Type 4 Sagittal spine alignment and increased sacral slope in patients with hip dysplasia - implications for Hip Spine relation

List of authors:

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Objectives: Decreased pelvic incidence(PI) and sacral slope(SS) were associated with femoroacetabular impingement (FAI) and acetabular retroversion(AR). But sagittal balance and SS and for hip dysplasia(HD) patients are unclear.

To report (1)frequency of patients with PI<40° and (2)frequency of patients with SS<35° and (3)types of SS(type 1-4) for patients with AR and HD.

Methods: A retrospective, IRB-approved, controlled study including 120 hips of consecutive patients with symptomatic FAI or HD was performed. Sagittal images of pelvic CT scans were reviewed for all patients to calculate parameters for sagittal balance(PI, SS and pelvic tilt). Patients with PI<40°, SS<35° and types of sacral slope(type 1-4 according to Roussouly-classification) were analysed.

The patients were allocated to the following groups: AR(41 hips), HD(47 hips) and hips with cam-FAI with normal acetabular morphology(32 hips,control group).

Results: (1)Frequency of PI<40° was significantly(p<0.001) increased in patients with AR(44%) compared to HD(11%).

(2)29% of the patients with AR had SS<35°(type 1), while 11% of patients with HD had SS< 35°.

(3)Frequency of SS >45°(type 4) was significantly(p<0.001) higher(49%) of the patients with HD compared to patients with AR(12%). 40% of patients with HD had SS 35-45°(type 3).

Conclusion: Almost half of patients with HD had increased SS>45° and type 4 spine. Increased SS was associated with increased lumbar lordosis. Patients with hip impingement and hip dysplasia can present with opposite sagittal parameters and hip-spine relation, that could be important for hip preservation surgery and spine surgery.

Keywords:

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EHS23-2145

Oral

Miscellaneous topics

Version control capability with a tapered-wedge cementless stem in total hip arthroplasty: assessment with pre- and post-operative CT

List of authors:

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Objectives: Femoral stem anteversion is critical for hip function after THA. Version control during cementless stem insertion is substantially difficult but flat single wedge stem allows some control. Using this stem we have controlled to obtain 25-40° anteversion as much as possible in our posterior approach THA. The objective of this study was to assess control capability by pre- and post-operative CT.

Methods: 320 THA cases (2019-2021) were retrospectively reviewed and 75 cases in those both pre- and post-op CTs were taken were included in this study. Pre-op femoral neck anteversion (Fem-V) and post-op stem anteversion (Stem-V) relative to the posterior femoral condyle were measured using each CT. Femoral fracture was examined on post-op CT, and radiographic stem fixation and post-op dislocation was determined by clinical records at the final follow-up (>1 year).

Results: The Fem-V ranged 10-63 (mean: 29)° and the Stem-V ranged 22-60 (mean: 36)°. Dispersion of the Stem-V was significantly reduced compared to dispersion of the Fem-V (F-test: $p < 0.05$). In the patient group whose Fem-V was small ($< 25^\circ$), version was significantly increased from 17° to 31° (T-test: $p < 0.05$), but in the group whose Fem-V was excessive ($> 40^\circ$), version change varied and decrease of version (from 47° to 42°) was not statistically significant. No femoral fracture/dislocation was found and bone-ingrown fixation was detected in all stems.

Conclusion: Dispersion of the Stem-V was successfully reduced compared to dispersion of the Fem-V without clinical problem. Version increase was done more predictably than version decrease, maybe due to anatomy of the greater trochanter where postero-lateral aspect has more space for control than antero-lateral aspect.

Keywords:

total hip arthroplasty, cementless stem, anteversion, version control

EHS23-2114

Hip-spine relationship

Oral

The knee-hip-spine trilemma in patients with severe congenital dysplasia of the hip undergoing total hip arthroplasty. 77 hips followed-up for a minimum of five years.

List of authors:

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Objectives: Pelvic bone defect in patients with severe congenital hip disease (CHD) lead to abnormalities in lumbar spine and lower limb alignment

We compared the clinical outcome and the spinopelvic and lower limb radiological changes over time in patients undergoing total hip arthroplasty (THA) due to uni- or bilateral CHD at a minimum follow-up of five years.

Methods: Sixty-four patients (77 hips) operated between 2006 and 2015 were analysed: 51 patients had unilateral CHD (group 1), and 13 bilateral CHD (group 2). Mean age was 41.6 years in group 1 and 53.6 in group 2 ($p < 0.001$). Hip, spine and knee clinical outcomes were compared. The radiological analysis included the postoperative hip reconstruction, and the evolution of the coronal and sagittal spinopelvic parameters assessing the pelvic obliquity (PO) and the sacro-femoro-pubic (SFP) angles, and the knee mechanical axis evaluating the tibio-femoral angle (TFA).

Results: At latest follow-up, the mean Harris Hip Score was 88.6 in group 1 and 90.7 in group 2 ($p = 0.025$). Postoperative lumbar back pain was reported in 23.4% of the cases and knee pain in 20.8% (no differences between groups). One supracondylar femoral osteotomy and one total knee arthroplasty were required. The radiological hip reconstruction and the SFP angle improvement were similar in both groups. The PO angle improved more in group 1 ($p = 0.01$) and was constant at 5 years. 30 patients in group 1 showed a TFA less than 10° and 17 in group 2 ($p = 0.7$).

Conclusion: Although hip function was better in patients with bilateral CHD after THA, the improvement in low back and knee pain was similar. PO correction was better in patients with unilateral CHD. Spinopelvic and knee alignment parameters were corrected and maintained over time at five years.

Keywords:

total hip arthroplasty; congenital hip disease; hip-spine; knee alignment

EHS23-2038

Poster

Outcomes / proms in Hip surgery

Comparison of the outcomes of Cementless Bipolar Hemiarthroplasty and Cementless Total Hip Arthroplasty for Displaced Femoral Neck Fractures in the Elderly

List of authors:

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Objectives: This study aimed to evaluate patient function and complications following cementless bipolar hemiarthroplasty(BHA) and otal hip arthroplasty(THA) in an elderly displaced femoral neck fracture (DFNF)

Methods: A prospective, randomized controlled trial comparing BHA and THA for DFNF treatment was performed. All operations were performed by a single surgeon using the same techniques the posterior approach. Patients were followed up at 1, 3, 6 and 12 months and their functional scores were calculated according to the Harris hip score and other complication.

Results: The cohort comprised 75 patients, with 38 patients in the BHA group (mean age 76.7 years) and 37 patients in the THA group (mean age 75.7 years). The mean operative times for the BHA and THA groups were 40.76 and 51.08 minutes respectively. The average intraoperative blood loss was 200 cc and 279.7 cc, respectively. The mean hospital stay was 5.07 days for the BHA group and 4.92 days for the THA group. The mean Harris hip scores at 1, 3, 6 and 12 months in the BHA group were 71.5, 78, 85 and 86, respectively, while in those in the THA group were 71, 79, 85.5 and 88 respectively. Statistically, there were no significant difference between the two groups. Morbidities including fractures and dislocations, and mortality rates, also showed no statistically significant difference.

Conclusion: Harris hip score, dislocation, length of hospital stay and mortality rate at one year is not statistically different between group. Blood loss and operative time were significantly lower in the BHA group than in the THA group.

Keywords:

fracture neck of femur, femoral neck fracture, bipolar hemiarthroplasty, total hip arthroplasty, Harris Hip Score

EHS23-2092
Miscellaneous topics

Oral

THE MUSCULOSKELETAL HEALTH OF HIP SURGEONS: A NATIONAL STUDY

List of authors:

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Objectives: The nature of tasks performed by hip surgeons often requires both forceful and repetitive manoeuvres, putting them at higher risk of musculoskeletal injuries. This study aimed to investigate the prevalence of musculoskeletal conditions among consultant hip surgeons and evaluate the association between their workplace and lifestyle factors and musculoskeletal health.

Methods: An online survey consisting of 22 questions was distributed to the consultant members of the British Hip Society via email and social media platforms. This survey was completed by 114 consultant hip surgeons.

Results: The mean age of the respondents was 48 years, with an average of 12 years in service. 94% were full-time, and 52% worked at a tertiary centre. 71% performed on-call duties and 79% had trauma commitments. 91% reported having one or more, 50% with three or more and 13% with five or more musculoskeletal conditions. 64% attributed their musculoskeletal condition to their profession. The most common musculoskeletal conditions were lower back pain (72%), neck pain (35%), and subacromial impingement (23%). 41% had altered the way they operate due to their health. Doing on-call shifts, service >10 years, and performing >150 hip replacements/year were associated with a higher musculoskeletal burden ($P<0.05$). Regular resistance or endurance training and $BMI<30$ were significant protective factors ($P<0.001$).

Conclusion: This study highlights a very high prevalence of musculoskeletal conditions among hip surgeons. There is a pressing need for the identification of preventative measures and improvement in the surgical environment of hip surgeons.

Keywords:

Ergonomics, musculoskeletal health, hip surgeon

EHS23-2238

Oral

Outcomes / proms in Hip surgery

In vivo wear resistance of Durasul highly cross-linked polyethylene acetabular liner: a retrospective study with minimum 15-year follow-up.

List of authors:

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Objectives: The first cause of revision of total hip arthroplasty is aseptic loosening due to polyethylene wear and subsequent osteolysis with prosthetic dislocation. In an attempt to reduce the wear problem, a new, highly cross-linked polyethylene (HXLPE) was introduced in the late 1990s, which is theoretically more resistant to wear. This study aims to compare the long-term wear rate of HXLPE Durasul® polyethylene acetabular inserts with that of conventional inserts. The primary assumption is that the wear resistance of the HXLPE Durasul® inserts is better than that of a conventional liner.

Methods: Data were prospectively collected and reviewed from patients who underwent total hip arthroplasty between 2000 and 2005 in a single. Patients were re-contacted and radiological and clinical outcomes were investigated. At a minimum 15 years follow-up the long-term clinical outcomes have been assessed through the following Patient Reported Outcome measures (PROMs): modified Harris Hip Score (mHHS). Wear was calculated radiographically on the latest pelvic X-ray, using a validated manual analysis technique described by Kang.

Results: 400 patients were collected retrospectively. Of these, 116 patients could be contacted, with a total of 128 hips (64 HXLPE cases, and 64 controls). The annual wear was 0.019 mm/year for Durasul® and 0.044 mm/year for conventional polyethylene. The mHHS was also better in patients treated with highly cross-linked polyethylene (82.04 vs. 71.93 in controls). The only recorded case of periprosthetic osteolysis occurred after 18 years after the surgery.

Conclusion: The results obtained confirm the excellent wear resistance capacity of Durasul acetabular inserts in the long term, in agreement with expectations and current literature.

Keywords:

survivorship, acetabular liner, tribology

EHS23-2231

Oral

Outcomes / proms in Hip surgery

SPINAL ANAESTHESIA WITH HYPERBARIC PRILOCAINE IS SAFE, RELIABLE AND REDUCES HOSPITAL LENGTH OF STAY IN TOTAL HIP ARTHROPLASTY

List of authors:

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Objectives: Spinal anaesthesia plays an integral role in enhanced recovery protocols for total hip arthroplasty (THA). Despite this there is little evidence comparing anaesthetic agents' effect on surgical outcomes. Prilocaine, a short-acting spinal anaesthetic, has been used safely and reliably to perform short-duration orthopaedic procedures, but has not been studied in THA. The aim of this study was to compare perioperative outcomes of patients undergoing THA using intrathecal prilocaine with those receiving bupivacaine.

Methods: A total of 211 THAs performed under spinal anaesthesia between July and December 2022 were retrospectively reviewed. All patients received either 2% hyperbaric prilocaine or 0.5% bupivacaine intrathecally. The primary outcome was hospital length of stay (LOS). Secondary perioperative outcomes, including post-anaesthesia care unit (PACU) recovery time, were also evaluated.

Results: 70 patients (33%) received prilocaine (median 70mg, range 50-80mg) and 141 (67%) received bupivacaine (median 12.5mg, range 7.5-20mg). No statistical differences were observed between the two groups for age, gender, BMI or ASA. Spinal anaesthesia using prilocaine was associated with reduced hospital LOS (2.1 vs 2.5 days, $p = 0.047$) and PACU recovery time (58.7 vs 65.9 minutes, $p = 0.048$). Two patients receiving bupivacaine required catheterisation for urinary retention, whilst no events occurred with prilocaine. Post-operative nausea was comparable between prilocaine and bupivacaine (66% vs 71%).

Conclusion: This study demonstrates that THA can be performed safely and reliably using intrathecal hyperbaric prilocaine. In comparison to bupivacaine, it is associated with reduced hospital LOS, PACU recovery time and incidence of postoperative urinary retention.

Keywords:

Arthroplasty, prilocaine, hip, length of stay

EHS23-2216

Poster

Outcomes / proms in Hip surgery

Optimys short stem in primary total hip arthroplasty: a 5-year analysis of 268 cases

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Objectives: The Optimys prothesis is an uncemented short stem, designed for bonepreserving primary minimally-invasive THA. A total of 21118 Optimys stems were used for THA within in the last 10 years. The aim of this study was to look at the long-term outcome regarding overall patient satisfaction, radiological signs of loosening and revision rates of the Optimys short stem in comparison to comparable short stems.

Methods: 265 patients (268 THA) were included. 30 patients were lost to follow-up. The data was collected prospectively in the SIRIS Register, statistical analysis was carried out through the SwissRDL. The radiographic analysis was carried out visually by an external from the study independent orthopedic surgeon. The HH-Score as well as WOMAC-Score were used for evaluation of patient satisfaction 5 years after primary implantation.

Results: In total 8 revisions were necessary, out of which 5 included a revision of the femoral stem (3 periprosthetic fractures, 1 femoral loosening, 1 infection). The cumulative revision-rate 5-years postoperative was at 2.3% (CI 1.0-5.1) while the Kaplan-Meier revision-rate of other uncemented stems lies at 3.8% (CI 3.7-3.9). The mean HH-Score was at 91.8 points, leading to a mean improvement of 39.1 points. Similar satisfactory outcomes were depicted using the WOMAC-Score with an overall decrease from 45.6 points at baseline to a mean of 3.8 points.

Conclusion: After initial migration, the Optimys shaft achieves secondary stabilization, with a low rate of further shaft subsidence or migration, suggesting a low-risk for secondary, aseptic loosening. The HHS and WOMAC-Score show a high improvement in patient satisfaction. The cumulative revision rate of the Optimys shaft can be compared to other established short stem shafts.

Keywords:

short stem, total hip arthroplasty

EHS23-2156

Oral

Outcomes / proms in Hip surgery

Long term outcomes of the triple tapered C-stem AMT cemented femoral stem

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Objectives: C-Stem AMT is a force-closed design, triple-tapered, polished cemented stem. This study aimed to report radiological outcomes and survivorship of the C-stem AMT, with a minimum 10-year follow-up.

Methods: This was a single-centre, multi-surgeon, retrospective study of total hip replacements (THRs) performed using the C-stem AMT between 2006 and 2012.

Results: 246 THRs we performed in 229 patients using the C-stem AMT, 137 female and 92 male patients. The mean age at surgery was 67 years. The average follow-up was 11.5 years. Surgical indications were osteoarthritis=229, avascular necrosis=9, dysplasia=4, fracture=2, and arthrodesis takedown=1. All THRs were performed via the posterior approach. The constructs for THRs were 207 (84%) cemented and 39 (16%) hybrid. The bearing combinations were 158 (64%) metal-on-polyethylene, 87 (35%) ceramic-on-polyethylene, and 1 (0.4%) metal-on-metal. The quality of the cement mantle on the postoperative radiographs was Barrack A in 213 (87%) and B in 33 (13%).

Five patients returned to theatre within a year; 2 periprosthetic fractures, 2 dislocations, and 1 wound washout. At the final follow-up radiographs, there were no Gruen zone lucencies in 148 (60.2%), 77(31.3%) in a single zone, and 21(8.5%) in two or more zones. Calcar resorption was seen in 42(17%). To date, 4 THRs (1.6%) have been revised (aseptic loosening of cup=1, infection=1, periprosthetic fracture=1). The mean time to revision was 12.1 years. There were no revisions for aseptic loosening of the femoral stem.

Conclusion: The C-stem AMT femoral stem has demonstrated excellent implant survivorship at a 10-year follow-up with modern cementing techniques.

Keywords:

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EHS23-2203

Miscellaneous topics

Oral

USING THE CAPABILITY, OPPORTUNITY, AND MOTIVATION MODEL OF BEHAVIOR (COM-B) TO IMPLEMENT A PATHWAY TO REDUCE 30-DAY ELECTIVE EMERGENCY ADMISSIONS.

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Objectives: Raised 30-day emergency readmission suggest complications related to the treatment after discharge from hospital. A board-approved quality improvement project pathway was introduced. The aim was to reduce readmission rates following implementation and discuss its importance in other elective orthopaedic centres.

Methods: Patient were provided with telephone and email contact details for non-life threatening medical assistance allowing for nurse led management of all complaints in the first instance. A new clinic room was available 7 days, and same day ultrasound scanning for DVT studies. A capability, opportunity and behaviour model of change was implemented. Readmission rates before, and six months after pathway implementation were collected using Model Hospital Services using Getting It Right First Time metrics, based on Hospital Episode Statistics data. Local Electronic System for documenting patient communications was analysed for patient outcomes following pathway.

Results: Before pathway, readmission following elective primary total hip replacement (THR) from April to June 2021 was 7.0%(Benchmark, 3.2%). After pathway, rates decreased to 3.8% from October to December 2021. 51% of patients making contact were managed with telephone advice. 5.1% required face-to-face clinic follow up, 30% required same day scan to exclude DVT. Despite pathway, 21 of 884 THRs performed in that period were re-admitted within 30 days. 60% were surgical and 40% medical. 1/3 of those patients were unaware of contact information. Discharge information has since been modified for clearer contact information and further reduce readmissions.

Conclusion: This pathway significantly reduced re-admission in our centre and can reduce readmission rates in other similar centres.

Keywords:

Readmission, elective centre, Primary Hip arthroplasty

EHS23-2321

Oral

Outcomes / proms in Hip surgery

Superior Transverse Atraumatic Reconstruction (STAR) approach provides better compared outcome to standard Direct Superior Approach (DSA): a matched, prospective comparative single-surgeon study

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Objectives: The Direct Superior Approach (DSA) is a muscle-sparing hip approach which does not protect the piriformis and the other short external rotators. We present a DSA modification we named STAR (Superior Transverse Atraumatic Reconstruction), which has DSA advantages but always preserves piriformis. Our study compared the early postoperative, radiological and functional results of patients undergoing primary total hip arthroplasty (THA) through the STAR approach with a matched DSA group performed by a senior surgeon

Methods: Each group, DSA and STAR, included 200 elective primary unilateral THAs performed by the surgeon between 2016-2017 and 2020-2021, respectively. Patients were included in both groups using the same inclusion criteria. Both groups were matched for age and sex. The same postoperative pain management, chemoprophylaxis and physiotherapy protocols were followed in both groups. Two independent orthopaedic surgeons performed the clinical and radiological follow-up.

Results: The STAR group had significantly lower mean incision length ($p=0.042$) and hospital stay ($p=0.002$) than the DSA group. The mean intraoperative blood loss ($p=0.085$) and the need for blood transfusion ($p=0.228$) were less for the STAR than DSA group. The mean postoperative functional scores improvement was significantly higher for the STAR than the DSA group at the end of the first and third postoperative months

Conclusion: The STAR approach offers earlier functional improvement, shorter hospital stay and less transfusion need than DSA for patients undergoing primary THA. Both approaches showed a limited complication risk and an outstanding acetabular and femoral access enabling the procedure.

Keywords:

STAR approach, DSA approach, THA, total hip arthroplasty, minimal invasive surgery, STAR

EHS23-2026

Oral

Outcomes / proms in Hip surgery

Long-term follow-up of 119 primary cemented total hip arthroplasties in 96 patients younger than 25 years old

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Objectives: Long term follow-up studies of THA in young patients are scarce. Therefore, we analysed all consecutive primary THAs in patients under 25 years performed at our institute.

Methods: All primary THAs performed in patients younger than 25 years in our tertiary care institute between 1988 and 2015 were retrospectively included (n = 119 hips). Cemented fixation was used in all patients. In case of acetabular bone deficiencies, reconstruction was performed using impaction bone grafting (IBG). We used Kaplan-Meier analysis to determine the survival of the primary THA with endpoints revision for any reason and aseptic loosening.

Results: The mean age at the primary THA was 20 years (range 12-24). The most prevalent diagnosis was avascular necrosis (31%). The mean follow-up of the primary THA was 11 years (range 0-32). 2 patients (2 hips) were lost to follow-up. 16 revisions were registered. The survival of any component for endpoint revision for any reason was estimated at 92% (CI 84-96) and 81% (CI 67-90) at 10 and 15-years follow-up, respectively. The survival of any component for endpoint revision for aseptic loosening was 99% (CI 93-100) and 88% (CI 71-95) at 10- and 15 years, respectively. 3 hips were revised due to infection.

Conclusion: This study shows that acceptable long-term follow-up results of primary THA in extremely young patients can be obtained using cemented fixation and IBG.

Keywords:

Young patients, THA, follow-up, primary THA, cemented THA

EHS23-2013

Oral

Outcomes / proms in Hip surgery

Patients report no improvement in total hip arthroplasty outcomes. An analysis of 4 years patient reported outcomes in the Netherlands.

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Objectives: Patient reported outcomes measurements (PROMS) are an important outcome in Total Hip Arthroplasty (THA) and are included in many national arthroplasty registries. PROMS results can be used to initiate improvements in THA care, both on a national and on hospital level. Research on longitudinal changes in PROMS results on a national level is missing, despite the costs and burden involved in collecting PROMS.

Methods: A retrospective study using publicly available pre-Covid THA PROMS datasets (2016-2019). Primary outcome: longitudinal comparison of PROMS baseline-3 months (pre-3M) and baseline-12 months (pre-12M) change scores and 95% confidence intervals (95%CI). Secondary outcomes: PROMS response rates and comparison of hospitals with low versus high response rates.

Results: More hospitals started collecting THA-PROMS (from 78% to 92%). NRS pain, HOOS-PS and EQ-5D descriptive change scores were identical from 2016 to 2019 for pre-3M and pre-12M. EQ-5D VAS change score improved from 2016 to 2019 but only for pre-3M, not for pre-12M. 95%CI pre-3M improved for EQ-5D (descriptive and VAS) and NRS pain with activity, all other 95%CI's remained stable. Median pre surgery RRs were between 55% (IQR 39%) and 70% (IQR 38%), 16% of the Dutch hospitals had a PROMS rate of 60% or higher. PROMS results were equal between hospitals with a high response rate or a low response rate.

Conclusion: There seems to be no improvement in patient report outcomes for total hip arthroplasty in the Netherlands. Low THA PROMS response rates are observed. PROMS aims and collection require a rethinking on a national level.

Keywords:

Total Hip Arthroplasty; Patient Reported Outcomes; Joint Replacement Registries

EHS23-2045
Hip resurfacing

Poster

DYSPLASTIC HIPs MAY SAFELY BE RESURFACED WITHOUT A CONTOURED FEMORAL COMPONENT

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Objectives: The oversized apron of the femoral component head that extends beyond the limit of the original femoral head is a potential cause of groin pain following resurfacing of dysplastic hips. A contoured head design has been proposed to address this. We investigated whether these dysplastic hips can effectively be resurfaced without the overhang by reducing the femoral head size, correcting the stem angulation into valgus, and translating the head laterally ensuring that its anteromedial metal rim is close to the bony margin.

Methods: Virtual surgery and measurements were done with three-dimensional CT-based planner. Retrospectively gathered data of dysplastic patients who underwent total hip arthroplasty with the center edge angle of less than 20° and with the femoral head size 48mm or more. Virtual surgery with The Birmingham Hip Resurfacing system (Smith&Nephew) was undertaken using two techniques: Anatomical resurfacing (AR), using the native head, and Reduced head resurfacing (RR), reducing the femoral head size, correcting the angulation into valgus (135-145°) and translating the component laterally to the medial head/neck junction.

Results: 20 patients (12 women and 8 man) were included, with a mean age of 55 and mean height of 163 cm. The mean head size was 50mm, the mean Center Edge angle was 10°, mean neck-shaft angle was 134°. The mean stem-shaft angle in AR was 136° while in RR it was 141°. The mean overhang in AR was 6mm while in RR it was 2mm. The overhang in RR was significantly smaller ($P < 0.01$). The mean size reduction needed in RR was 4 mm.

Conclusion: Reduced head resurfacing allows even dysplastic hips to be resurfaced with minimal overhang, suggesting that a contoured femoral head may not be necessary to avoid psoas impingement.

Keywords:

Resurfacing Hip Arthroplasty, Dysplastic Hip, Iliopsoas Impingement

EHS23-2127
New technologies

Oral

Blood Titanium Levels after 3D Printed Hip Implantation

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Objectives: To better understand the concentrations of titanium (Ti) in blood samples taken from patients implanted with custom 3D printed cups.

Methods: Blood samples were drawn from 6 male and 12 female patients aged 69.5 (40-90) years, during routine clinic visits. All had well-functioning custom 3D printed titanium cups. Ti concentrations were measured using high resolution inductively-coupled plasma mass spectrometry (HR ICP-MS). We captured longitudinal blood Ti data in a subset of patients.

We (1) compared these Ti levels with baseline levels from conventionally manufactured hips and (2) investigated the trends in blood Ti changes following implantation.

Results: The median (range) blood Ti levels measured in the most current samples was 13.05 (3.9-34.9) ppb; this was greater than baseline levels of 2.2 ppb ($p < 0.01$).

Longitudinal measures, captured between 1 and 36 months post-implantation, showed an initial increase in Ti levels by up to a factor of 2, in the first 3 months following implantation, followed by a general decline in the levels measured up to 12 months. Comparison of the most recent blood metal data from all patients revealed significantly greater Ti levels in patients with a time in situ of between 24-36 months, compared with 12-24 months; 22.12 (12.08-34.9) ppb and 6.39 (3.9-33.1) ppb respectively, $p < 0.05$.

Conclusion: Patients implanted with large 3D printed acetabular cups had significantly greater levels of Ti in their blood when compared to baseline levels.

There is a trend towards increasing levels at 36 months following implantation.

This study provides understanding of the spread of blood Ti measured; future work will build on this to establish its role as a biomarker for function in these patients.

Keywords:

3D Printing; Titanium; Metal Ion; Biomarker

EHS23-2244

Poster

Joint preservation

Fifty percent of patients undergoing periacetabular osteotomy for hip dysplasia showed normal findings upon neonatal ultrasound screening

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Objectives: Developmental dysplasia of the hip is characterized by the pathomorphology of inadequate acetabular coverage of the femoral head leading to increased loading of the articular surface. Germany introduced a nationwide universal ultrasound (U3) screening program for all newborn infants in 1996. Despite the introduction of this screening program, we see a rise in young adults with symptomatic acetabular undercoverage seeking treatment in hip preservation centers.

Methods: A consecutive series of patients who underwent periacetabular osteotomy for the treatment of symptomatic dysplasia of the hip between 10/2014 and 10/2022 were considered for inclusion in the study. Inclusion criteria were symptomatic hip dysplasia that was diagnosed based on an anterior-posterior pelvic radiograph. Patients were contacted for retrieval of a simple set of data regarding the U3 screening exam and prior treatments. In addition, the radiological parameters of the acetabular coverage were collected and correlated for each patient.

Results: In 47 cases (51,1%), ultrasonography revealed a positive finding (Graf >1). Forty-five (48,9%) hips were reported to be normal (Graf 1) upon U3 and needed to undergo pelvic osteotomy in their adulthood due to hip dysplasia. The true positive rate of ultrasonography was calculated to be 51.0%. Both patient groups, with DDH detection and without DDH detection in the U3 examination, did not differ regarding gender distribution, time point of surgery and radiographic acetabular measures ($p>0.05$).

Conclusion: This study underlines that acetabular undercoverage cannot be ruled out based on a normal finding of ultrasonography screening. Furthermore, the study also shows that residual dysplasia may persist despite conservative treatment.

Keywords:

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EHS23-2084

Postop complications

Oral

A five-year follow-up of a generic polished tapered stem with high implant fractures

List of authors:

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Objectives: The present study investigated the incidence of implant failure in 315 cemented polished tapered stems (Fortress stems, Biotechni, La Ciotat, France). The stem design demonstrated a significantly high rate of failure at the neck-shoulder region, attributed to an adaptation in the insertion hole that caused a stress raiser.

Methods: The study included patients who underwent a hybrid total hip arthroplasty (THA) using a posterolateral approach between 2010 and 2017. Patient records and radiographies were retrospectively analyzed to identify cases of failure. A failure analysis was performed for the two types of failure observed. Data and statistics were managed in an excel file.

Results: During the mean follow-up period of 61.5 months, 12 femoral stems (3.5%) fractured, with 11 occurring at the neck-shoulder junction and 1 at the head-neck junction. Implant failure occurred at a mean of 73.1 months (range 50-103 months) after surgery. The average BMI of the fractured stems was significantly higher (31.63 kg/m²) than that of the non-fractured group (26.56 kg/m²) ($p = 0.004388$). After 104 months, the estimated chance of survival (Kaplan-Meier) was 0.896. All fractures, except one, were revised using a cement-in-cement technique, while one was revised using a modular uncemented revision stem. In total, 16 (5.1%) failures were reported due to instability and periprosthetic joint infection (PJI) in addition to the implant fractures, with a survival rate of 0.816 after 122 months.

Conclusion: This study highlights the high failure rates associated with the use of this specific cemented stem design. The increasing number of THA surgeries performed in younger and more active patients could result in a higher incidence of this complication.

Keywords:

Implant fracture, Hip arthroplasty, cemented stem, stem design, revision

EHS23-2169

Poster

Postop complications

Lower Extremity Arterial Calcification Predicts Referral to Intensive Care Unit After Primary Total Hip Arthroplasty

List of authors:

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Case Study: Objectives: Lower extremity arterial calcification (LEAC) increases the risk of cardiovascular adverse events in patients with peripheral arterial disease, but its impact on postoperative complications and intensive care unit (ICU) referral after total hip arthroplasty (THA) is unclear. We aimed to investigate the impact of LEAC on postoperative outcomes in primary THA patients.

Methods: We retrospectively analyzed 705 patients who underwent primary THA, identifying 64 (9.13%) patients with and 641 without LEAC. A preoperative anteroposterior pelvic radiograph was used to evaluate the presence of LEAC. LEAC-patients were older (77 ± 9 vs. 67 ± 11 years; $p<0.001$). Admission to ICU, length of stay, readmissions, and 90-day mortality were recorded. A logistic regression model was used to evaluate LEAC as a risk factor for referral to ICU.

Results: Patients with LEAC had higher incidence of admission to ICU (12.5% vs. 1.09%; $p<0.001$), longer in-hospital stay (4.7 ± 1.8 vs. 4.2 ± 1.3 days; $p=0.006$); higher readmissions (25% vs. 5.15%; $p<0.001$), and higher 90-day mortality rate (9.3% vs. 0%; $p<0.001$) than patients without LEAC. Of the patients with LEAC admitted to ICU, 5/8 (62.5%) did not have a previous indication to do so in the preoperative assessment performed by the Department of Anesthesiology, while all non-LEAC ones referred to ICU did so. Logistic regression analysis showed that LEAC was an independent risk factor for ICU admission (OR 4.6; 95%CI 1.3-16.3, $p=0.019$).

Conclusions: LEAC was an independent risk factor for ICU admission, longer in-hospital stay, and higher 90-day mortality rate. Identifying patients with LEAC can aid in the preoperative assessment and risk stratification of patients planned for primary THA.

Keywords:

lower extremity arterial calcification; intensive care unit, total hip arthroplasty; readmissions

EHS23-2095
Joint preservation

Poster

Minimum 5-Year Results of a novel periacetabular osteotomy -The Spherical Periacetabular Osteotomy with cutting into tear drop area-

List of authors:

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Objectives: Spherical periacetabular osteotomy (SPO) is an innovative periacetabular osteotomy for patients with developmental dysplasia of the hip joint (DDH). SPO involves preserving the pelvic ring by splitting the teardrop area according to patient-specific preoperative 3-dimensional planning. The procedure is performed in an anterior approach with a 7cm incision. The aim of this study was to investigate minimum 5-year results.

Forty-five patients (49 hips) were able to be followed over 5 years (follow up rate: 84.5%), including 4 males (4 hips) and 41 females (45 hips). The mean age at surgery was 39 years old (range: 17- 56 years old). The average follow-up duration is 5.9 years (5 - 8 years). The Tönnis grade of these patients at surgery were as follows: grade 0: 23 cases, grade 1: 19 cases, grade 2: 7 cases.

Methods: Postoperative Tönnis grades classifications were performed using the radiographs at the last follow up period. The PROMs were collected and evaluated. Statistic analysis was performed with the paired T-test.

Results: The Tönnis grade at the last follow-up was grade 0 for 18 cases, grade 1 for 23 cases, and grade 2 for 8 cases. Seven of 49 cases (14.3%) were judged that the Tönnis grade worsened (5 cases had changed from grade 0 to 1, and 2 cases had changed from grade 1 to 2). Therefore, there were no cases that had a change to grade 3 or converted to THA. The mean HHS score was significantly improved at the last follow-up (87 points) compared to preoperatively (58 points).

Conclusion: There were 7 cases (14.3%) with progressing OA. However, all cases displayed strong HHS with minimum 5-year follow-up. This novel periacetabular osteotomy provides an alternative procedure for DDH patients.

Keywords:

Hip preserving surgery, Periacetabular osteotomy, Hip arthritis, Developmental dysplasia of the hip joint

EHS23-2288
New technologies

Oral

Intraoperative Neuromonitoring to prevent nerve injury during Total Hip Arthroplasty in patients with severe hip deformities

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Case Study: OBJECTIVE

To report about the feasibility of intraoperative neuromonitoring (IONM) during total hip arthroplasty (THA) in severe hip deformities.

METHODS

This retrospective case series includes 18 cases with symptomatic severe DDH (Crowe 3/4) or other severe hip deformities. All cases received THA with IONM between September 2019 and October 2022. The goal of surgery in all cases was to reestablish the original center of rotation.

Monitored modalities were Transcranial Motor Evoked Potentials (TcMEPs), Somatosensory Evoked Potentials (SSEPs) and free-running Electromyography (EMG). Alarm criteria were a TcMEP amplitude loss of 80%, neurotonic discharges on the free-running EMG and/or significant SSEP amplitude loss.

Follow-up took place during hospital stay and at the follow-up visit 8 weeks postoperatively.

RESULTS

In 11 cases we found IONM signal alerts that correlated with several surgical events: surgical exposure/hip dislocation (n=9), acetabular reconstruction/cementing (n=3) and trial reduction (n=5).

Actions taken were removal or replacement of instruments, temporal hip repositioning, screw replacement of the massive autograft (n=1) and more subtrochanteric osteostomy (n=4).

In 11 cases the IONM alerts concerned sciatic innervated muscles and in 5 cases also the femoral innervated muscles alerted. In all cases normalization of IONM signals occurred spontaneously or after corrective maneuvers. No cases showed a postoperative neurological deficit.

CONCLUSION

IONM in THA for severe hip deformities revealed numerous specific surgical events leading to signal alerts. Timely adjustment of our surgical approach resulted in improvement of signals in all cases. None of our patients experienced a postoperative neurological deficit.

Keywords:

Intraoperative neuromonitoring, Total Hip Arthroplasty, Developmental Dysplasia of the Hip, hip deformities, nerve injury, sciatic nerve, postoperative complications

EHS23-2260

Poster

Outcomes / proms in Hip surgery

Validation of the HOOS-12 shortform in a German Cohort

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Objectives: To assess the psychometric properties of the recently established HOOS-12 shortform.

Methods: HOOS-12 data of patients who received total hip arthroplasty (THA) as part of a cross-sectoral multi-center prospective study was used for the analyses. HOOS and EQ5D-5L scores were collected at baseline, 3 months, 6 months, and 12 months after surgery.

Mean changes between baseline and one year postop. were determined to assess responsiveness. Internal consistency was assessed using Cronbach's alpha. Pearson correlations were calculated for the assessment of construct validity. A ceiling or floor effect were considered present when more than 15% of patients scored the best or worst scores, respectively.

Results: 935 patients were included (413 m, 522 f; mean age 66.0 (SD 10.6); mean BMI 28.3 kg/m² (SD 5.5)). All HOOS-12 scales demonstrated high Cronbach's alpha values indicating internal consistency reliability and demonstrated inter-item correlation scores exceeding 0.30.

The correlation was very high between HOOS-12 Pain / HOOS Pain ($r=0.90$), HOOS-12 Function / HOOS ADL ($r=0.89$) and Sport/Recreation ($r=0.74$). Correlation was moderate between HOOS-12 Pain and EQ-5D Pain ($r=-0.58$) and HOOS-12 Function and EQ-5D ADL ($r=-0.59$). All HOOS-12 scales were responsive to change after THA (effect sizes 1.8 to 3.0). Ceiling effects were negligible at baseline but notable post THA (Pain 52.8%; Function 40.3%; QoL 23.2%; summary 15.9%).

Conclusion: The HOOS-12 showed good convergent construct validity and is responsive to changes in pain, function, QoL and hip impact between preoperatively and 1 year postoperatively. A substantial ceiling effect limits the ability to capture variance across particularly well-performing patients.

Keywords:

HOOS; HOOS-12, THA, PROMs

EHS23-2106

Oral

Outcomes / proms in Hip surgery

Selective THA-approach use amongst junior surgeons improves safety of introducing the anterior approach - A Prospective, multi-surgeon, comparative, study

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Objectives: This study compared outcome of the first THAs of junior, fellowship-trained, surgeons who perform THA through both anterior and posterior (PA) approaches, and of THAs performed over the same period by senior surgeons who perform THA through either AA or PA, to determine whether: Fellowship training and selective practice allows for safe introduction of AA into practice; and whether selective approach-use influences outcome.

Methods: This is a prospective, consecutive study of 1200 primary THAs (1134 patients), operated between 2018-2020 by four surgeons in two academic, centres. The first 800 THAs of two junior, dual-approach, surgeons (AA/PA: 400/400) were compared with 400 THAs (AA/PA: 200/200) cases of two senior, single-approach, surgeons. Most patients were females (54%), mean age was 65±12years-old and mean BMI was 29±6. Complication- reoperation-, and revision rates, and patient-reported outcome (pre- and post-op) using Oxford-Hip-Score (OHS) were analyzed.

Results: At 3.1 years (range: 2.0-6.8) follow-up, there were 43 complications (3.6%), including 27 re-operations (2.3%); with no difference between junior and senior surgeons for AA-THA (Junior: 8/455 vs. Senior: 3/200; p=0.355) or PA-THA (Junior: 11/345 vs. Senior: 5/200; p=0.400). Amongst juniors, there was no difference in complications (AA:8/455 vs. PA:11/345; p=0.140) and in change in OHS (AA:20.5±7.7 vs. PA:20.5±8.0; p=0.581) between approaches.

Conclusion: Contemporary training and selective approach-use minimizes the learning curve, allowing junior staff to have equivalent outcome to established, senior surgeons in both AA and PA. We would advocate for selective approach use amongst junior arthroplasty surgeons when introducing the AA into practice.

Keywords:

Total hip arthroplasty, Outcome, Complications, Anterior approach, Posterior approach, Learning curve

EHS23-2052
Acetabular revisions

Poster

Cementation of a Dual Mobility Cup in a well fixed metal acetabular component. The "cup-in-cup" or the double socket technique.

List of authors:

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Objectives: The objective of this study was to evaluate retrospectively the clinical-radiographic outcomes and complications of the cup-in-cup technique performed with a cemented dual mobility cup into a cementless well-fixed shell, in revision THA.

Methods: The "cup-in-cup" or the double socket technique is a treatment method, which was initially described as the cementation of a polyethylene liner into a well-fixed shell. This method allows for revision of failed THA in situations where the cementless cup is well-fixed. From May 2014 to May 2020, 14 patients were treated with the cemented DMC "cup in cup" technique. Recurrent dislocation (64%), and polyethylene wear (36%) were the reasons for surgery. With mean follow up of 4 years. 5 were females and 9 males. The median age of the patients was 74 years. (64 to 90). All patients received a cement Dual Mobility Cup. We used preoperatively and postoperatively the Harris Hip Score (HHS).

Results: No dislocations. One revision was performed due to periprosthetic joint infection in 2 stage. No re revisions for loosening. 4 patients had died. The mean HHS score preoperative was 51 (29-63) and the postoperative 84 (79 -91).

Conclusion: We found that the "double-socket" technique with a dual mobility cup cemented in a well-fixed metal cup ensured a straightforward revision technique that was efficient to restore stability and provide a secure acetabular construct, minimizes potential morbidity due to bone loss, intraoperative bleeding or prolonged operative time, especially in elderly and frail patients.

Keywords:

Dual mobility cup, "Cup-in-cup", Double socket, Total hip arthroplasty, Revision THA

EHS23-2185

Poster

Miscellaneous topics

THE QUALITY OF REPORTING IN RANDOMIZED CONTROLLED TRIALS OF STRENGTHENING EXERCISES IN TOTAL HIP ARTHROPLASTY

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Objectives: Total hip arthroplasty (THA) leads to pain relief, functional improvement and significant improvement in quality of life in patients with end-stage joint disease. Rehabilitation is expected to prevent permanent deterioration and optimize functional recovery after TKA. Strengthening exercises (SE) are the most effective intervention for improving muscle strength and functionality and have been recommended in THA rehabilitation guidelines. Randomized controlled trials (RCTs) are the gold standard for evaluating the effects of health interventions and provide the highest quality clinical evidence for the selection of SE to use patients with THA.

Methods: We analyzed full-text reports of 17 RCTs using SE in patients undergoing TKA. RCTs are from PubMed and Cochrane Review. The PEDro scale and the 9-item CONSORT were used to assess the quality of the RCTs.

Results: The mean PEDro score was 5.59 ± 1.42 . There were no RCTs in which subjects were blinded and all therapists performing the therapy were blinded. After these items, the least completed item was blinding of all raters who measured at least one key outcome (4[23.52%]). CONSORT item never met in studies: where data was collected. All studies were designed as a single center. Following this, the most unreported item; statistical correction for multiple primary outcomes (4[23.52%]).

Conclusion: Our results show that the quality of reporting in the literature on RCTs with SE in patients with THA is insufficient. We think that better quality studies will emerge when the studies are planned and written in accordance with the CONSORT criteria and PEDro items.

Keywords:

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EHS23-2188

Poster

Acetabular revisions

Revision hip arthroplasty with 3d-printed custom porous titanium cup: from histological and morphometric study to clinical outcome

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Objectives: To study the osseointegrative properties of 3D titanium and tantalum porous implants with different surface structures in animal experiments and perform clinical trials in case of acetabular defects using 3D printed porous cups.

Methods: At the first stage the experiment was carried out on 62 male white rats, which had titanium implants with different surface structures inserted in the distal femur bone. The implants were made up of multiple layers of interlacing pores of 300 microns (series 1); rough (> 2 microns) (series 2), or made from tantalum with 300 microns pores and 80% porosity (series 3). The second stage involved a prospective analysis, which included 5 patients (all females) undergoing cup revision hip arthroplasty with a 3D-printed porous titanium custom implant. All patients had Paprosky type 3 acetabular defects. A 3D-custom cup was made from titanium powder Ti-6Al-4V

Results: There was a difference between the indices of the bone-implant volume on day 90 between the 1st and 2nd experiment series ([48.43±2.2] %, and [36.88 ± 2.56] %), and between the 2nd and 3rd series ([36.88 ± 2.53] % and [51.2 ± 3.06] %, respectively).

Harris Hip Score improved up 32 to 86 points in 1 year follow-up. According to radiographic outcomes, in all patients total ingrowth of spongy bone into 3D-printed porous titanium custom implant was achieved.

Conclusion: Titanium implants with multilayered interlaced pore layers of 300 microns and tantalum with 300 microns pore size and 80 % porosity may be promising. Custom 3D-printed titanium porous cups are a reliable surgery option for severe acetabular defects and allow for the reconstruction of the center of rotation, as well as inclination and anteversion.

Keywords:

: 3D porous Titanium, Bone-to-implant contact, 3D CT; custom 3D porous printed cup; Paprosky III acetabular defects; revision THA

EHS23-2069
Acetabular revisions

Oral

RADIOGRAPHIC EVALUATION OF 41 PAPROSKY 3A AND 3B PATIENTS UNDERGOING ACETABULAR REVISION WITH TRABECULAR METAL AUGMENTS

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Objectives: The purpose of this study was to evaluate the fixation of trabecular metal augments in patients undergoing revision total hip arthroplasty with large acetabular bone defects.

Methods: Radiographies of thirty-nine patients, totaling 41 hips, undergoing revision total hip arthroplasty using trabecular metal augments were evaluated from September 2010 to September 2020. This study included Paprosky 3A and 3B cases only. Preoperative and postoperative images were analyzed. Implant non-fixation was determined as the presence of a component angle variation greater than 10 degrees or a displacement greater than 6 mm. Patients with a follow-up time less than 24 months or those who did not attend the last two visits were excluded from the study.

Results: The mean follow-up time was 52.4 months (31-109). Fixation was achieved in all cases despite its high complexity. There was one dislocation case which required open reduction. Three patients progressed to infection and was surgically approached, with extensive debridement and intravenous antibiotics and treated with the implants withdrawal due the serious defect.

Conclusion: The implant trabecular metal augments showed excellent results in the short and medium term and may be another option in the reconstruction of large acetabular defects, sometimes replacing bone reconstruction using bone bank or autologous graft.

Keywords:

Arthroplasty. Hip replacement. . Acetabular defects

EHS23-2243

Oral

Acetabular revisions

Early results of a new cementless acetabular ultra-porous titanium shell with a modular polyaxial iliac screw in revision arthroplasty

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Objectives: Acetabular stemmed cups can be used in complex cases of bone loss. Since their conception, in 1968 with Ring and later in 1993 with McMinn, new models have been developed. The Medacta Iliac Screw Cup was designed to improve for long-term metal-bone biologic fixation and implant positioning thanks to modularity. This study aims to evaluate the clinical and radiographic outcomes of patients undergoing Iliac Screw Cup Medacta implantation in two Italian centers.

Methods: Prospective study including patients undergoing acetabular revision in two centers since May 2021. Preoperative clinical and radiographic data, surgical intervention data, and patients' clinical and radiographic conditions were collected at follow-up. The following patient-reported outcome measures (PROMs) were assessed: preoperative Hip disability and Osteoarthritis Outcome Score Physical Function Shortform (HOOS PS) and follow-up HOOS PS and Forgotten Joint Score (FJS).

Results: A total of 14 patients were eligible for the study, with a mean age of 68.5 years, 64% female. Acetabular bone loss was Paprosky grade 3B in 8 cases and 3A in 6 cases. In 86% of cases, it was revision surgery, of these 75% for aseptic loosening. The average follow-up is currently one year. The mean preoperative HOOS PS score was 32.75, and at follow-up 80.08. The mean FJS score at follow-up was 76.13. Two cases of complications occurred: a dislocation (treated conservatively) and a periprosthetic infection (which required explantation). Excellent radiographic results were observed in all patients.

Conclusion: Preliminary results are encouraging, with excellent results at the one-year mean follow-up. However, it is necessary to expand the sample analyzed and the follow-up to confirm the data obtained.

Keywords:

acetabular revision, 3d printing, additive manufacturing

EHS23-2161
Acetabular revisions

Oral

Clinical and radiological outcomes in our 6 years experience using custom-made implants in severe acetabular defects

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Objectives: There are several treatment options for managing severe acetabular defects in hip revision surgery (rTHA). In some rare cases the components available on the market, despite a wide range of modularity, are not sufficient to guarantee adequate results. This study aims to evaluate short- and medium-term outcomes of custom-made acetabular implants (CMAIs) to manage these bone defects.

Methods: 14 patients with severe acetabular defects (Paprosky III), who underwent rTHA with CMAIs in our hospital, were included in the study (2016-2022). The demographic, socioeconomic, clinical, and radiological (COR restoration, leg length discrepancy, signs of mobilization) data were collected retrospectively.

Results: mean follow-up was 50 months (12-82 months). The only major complication was early post-operative dislocation, which occurred in 3 cases (23.1% - 1 case required femoral head revision). No CMAIs were explanted or revised. All clinical scores showed a mean significant improvement: HHS +33,7pt, EQ-5D +0,40pt, and OHS +15,6pt. Radiographic evaluation revealed good, despite partial, recovery of COR and leg length discrepancy; there were no signs of aseptic loosening at the last follow-up.

Conclusion: the CMAIs in revision surgery represent a viable option, as evidenced by the data from this study and current literature. Further studies, with larger case series and longer follow-up, are needed to quantify the clinical validity and the cost-effectiveness, as well as to define the anatomopathological and biomechanical preoperative parameters that suggest resorting to this solution. Establishing clear indications for CMAIs is an essential prerogative for comparison with other standard implants.

Keywords:

Acetabular Revision, Acetabular bone defects, 3D Printing, Custom Made Acetabular Cup

EHS23-2147

Acetabular revisions

Oral

Can control leg-length discrepancy in revision hip arthroplasty with dual mobility bearing? A Retrospective case series

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Objectives: Dual mobility acetabulum cup in Total hip arthroplasty is considered an alternative option adopted to manage stability and prevent recurrent dislocation, mostly in high-risk populations. Despite the frequency of dislocation being studied, the leg-length discrepancy is another complication that can result in negative consequences after surgery. However, the study in this topic have been scarce. Therefore, we conducted a retrospective case series to evaluate the leg-length discrepancy in revision hip arthroplasty using dual mobility cup in patients.

Methods: A retrospective review was conducted on data from 66 patients who underwent revision total hip replacement at a single department between 2018 and 2022. The posterior approach was used for surgery, and radiographic measurements were taken to assess leg length discrepancies. The Trident HA and Dual Mobility System cups, as well as the Accolade II TMZF and Restoration modular revision stem, were used as implants.

Results: The results showed that the mean post-operative difference of LLD was 3.1 mm (-31.2 mm to 50.2 mm), with a mean pre-operative and post-operative difference of LLD of 2.7 mm (-23 mm to 34 mm). thirty-three of sixty-six patients had an LLD of less than 5 mm with 54% of patients in the modular revision stem group and 44% in the Wedged taper stem group having within 5 mm LLD. The incidence of LLD was lower in the modular revision stem group. There were complications in three cases. The mean follow-up time was 19.4 months

Conclusion: Dual mobility acetabulum cup in combination with a modular stem offers favorable outcomes for LLD among patients undergoing revision total hip arthroplasty, in addition to its advantage in preventing dislocation in high-risk dislocation groups

Keywords:

Leg-length discrepancy, Revision hip arthroplasty , Dual mobility

EHS23-2027
Acetabular revisions

Poster

The Role of 3D Printing in Massive bone loss in Acetabular Revision. Two Cases Report

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Objectives: The main objective is to evaluate the role in the use of 3D printing technology, through a virtual simulation in pre-operative planning and your resolution, for 2 cases with a massive loss of bone in acetabular revision (Paprosky type 3A and 3B).

Methods: We present two cases of severe acetabular bone loss undergoing revision total hip arthroplasty with a fully digital design and 3D printed acetabular implant. Case 1, a 56-year-old female, history of breast and uterine cancer, presented with hip protrusion 1 year after a previously failed cement total hip arthroplasty performed for NOA. This case was found to have severely deficient acetabular bone stock, (Paprosky 3A). Case 2, a 63-year-old female, history of rheumatoid arthritis, presented 2 years after a previously failed revision total hip arthroplasty performed for loosening, with severely deficient acetabular bone stock, (Paprosky 3B). Both cases were reconstructed with a custom 3D printed acetabular implant, with multiples screws and cement a dual mobility joint into this new implant.

Results: Preoperative HHS was for case 1: 63, case 2:55 and postoperative was 85 and 78. No re revisions for aseptic loosening. No dislocations. No infections. The patients were discharged on the second months following the operation. There was good progression with full range of motion of the hip and no signs of loosening on X-ray at the 12 months' review.

Conclusion: We believe that 3D printing technology will assist orthopedic surgeons improving the clinical outcomes. 3D printing was found to be a valuable tool in orthopedic surgeries that involve complex hip revision. Ongoing follow up of these new implants needs to continue to ensure the longevity of outcomes to ensure cost-effectiveness.

Keywords:

3D Printed, Acetabular Revision, Hip Revision

EHS23-2014
Acetabular revisions

Oral

Management of acetabular defects in revision THA

List of authors:

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Objectives: With increasing number of THA annually and fact that first of them are performed 20-30 years ago and patients age increase in directly proportional increase number of loosened THA. Acetabular defects are often caused by aseptic or septic loosening of the cup.

Methods: We present 42 cases with mean follow up 5 years- 2014 to 2022. Gender distribution - 25 female and 17 male, age variety between 38 and 79, average 68. 31 of acetabular defects are caused by loosened primary cemented cup, 11- in septic loosening and 2 stage treatment of the infection. Most of the aseptic loosened implants are cemented. Management of acetabular defects are according to the Paprosky classification.

In type 2b, 2c and 3a are used acetabular reconstruction cage with impacted bone allografting and cemented dual mobility cup. In type 3b and type 4 with cup and cement protrusion into pelvis are used individual patient specific 3D implants with trabecular metal back and built in cup and ceramic liner for 36 ceramic head.

Results: Average Harris hip score (HHS) has been increased from 34 to 75.

In patients with acetabular cage and impacted bone allograft we had excellent results with full integration on the 6 month after surgery in all patients. Length leg was restored up to +/- 1cm.

In patients with individual 3D printed implants we had satisfied results with great bone integration between the implant and bone with some mismatch of the implant and overhanging. There are 2 infected patients included in this study.

In average 5 year follow up there are no aseptic loosened implants.

Conclusion: Managing acetabular defects can be challenging and require a lot of knowledge, experience and adequate preparation. With advancing technology patient specific 3D implants come into us with excellent results.

Keywords:

acetabular defects, THA revision, reconstruction cage, patient specific 3d implants

EHS23-2230
Acetabular revisions

Poster

Cementation of dual-mobility cups into stable shells in revision total hip arthroplasty

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Objectives: Cementation of dual-mobility (DM) cups into stable shells is gaining interest in revision total hip arthroplasty (THA) to decrease instability. The aim of this study was to evaluate the results with this technique

Methods: 32 patients (34 hips) underwent revision THA between 2012 and 2019 with a DM cup cemented into an existing well-fixed shell (n=17) or a newly implanted one (n=17), with a minimum follow-up of 2 years. Mean age was 73.9 years. Main indications were aseptic loosening (38.2%) and instability (32.4%). Mean follow-up was 3.6 years (range, 2-9). Clinical and radiographic outcomes, survivorship and complications were analyzed

Results: The mean Harris Hip Score at the latest follow-up was 82.2 and the mean Merlé D'Aubigné score was 14.2. 96.8% of cups showed a stable fixation. No dissociation at the cement-cup interface was observed. There was one recurrent hip dislocation (2.9%). 2 cups were revised (5.9%): one because of aseptic loosening and one due to periprosthetic infection

Conclusion: Cementation of DM cups into stable shells in complex revision THA has good clinical and radiographic outcomes, a reliable acetabular fixation and a low dislocation rate at short to medium-term follow-up

Keywords:

dual mobility, revision total hip arthroplasty, dislocation

EHS23-2012

False easy primary hips

Oral

The intertrochanteric line is a feasible, accurate, and reliable reference for femoral neck osteotomy in direct anterior THA

List of authors:

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Objectives: Blind femoral neck osteotomy may cause a catastrophe during direct anterior approach (DAA) hip replacement. For DAA, lesser trochanter (LT) is unvisualized before the osteotomy, whereas the intertrochanteric line (ITL) can be easily recognized. This study aims to investigate the ITL whether or not being an alternative bony landmark for femoral neck osteotomy during the DAA.

Methods: Three anatomical references, including ITL height (ITL-H), ITL angle (ITL-A), and femoral saddle height (SH) were measured from 3D-CT models of 50 normal hip patients (30 males and 20 females) to simulate a cutting height of 10 mm above LT. Twelve cadaveric hip specimens were then used to evaluate the accuracy of the proposed anatomical references.

Results: The mean ITL-H, ITL-A, and SH were 23 ± 4 mm, 17.4 ± 3.5 degrees and 26 ± 4 mm, respectively. The value of ITL-A is vary depending on gender ($p = 0.001$) and age ($p = 0.04$), whereas the SH and ITL-H were not different between genders ($p = 0.07$ and 0.83 , respectively). The ITL-H also did not correlate with age ($p = 0.06$). Femoral neck osteotomy performed at 23 mm above the inferior ITL could produce 80% and 100% success rate for the cutting height of 10-15 mm and >5 mm above LT, respectively in Asian hips.

Conclusion: ITL is an alternative bony landmark for femoral neck osteotomy in DAA. Cutting height of 23 mm above the inferior ITL is a safe and reproducible anatomical reference for femoral neck osteotomy during the DAA.

Keywords:

direct anterior approach, femoral neck osteotomy, total hip arthroplasty

EHS23-2173

Oral

False easy primary hips

Preoperative surgical planning in total hip arthroplasty: pitfalls and pearl for femoral offset measurements

List of authors:

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Objectives: Preoperative planning in THA is an essential task to obtain favorable outcome and long-term implant survival. X-ray based planning is still far more used, with inherited intrinsic limitation of the technique. Surgeons can't often dispose of proper Hip X-ray due to mistaken imaging acquisition or limited movement on osteoarthritic hip. The femur is often caught externally rotated, and the femoral neck appears to be shortened. Surgeons must be aware of this pitfall and they must overcome this bias. To restore the femoral offset (FO) on inaccurate x-ray, the virtual line which connect the intertrochanteric line to intertrochanter crest, called "double profile of the greater trochanter" (DPGT), could be the length to correct the underestimated FO

Methods: This a retrospective study took place in University Hospital of Florence. 676 consecutive X-ray were analyzed. 119 patients with mono- lateral coxarthrosis were enrolled. FO on Healthy hip was compared with pathological FO, the respective DPGT were added to the formers

Results: The results show that on osteoarthritic hip the FO is statistically shorter than FO on healthy hip, all along the distribution. It can be assumed that there is no difference between FO of healthy and pathological hip summed to the respective DPGT (-0.4958; 0.0025 mm, $p < 0.001$ I.C. 95%). At date, there is no quantitative measures to assess the degree of femoral external rotation on x-ray

Conclusion: Preliminary results shows that the addition of the DPGT to the FO is a reproducible method that showed consistency in our cohort.

Keywords:

Pre-operative planning; Femoral Offset; Total Hip Arthroplasty

EHS23-2164
Femoral revisions

Poster

Failure of the acetabular polyethylene liner and fracture of a short stem in a patient with proximal femoral deformity

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Case Study: Objectives:

Fracture of cementless femoral stems are rare with monoblock designs. We present a case of a failure of the acetabular polyethylene liner and afterwards a fracture of the femoral stem in a patient with femoral deformity.

Methods:

A 37-year-old woman with a history of bilateral Perthes disease presented to our institution with right hip pain. She was treated during childhood with a femoral osteotomy and she developed hip osteoarthritis with a severe flexion deformity in the proximal femur. In order to avoid a corrective osteotomy, a short stem design was chosen for a total hip arthroplasty (THA).

Results:

The short-term results were satisfactory, but 5 years after the THA, she suffered a rupture of the polyethylene liner, without previous evidence of wear or symptoms. The polyethylene was replaced with an identical one. Almost three years after this complication, the stem had a fracture in the base of the neck that involved the introducer hole. The femoral component had to be revised with an extended trochanteric osteotomy to extract the implant and correct the deformity, and a modular fluted tapered stem with cerclage wires was used.

Conclusions:

Short stems may be a good alternative for THA in femoral deformities. However, severe deformities could cause biomechanical changes that may be a source of impingement or abnormal stress of the implant. This situation could lead to failure of the liner and fracture of the stem.

Keywords:

short-stem, implant fracture, femoral revision

EHS23-2040
Femoral revisions

Poster

Femoral revision with primary cementless stems

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Objectives: The objective of this study was to evaluate retrospectively the clinical-radiographic outcomes and complications for patients with Paprosky I or II femoral bone loss undergoing revision THA with a primary cementless stem.

Methods: 16 Revision THA surgeries were performed (for primary infected THA), in two-stage, through a posterolateral approach, no extended trochanteric osteotomy or window bones was made at the time of revision THA, (at the moment to remove the prosthesis, in the first-stage neither), between January 2014 and January 2020. With mean follow up of 5 years. 4 were females and 12 males. The median age of the patients was 63 years. (54 to 78) Pre-operative radiographs were evaluated and femoral bone loss classified using the Paprosky classification system (I or II). All patients received a primary cementless stem and were assessed preoperatively and postoperatively using the Harris Hip Score (HHS).

Results: No re infections. No dislocations. No re revisions. All cases showed stable fixation of the femoral stem at last follow-up, without loosening. Preoperative Harris score was 57 (45-68 range) and postoperative was 88 (78-94 range).

Conclusion: The use of primary cementless stems in femoral revision has gained popularity, but no clear consensus about the correct indication is still present. The main limitation of our study is the small number of total patients included in the series, but we believe to use of modern primary cementless femoral stems is a viable option for revision hip arthroplasty in the setting of preserved proximal femoral bone. (Paprosky I or II), in selective patients

Keywords:

primary cementless stems, femoral revision, femoral bone loss

EHS23-2232
Femoral revisions

Oral

Tapered Modular Fluted Stem in Hip Revision Surgery: Mid-term Outcomes of a Single Stem and Technical Notes

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Objectives: Tapered fluted modular titanium (TFMT) stems recently gained success in femoral revision arthroplasty as they allow for optimal press-fit even in short diaphyseal segments and personalized adjustment of soft-tissue tension and stem version. Yet, mid/long-term results are scarce compared to primary implants. This study aims to evaluate medium-term outcomes of the Reclaim stem (Depuy, Warsaw, In, USA)

Methods: A retrospective study was conducted on a population of 25 people who underwent total hip revision with a single TFMT stem. The minimum follow-up was 5 years. Data collected include stem survival, patient survival with a Kaplan-Meier curve, patient outcomes analyzed as HHS, intraoperative complications, and subsidence

Results: All 23 out of 25 patients were available for follow-up at the end of the study period. Two patients had died for reasons unrelated to the revision surgery. Stem survival was 100%, and no stem fracture was registered. The patient survival rate at five years was 92%. The mean HHS score increased from 43.6 to 81.8 at the final follow-up. One intraoperative complication was reported. There was no stem subsidence greater than 2 mm.

Conclusion: The study shows satisfactory mid-term outcomes for the evaluated TFMT stem. The rate of complication was relatively low and stem survival was high. Furthermore, significant improvement in hip function could be observed, and no stem fracture was registered. Although longer follow-up studies are needed, the results further support the use of these stems in revision hip surgery.

Keywords:

stem revision, modular stem, fluted stem

EHS23-2235
Femoral revisions

Oral

Anterior Transfemoral approach for stem extraction in revision total hip surgery: surgical technique and mid-term follow up

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Objectives: Revision total hip replacement surgery can be challenging due to the difficulty of removing the existing stem while preserving bone stock and avoiding further complications. The anterior femoral window technique has been proposed as an alternative approach for stem extraction as it avoids violation of the abductor mechanism and allows preservation of mediolateral press-fit.

Methods: A retrospective analysis of 20 patients who underwent revision total hip replacement surgery with an anterior femoral window technique for femoral stem extraction was conducted. All patients had a minimum follow-up of five years. Data on surgical technique, operative time, blood loss, complications, and clinical outcomes were collected and analyzed.

Results: The mean operative time was 149.5 minutes, and the mean blood loss was 840 ml. There were no intraoperative complications related to the anterior femoral window technique. At the radiologic follow up there was one delay in consolidation due to a fracture of the window itself. The mean Harris Hip Score improved from 35.4 preoperatively to 86.1 at the final follow-up. Radiographic evaluation showed stable fixation of the revision femoral stem in all cases.

Conclusion: The anterior femoral window technique is a safe and effective approach for stem extraction in revision total hip replacement surgery. The technique can achieve a stable fixation of the revision femoral stem, improve clinical outcomes, and minimize the risk of complications. Further studies with larger sample sizes and longer follow-up periods are needed to confirm these findings and compare the anterior femoral window technique with other stem extraction methods.

Keywords:

stem revision, transfemoral approach, stem extraction

EHS23-2043
Femoral revisions

Poster

To use of Cortical Strut Allograft Support Femoral in Revision Total Hip Arthroplasty

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Objectives: The objectives of this retrospective study was to evaluate the clinical-radiological behavior, short-medium term survivorship, objectively with HHS and the complications in 21 revision THA with the use of cortical strut allograft support femoral during placement of a fluted modular femoral implant.

Methods: 21 Revision THA surgeries were performed through a posterolateral approach, 18 of them, needed an extended trochanteric osteotomy at the time of revision,(January 2014 to January 2021).Mean follow up of 5 years. 14 were females.The median age of the patients was 71 years. Preoperative rx, we used the Paprosky classification. All stems were cementless fluted taper modular designs.Fresh frozen femoral or tibial allografts were used as cortical strut allografts in all cases,the strut allograft was applied, on the weakened host femur or in the bone loss region, being the femur protected by the cortical strut allograft.The reflected muscle envelope would be laid over the strut allograft.

Results: No intraoperative fracture.No infections.We had a case with recurrent dislocation, it was necessary revision of the cup, to Dual Mobility, with good evolution. All the cortical strut allografts and trochanteric osteotomy have united. All cases showed stable fixation of the femoral stem at last follow-up Preoperative Harris score was 52(39-69 range)and postoperative was 83 (78-93 range).No loosening.

Conclusion: We believe that the use of a fluted modular femoral stem in a compromised femur with a supplementary cortical strut allograft is safe and provides satisfactory clinical and radiological outcomes.Cortical strut allografts effectively increase femoral diameter and cortical width, which are essential for restoring bone stock and ensuring component stability.

Keywords:

total hip arthroplasty, revision hip arthroplasty, modular femoral component, cortical strut allograft.

EHS23-2269
Femoral revisions

Poster

Cemented femoral stem fracture: a rare complication of hip arthroplasty

List of authors:

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Case Study: Mechanical failure of total hip arthroplasty (THA) components are rare occurrences in patients submitted to THA, with few reports found in the literature. The authors present a case of a cemented femoral stem fracture and highlight risk factors involved in the development of this complication.

A 64 year-old woman presents to the emergency department with severe left hip pain and inability to ambulate. She had been submitted to left total hip arthroplasty (THA) in 1996, which was revised surgically in 2013 due to aseptic loosening of the acetabular component. The patient's complaints had started two weeks before, with no history of recent left hip trauma. X-ray examination revealed a fractured femoral stem and the patient later underwent surgical revision of the femoral component. The femoral component was extracted via an extended trochanteric osteotomy (ETO) and a new stem was implanted.

Mechanical failure of total hip arthroplasty (THA) components are rare occurrences in patients submitted to THA, occurring in both cemented and uncemented stems. In his original series, Charnley estimated a 0.23% overall incidence. More recent studies point to an incidence between one and two percent. The most common cause underlying femoral stem fractures is loss of proximal bone support, causing cantilever of the implant that is fixed distally, and subsequent failure. This is usually the result of osteolysis around the implant due to stress shielding. Other risk factors that have been identified are high BMI, the use of small diameter stems and an ETO.

Femoral stem fractures are rare complications of THA and their management requires revision surgery, contributing to increased morbidity and mortality in hip arthroplasty.

Keywords:

cemented, femoral, stem, fracture, hip, revision, surgery

EHS23-2201
Hip arthroscopy

Oral

Complications associated to pivot-less vs standard technique in hip arthroscopy

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Objectives: To find out if the use of a perineal post is related to the development of postoperative complications.

Methods: Retrospective case-control study that included all patients that underwent a hip arthroscopy carried by a single senior surgeon in two centers, from January 2020 to August 2022. A post-less hip distraction system was used at one center (group A), and a traction system with a perineal post was used at the other (group B). Inclusion criteria consisted of patients with a FAI diagnosis that underwent a surgery requiring a minimum hip distraction time of 30 minutes and at least 6 months follow-up. The complications included pudendal nerve injury, genital or groin hematoma, skin necrosis, scrotal or vulvar tear, and sciatic nerve dysfunction. Traction time was also recorded, and it was treated as a potentially confounding variable. Patient reported satisfaction was measured with the VAS scale. Statistical analysis was performed using RStudio.

Results: 51 patients were included after applying exclusion criteria, 18 patients in group A and 33 patients in group B. Four patients (12%) in the perineal group experienced pudendal nerve injury versus 0 (0%) in the post-less group. Nineteen patients (57%) had complications in the perineal post group versus 2 (11%) in the post-less group ($p=.046$). Two patients in the perineal post group reported superficial skin tear and two patients reported skin necrosis. Traction time was associated with the presence of complications ($p=.02$). No correlation was seen between traction time and the use of pivot ($p=.35$). VAS for patient satisfaction had a median of 9 in both groups.

Conclusion: Post-less hip distractions system resulted in a decrease of postoperative complications related to the use of a perineal post.

Keywords:

Complications, hip arthroscopy, distraction, pivot

EHS23-2063
Hip arthroscopy

Oral

Cortical hypertrophy of cemented triple taper stems at a minimum follow-up of 10 years

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Objectives: The curved triple taper stem was designed for physiological load transfer and uniformity of hoop stress in the proximal medial region, reducing the incidence of cortical hypertrophy (CH) compared to the straight triple taper stem. The aim of this study is to investigate CH in cemented triple taper stems and to compare straight taper stem with curved taper stem.

Methods: Between May 2006 and December 2011, we retrospectively evaluated consecutive 621 patients (751 hips) who were performed primary total hip arthroplasty with triple taper stems at a minimum of 10 years. Straight group (C-stem, Johnson & Johnson, United States of America) included 377 hips, and curved group (SC Stem, Kyocera, Japan) included 374 hips. Sixty-one cases with malalignment over 3 degrees were excluded. Japanese Orthopaedic Association score (JOA score) were used for clinical assessment. In radiographic findings, incidence of stem loosening and CH were compared between straight and curved triple taper stems. Statistical analysis was used the Student's t test and the Chi-square test.

Results: In the mean JOA score at 10 years, there were no significant differences between with and without CH, in both groups. No stem loosening was observed in all cases. The incidence of CH was 20.6% (71/345) and 11.3% (39/345) in straight and curved groups, respectively ($P < 0.05$). CH was more common in zone 5 in both groups, with 17.8% and 8.4% in straight and curved groups, respectively ($P < 0.05$).

Conclusion: In the incidence of CH at 10 years, the advantage of the curved triple taper stem was demonstrated. According to previous reports, the incidence of CH in double taper stem was 9.5%, and zone 5 was the most common occurrence site. The incidence and site of CH need to be examined from multiple angles.

Keywords:

cortical hypertrophy, triple taper stem

EHS23-2017
Hip arthroscopy

Oral

Pericapsular Nerve Group Block reduces post-operative pain in hip arthroscopy for femoroacetabular impingement surgery: A prospective randomized controlled clinical trial

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Objectives: This study aimed to (1) investigate whether the use of a Pericapsular Nerve Group (PENG) block would reduce peri-operative pain after arthroscopic therapy for femoroacetabular impingement syndrome (FAIS) and (2) to examine the number of additional opioids and post-operative nausea and vomiting (PONV).

Methods: Between May 2022 and October 2022, patients (N = 68) undergoing arthroscopic surgery for FAIS were randomly allocated into two groups. The first group received an ultrasound-guided PENG preoperatively with 20 ml of 0.375% ropivacaine and standardized post-operative oral medication. The second group received a sham block preoperatively with 20 ml of 0.9% saline and standardized post-operative oral medication. Primary endpoints were pain scores (visual analogue score, 0 to 10) during the first 24 hours postoperatively. The incidence of post-operative nausea and vomiting as well as opioid usage (converted to morphine equivalent) within the first 24 hours were secondary outcomes.

Results: Randomization and permission were successfully obtained from 68 participants. From the fifteenth postoperative hour, the PENG group reported significantly less postoperative pain than the control group ($p = 0.032$). Opioid dosage and PONV did not differ significantly between groups ($p = 0.987$ and $p = 0.655$, respectively). Concomitant complications such as falls, hematomas, or weakened muscles did not occur in either group.

Conclusion: A PENG block reduces pain after arthroscopic treatment for FAIS. However, there was no proof that the PENG group consumed fewer opioids than the control group. Overall, PONV was found at a low and comparable rate. Therefore, in arthroscopic treatment for FAIS, a PENG block may complement a multimodal pain treatment strategy.

Keywords:

femoroacetabular impingement syndrome; hip arthroscopy; analgesia; regional anesthesia

EHS23-2325
Hip arthroscopy

Oral

High hip offset as a risk factor for femoroacetabular impingement? An MRI analysis of symptomatic FAI patients

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Objectives: Femoroacetabular impingement is characterized by an abnormal morphology of the femur and/or the acetabulum that promotes pathological contact in the extremes of range of motion of the hip.

The objectives of this study were to identify radiological risks factors predictive of symptomatic FAI.

Methods: We performed a review of 20 symptomatic patients submitted to FAI surgery in our institution. Preoperative MRI parameters, such as the alfa angle and acetabular version, and radiographic parameters, such as the COR offset, femoral neck shaft angle, Tonnis roof angle and Wiberg angle, were analyzed. These results were compared with the contralateral asymptomatic hip and with a sample of patients without hip symptoms that had MRI and x-ray performed for other causes (gynecologic, oncologic).

Results: The mean alfa angle was statistically superior in the symptomatic group (56,47° vs 36,78° in control group). Comparing symptomatic and asymptomatic groups, an alfa angle superior to 51,3° was predictive of symptoms. The COR offset was statistically inferior in the control group (35,28mm vs 45,46mm in the symptomatic group). The mean acetabular version, although not statistically significant, was inferior in the symptomatic group (14,94° in symptomatic; 18,58° in asymptomatic; 20,82° in control group).

The mean femoral neck shaft angle was higher in the control group (134° vs 132°) although it did not reach statistical significance.

Conclusion: Although higher values for the alfa angle are recognized as a risk factor for FAI, the influence of the COR offset is not described in the literature yet.

We hypothesize that a lower COR offset may represent a coxa vara variation that promotes early bony contact and symptomatic impingement.

Keywords:

hip offset; femoroacetabular impingement; MRI analysis; risk factor

EHS23-2174
Hip arthroscopy

Oral

Long term results of hip arthroscopy at over ten years of minimum follow-up

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Objectives: The goal of this study is to retrospectively assess the long-term clinical outcomes of hip arthroscopy (HA) patients with a minimum follow-up of 10 years through patient-reported outcomes (PROMs) and the minimal clinically significant difference (MCID).

Methods: Data on patients who had hip arthroscopy between March 2003 and December 2012 were retrospectively examined. Visual analog scale (VAS) modified Harris Hip Score (mHHS), Non-Arthritic Hip Score (NAHS), Hip Outcome Score (HOS), and Patient acceptable symptoms state were obtained pre and post-operatively. Different variables were also investigated and matched with PROMs results. They included patient-related variables such as sex, age, and body mass index (BMI) and procedure-related such as microfractures, labral sutures, and concomitance of femoroacetabular impingement (FAI) in combination with other hip pathologies. The MCID was set at an mHHS improvement of at least 12 points.

Results: Between 202 patients, 131 patients could be contacted and 80 were available for the final follow-up. The average follow-up was 11 years and 8 months. The overall survival rate was 80.2% with 26 patients (over 131) converted to THA. In the remaining patients, PROMs improvements were noted in 87,2% of the patients. PASS was reached in over 90% of the patients and MCID in 70,2% (P value < 0.05). There were no significant differences based on sex, age, BMI, microfractures, and presence of FAI in combination with pathologies.

Conclusion: Hip arthroscopy demonstrated very good long-term results with a high satisfaction rate. At more than 11 years in more than 70% of the patients, the overall hip function is still well improved, and pain is reduced.

Keywords:

Hip Arthroscopy, Long term follow up

EHS23-2198
Hip Instability

Oral

Mid-Term Outcomes of the Freedom Constrained Liner as a Preventive Measure for Recurrent Hip Dislocation

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Objectives: Dislocation is a primary cause of failure following primary and revision hip arthroplasty. Dislocation rates after primary total hip arthroplasty (THA) range from 2-7%, while revision THA sees an increase in frequency up to 25%. Recurrent dislocation remains one of the most challenging issues to address in hip revision surgery. This study aims to analyze the outcomes of the Freedom constrained liner in patients undergoing hip revision due to recurrent hip dislocation.

Methods: A single-center retrospective study was conducted, including all hip revisions for instability in which the Freedom liner was implanted between January 2017 and January 2022. Evaluated variables included demographics, number of previous surgeries, surgical approach, and indication. Patients were followed for a minimum of one year, with failure defined as the occurrence of a new dislocation episode.

Results: A total of 30 patients met the inclusion criteria. The median age was 73, with 36.6% of the participants being male. The median number of previous surgeries was 1. An anterolateral approach was utilized in 56.7% of the patients. After a median follow-up of 47 months, two patients (6.6%) experienced a new dislocation episode. Both patients underwent re-revision using a dual-mobility system; one patient did not present further dislocation episodes, while the other required one closed reduction.

Conclusion: The Freedom constrained system proves to be a reliable device for preventing recurrent dislocation in complex hip instability cases. Dual-mobility may serve as an alternative option in cases where the Freedom constrained system fails.

Keywords:

Instability, constrained liner

EHS23-2170
Hip Instability

Oral

Is the ligamentum teres providing stability to the hip joint? A study on the tensile properties in young patients undergoing hip preserving surgery

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Objectives: Lesions of the ligamentum teres (LT) are highly prevalent in young patients. The origin of the lesions are not known. While it is assumed to provide stabilization to the hip joint, solid data about biomechanical features are lacking.

Aims: to determine (1) ultimate load to failure, stiffness, tensile strength, and elastic modulus of fresh frozen LTs compared to other ligaments of the human body. (2) if demographic/anatomic/degenerative factors are associated with different biomechanical properties.

Methods: IRB approved study on intraoperatively harvested LTs of 41 patients undergoing surgical hip dislocation for joint preservation. Exclusion of patients with previous surgeries, post-traumatic, avascular necrosis, slipped capital femoral epiphysis and Perthes. The ligament was thoroughly transected at its origin and insertion area. Storage at -20° C. Specimens were mounted to a materials testing machine (Instron Electropuls 10,000, Norwood, MA, USA) via custom clamps.

Force-displacement/stress-strain curves were generated. Ultimate failure load, tensile strength were measured; stiffness (N/mm) and elastic modulus (MPa) were determined.

Results: (1) The mean ultimate load to failure of the LT was 126 N, compared to values from the literature of 351 N for the iliofemoral and 136 N for the ischiofemoral ligaments. (2) Younger age, female gender, and excessive femoral torsion associated with significantly higher load to failure rates ($p=0.01$; 0.04 ; 0.04 respectively)

Conclusion: The LT is significantly weaker compared to other stabilizing ligaments. The LT has rather a proprioceptive and nociceptive than a stabilizing function. Tensile properties of the LT depend on a variety of factors.

Keywords:

Ligamentum teres, acetabular fossa, fovea capitis, joint preserving surgery, surgical hip dislocation, tensile properties, load to failure

EHS23-2280
Hip Instability

Oral

The MAASH technique prevents primary total hip replacement dislocations and excessive leg length discrepancy. A ten-year analysis of 407 cases of primary THR.

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Objectives: Capsule ligaments of the hip are the most important restraint elements of hip motion, providing joint stability during its whole range of movement. The MAASH technique is an anterolateral approach for primary total hip replacement (THR) which preserves the iliofemoral and pubofemoral ligaments. This technique was published in 2013 reporting the first 100 THR performed through the MAASH technique. In this study we present our results from 2010 to 2019, a total of 407 cases.

Methods: This is a retrospective consecutive case study, focused on our results, regarding net leg length discrepancy (LLD), THR stability, THR implant positioning (cup abduction angle and anteversion), Length of Hospital stay (LOS) and surgical complications.

Results: Net LLD median value was 4.92 mm following a primary THR on average. No dislocations were reported during the ten-year period. Previous medical conditions and other risk factors did not affect THR stability.

Conclusion: Based on the data we recorded during a ten-year period, we believe that MT is a reliable and reproducible procedure for primary total hip replacement, which decreases LLD and is associated with a zero dislocation rate. Our results were not affected by the type of implant that was used.

Keywords:

Total hip replacement; Arthroplasty; Ligament preservation; Leg length discrepancy; Hip dislocation

EHS23-2330
Hip Instability

Poster

Total Hip Arthroplasty Using Dual- mobility Acetabular Cup

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Objectives: The aim of our prospective study is to assess the functional outcome and the incidence of complications in total hip arthroplasty using dual-mobility acetabular cup.

Methods: In the period January 2018- June 2021 in total 451 patients underwent primary total hip replacement surgery using a dual- mobility acetabular cup in our institute. Regarding sex 147(32.6%) of them are male and 304(67.4%) female with a mean age at time of operation 71.56 ± 65 SD years. Under 70 years of age are 133(29.5%) of the patients. The reason for surgery was fracture of the femoral neck in 219(48.56%) of the patients and hip arthritis in 232(51.44%) of them. For fixation methods in 104(23.1%) cementless, 291(64.5%) cemented and 56(12.4%) reverse- hybrid fixation was used. In this prospective study the minimum time of follow- up is 18 months with a mean follow- up of 26.4 months. In total 47(10.5%) patients were lost to the minimum follow- up period.

Results: In a short-term follow up period we received an excellent functional outcome with a mean Harris Hip Score of 88.3. We did not encounter any cases of dislocation (standard or intra- prosthetic). We had 2 cases of aseptic loosening. We encountered 2 cases of superficial infection and 3 deep infections with loosening of the components.

Conclusion: The dual-mobility acetabular cup is a reliable option regarding hip instability with a low risk of dislocation and loosening for a short- term follow up. It increases the range of motion of the hip, the functional outcome and eliminates post-operative restrictions. The improved design of the cup and quality of the polyethylene allow us to reconsider the indications for its usage in patients under 70 years of age, without comorbidity with muscular and neurological deficiency.

Keywords:

Total Hip Arthroplasty, Dual-mobility Cup, Dislocation rate

EHS23-2214

Oral

Infection around the hip

Is Fibrinogen a Reliable Biomarker in the Diagnosis of Peri-Prosthetic Joint Infection? A Systematic Review and Meta-Analysis

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Objectives: In recent years, several studies have identified closed correlations between the coagulation cascade and inflammatory mechanisms in infective diseases. Fibrinogen (PF) is emerging as promising biomarker for the diagnosis of peri-prosthetic joint infection (PJI). This study aims to investigate the diagnostic value of PF in diagnosing PJI and to explore potential causes influencing the diagnostic value of PF.

Methods: PubMed, Embase, and Cochrane Library were searched regarding the role of fibrinogen as a biomarker in the diagnosis of PJI. Studies in English were included in the meta-analysis if they determined the diagnostic value of fibrinogen for PJI detection after hip or knee arthroplasty, applying the recognized diagnostic criteria for PJI. A quality evaluation of the studies included was performed. The pooled sensitivity, specificity, likelihood ratios and diagnostic odds ratio (DOR) and the area under the receiver operating characteristic curve (AUROC) were obtained using the statistical software STATA, version 17 (StataCorp, College Station, TX).

Results: Ten studies (9 retrospective) were included in the study. Low publication bias was detected, but with high heterogeneity among them. Plasma fibrinogen showed a good diagnostic accuracy and clinical utility in PJI (sensitivity, 0.81 [95% confidence interval {CI}, 0.75-0.86]; specificity, 0.82 [95% CI, 0.76-0.86]; AUROC, 0.88 [95% CI, 0.85-0.91]; DOR, 19 [95% CI, 14-26]).

Conclusion: The attempt to find an "ideal" biomarker is crucial to improve the sensitivity and specificity of the current diagnostic algorithms for PJI. The analysis performed in the current study indicates that plasma fibrinogen test is a valid biomarker for PJI diagnosis.

Keywords:

peri-prosthetic joint infection; plasma fibrinogen; serum biomarker; systematic review

EHS23-2007
Infection around the hip

Poster

Management of periprosthetic Infection in the hip joint

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Objectives: Management of periprosthetic hip joint infection in patients with chronic osteomyelitis with onset more than 4 weeks according to Tsukayama classification provides a few challenges. In such patients the microorganisms are deeply intergraded, both on the surface of the endoprosthesis, in the form of biofilm, and inside the bone structure.

Methods: To overcome the infection our approach consists of removing the compromised endoprosthesis and bone cement, if its present, wide range bone and soft tissue debridement and irrigation: first with H₂O₂, diluted iodine solution and 9-12 liters NaCl 0,9% solution.

During the surgery we take 5-7 microbiological samples which determine the antibiotic treatment. The implanted static spacer is premade and impregnated with vancomycin and gentamycin or only gentamycin.

Results: We analyzed retrospectively data of patients who have undergone first stage revision surgery between 01/01/2017 and 01/01/2022.

In this period, we treated 47 patients with periprosthetic hip joint infection. 37 patients had clinical and radiological control on the first, third and sixth month after spacer implantation. 1 patient died 3 months after surgery and 5 patients was pleased with spacer and didnt show up for following up. 4 patients had reinfection(one of which came with infected spacer 5 years after implantation) which makes the success rate 91.4%. Our approach in chronic hip infection has few drawbacks - joint stiffness and pain caused by the spacer and slower return to normal life for the patient. However, its success rate makes it viable choice for chronic infection.

Conclusion: The treatment of total hip arthroplasty infection is long and difficult process yet for chronic infection treatment with antibiotic "Spacer" is a gold standard.

Keywords:

THA, chronic infection, revision, complication, two stage, spacer, antibiotic

EHS23-2061

Poster

Infection around the hip

Can serum C-reactive protein determine the timing of reimplantation in two-stage revised arthroplasty for periprosthetic hip infection?

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Objectives: There are no definitive guides to determine the timing of reimplantation in two-stage revision total hip arthroplasties (THA) for periprosthetic joint infection (PJI). This study was designed to support a rational strategy of surgical treatment using serum C-reactive protein (CRP).

Methods: We analyzed a total of 75 hips for PJI in the process of performing two-stage and multiple-stage revision THAs. CRP level was retrospectively evaluated every week and transformed to log₂ (CRP) using a logistic regression model. Prosthesis survival from recurrent infection was determined by Kaplan-Meier analysis, using implant removal as the endpoint. Receiver operating characteristic curves were calculated using each log₂ (CRP) to assess predictions of recurrent infection.

Results: The 10-year survival rates were 85% (95% confidence interval, 76-95) and 100% for two-stage and multiple-stage revision THAs, respectively. Preoperatively, at 1, 2, 3, and 5 weeks, log₂ (CRP) was not associated with recurrent infection. In failed two-stage revision THAs, log₂ (CRP) at 3 weeks divided by that at 2 weeks showed a significant difference. Failure was associated with a ratio of >4.0 for the CRP level between 3 and 2 weeks.

Conclusion: In two-stage revision THA for PJI, patients with CRP elevation from 2 weeks to 3 weeks, especially 4-fold elevation, suggests the need for further debridement and postponement of second-staged reimplantation.

Keywords:

Infection; Total hip arthroplasty; One-stage revision; Two-stage revision; Scoring system

EHS23-2273

Oral

Infection around the hip

Sensitivity, specificity, accuracy of culture and chemical-physical examination of synovial fluid in the diagnosis of periprosthetic hip and knee infections

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Objectives: Although shared criteria for diagnosis have been formulated, using multiple criteria, an inaccurate diagnosis is found in 15-20% of cases.

The aim of the study was to analyze the sensitivity, specificity and accuracy of the culture and chemical-physical examination of synovial fluid performed in the pre-operative period of a prosthetic revision in the diagnosis of periprosthetic infections of the hip and knee, comparing the results of the needle aspiration with the findings peri- and intraoperative.

Methods: We retrospectively analyzed 334 consecutive samples of synovial fluid performed for the diagnosis of periprosthetic infection in the pre-operative phase of a revision prosthesis: 58 cases were excluded due to unsuitability for analysis or punctio sicca. 101 suspected hip prosthesis infections and 175 prosthetic knee infections were included. Patients were defined as infected and noninfected based on the Philadelphia criteria.

Sensitivity, specificity, and reliability of synovial fluid culture, white blood cell percentage, and CRP were evaluated.

Results: Culture in patients suspected of having PJI on hip replacement has a sensitivity of 35%, specificity of 97%, and reliability of 65%. In suspected knee PJI instead the culture test has a sensitivity of 37%, a specificity of 98% and a reliability of 82%. The ROC curve of the PCR, on the other hand, has an AUC of 0.7 and a Youden index between 0.4 mg/dL and 0.8 mg/dL. The ROC curve of WBC percentage has an AUC of 0.6 and a Youden index between 20% and 40%.

Conclusion: In the diagnosis of periprosthetic infection, the association of multiple evaluations on the synovial fluid taken in the pre-operative period is useful for improving the modest sensitivity of the culture test.

Keywords:

PJI, hip replacement, synovial fluid, needle aspiration, philadelphia criteria, early diagnosis,

EHS23-2135
Infection around the hip

Oral

LONG-TERM FUNCTIONAL RESULTS AND SURVIVORSHIP AFTER 1 OR 2-STAGE REIMPLANTATION BECAUSE OF INFECTION

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Objectives: Survivorship and functional results after 10 years of reimplantation because of infection (one- and two-stage)

Methods: Retrospective analysis: 29 patients of 70+/-11 years (46-93) (14 female) reimplanted from 2002 to 2011, followed prospectively. Original infection appeared in 6 hemiarthroplasties, 6 revision cups, 4 revision stems and 13 primary total hips. One-stage protocol for 6 cases and two-stage for 23; impaction grafting for bone defect in 6 cups and 3 stems. Follow-up: 11.8+/-3.9 years (5-19), no lost-to-follow-up, shortest due to patient death of unrelated causes.

Results: 1 infection recurrence after 5 years, 1 cup-exchange (aseptic loosening of Slooff) after 9 years, 1 presented radiographic signs of Slooff loosening after 15 years. Survivorship after 19 years: 96.5% free of infection recurrence, 93% free of component revision, 89.5% free of radiographic signs of loosening. At the end of follow-up: 17/29 patients suffered no pain but 3/29 used minor opioids; 8/29 walked unlimited distances while 3/29 only indoors; 9 needed no aid but 3/29 used a walker; 10/29 climbed stairs normally but 5 were unable; only 16/29 were able to use public transport, and only 14/29 were able to perform usual tasks for their age.

Conclusion: After long-term follow-up of reimplantation because of infection, recurrence and mechanical loosening remain very low and survivorship is quite good. But subjective and functional results are fair to good, perhaps partially because of advanced age of some patients.

Keywords:

Prosthetic Joint Infection, Hip Arthroplasty, Exchange Surgery, Survivorship, Long-Term Results

EHS23-2005

Poster

Infection around the hip

Two stage revision surgery in chronic periprosthetic joint infection in the hip

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Objectives: Periprosthetic joint infection represents a serious complication following THA. Incidence is increasing over the years mainly with increasing number of arthroplasties performed, developing antibiotic resistance microorganisms and improving diagnostic infections. In the setting of chronic or age-indeterminate THA infection, a 2-staged approach has been traditionally the preferred method of treatment over single-stage.

Methods: Stage one involved irrigation and debridement of all nonviable tissue, radical synovectomy, and removal of all implants and cement and taking multiple(5-10) microbiology samples. All patients received an antibiotic spacer based on antibiogram. Mostly in our practice we isolate Gram positive microorganisms- staph. aureus. We use vancomycin and gentamycin spacer and additional antibiotic in cement 1g to every 10g cement. The second stage consisted of removal of the spacer and reimplantation with new components. The usual time between the two stages of treatment is 6 to 12 weeks.

Results: We analyzed retrospectively data of patients who have undergone two stage revision surgery between 01/01/2017 and 01/01/2022.

In this period, we treated 26 patients with two-stage revision surgery. All patients have clinical and radiological control on the first, third and sixth month after spacer implant. If the tests showed no presence of infection patients undergone the second stage of the treatment. On 16 of the patients antibiotic bone cement, according to the antibiogram, was used in second stage to fix the components. Two of them had reinfection which makes the success rate 92.2%.

Conclusion: The treatment of total hip arthroplasty infection is long and difficult process yet for chronic infection two stage revision is gold standard.

Keywords:

THA, chronic infection, revision, complication

EHS23-2021
Infection around the hip

Poster

FUNGAL SEPTIC ARTHRITIS OF THE HIP JOINT. A CASE REPORT

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Objectives: The objective and the key learning point from this case report is to consider rare etiological organisms other than bacterial as septic arthritis joint, as such should consider fungal infection and its effective treatment in two stage surgery.

Methods: Man, 40 year-old physical education teacher with known right hip osteoarthritis, he was hospitalized with pneumonia and rapid onset of increasing right hip pain, pyrexia. CRP 220 mg/ml. and VRS 120. HIV test was positive. Positive *Candida Albicans* cultures were obtained from the hip. We decided, performed two stage surgery. First stage, resection arthroplasty, cement hip spacer impregnated with gentamicin, vancomycin and amphotericin B, through an posterolateral approach, was placed it. IV amphotericin B 1,50 g, for 4 weeks, oral fluconazole 400 mg/day was escalated for 11 months more. After a new negative biopsies post oral treatment and normal blood markers, second stage procedure was performed 14 months following the first stage procedure with implantation of a cementless total hip replacement.

Results: The patient, HIV positive, was treated 2-stage exchange arthroplasty, is free from infection, with a follow-up of 5 years, no pain and complete mobility of the hip. He walks without crutches and no limp.

Conclusion: Fungal septic arthritis can be caused in immunosuppressed patients. More commonly, occurs secondary to colonization of patients at risk. Rapid joint destruction is a symptom to keep in mind. Although this is only one case, we can say that the treatment in 2-stage exchange arthroplasty, in fungal septic arthritis in the hip joint, was the correct, together the systemic antifungal therapy for 12 months. Currently functioning with pain-free range of motion of the right hip with no complications.

Keywords:

Fungal septic arthritis, 2-stage exchange arthroplasty, fluconazole

EHS23-2150

Infection around the hip

Poster

Successful implant retention in a chronified haematogenous bilateral periprosthetic hip joint infection with *Enterococcus faecalis* - a case report

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Case Study: Enterococci are usually considered as difficult to treat due to limited antibiotic activity against their biofilm formation and due to their antibiotic resistances. We present a case in which bilateral hematogenous hip PJI could be treated successfully with implant retention, despite chronification and partial loosening.

A 68-year-old male was transferred to our institution with recurrent bacteraemia of unknown origin with *E. faecalis*. Total hip arthroplasty (THA) had been performed bilaterally 2, respective 7 years previously. Aortic arch replacement with a biological aortic valve had been performed 3 years before. Echocardiography showed no evidence of endocarditis. After the third episode of bacteremia, the hip joints were aspirated.

E. faecalis was detected in the two samples. Due to the synchronous infection and recurrence of bacteraemia, a hematogenous seeding, originating from the aortic replacement, had to be considered. Debridement and replacement of the modular components was carried out, including exchange of the loosened cup on the right side. Antibiotic treatment was enhanced by local application of vancomycin. Antibiotic therapy was continued for 3 months followed by suppression therapy for 9 months. Follow-up up to 3 years was unremarkable.

In the present case, treatment of chronic enterococcal PJI preserving the implants was successful, despite unfavorable odds. Considering duration of infection, the causative microorganism and loosening of one of the implants, staged exchange of both hip replacements would have been the standard of care. This case illustrates that some established concepts have to be challenged from time to time. Implant fixation is more important than time since onset of infection.

Keywords:

Periprosthetic joint infection, PJI, implant-retention, DAIR, local antibiotics, calcium sulphate, CaSO₄

EHS23-2094
Joint preservation

Poster

Long-term outcome 35 years after rotational acetabular osteotomy

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Objectives: Rotational acetabular osteotomy (RAO), a periacetabular osteotomy technique developed in Japan, has proven useful as a joint-sparing procedure in patients with acetabular dysplasia. This study investigated the 35-year survival rate after RAO, with THA as the endpoint.

Methods: 172 hips with RAO, performed in 170 cases from 1986 to 1991, were included in the study. Of these, 52 hips in 52 cases were classified as Tönnis grade 0, 60 hips in 59 cases as grade 1, and 60 hips in 59 cases as grade 2. The mean age at surgery was 25 years for grade 0, 31 years for grade 1, and 34 years for grade 2. The mean follow-up period was 21 years (max. 36 years) for grade 0, 23 years (max. 35 years) for grade 1, and 20 years (max. 35 years) for grade 2. The joint preservation rate was calculated using the Kaplan-Meier method.

Results: 54 of the 172 hips were converted to THA, including 7 (13%) classified as grade 0, 15 (25%) as grade 1, and 32 (53%) as grade 2 at the time of RAO. Joint preservation rates and 95% confidence intervals for grade 0, 1, and 2, respectively, were: 80% (61-91), 86% (71-94), and 57% (42-70) at 30 years; and 40% (15-82), 51% (30-69), and 26% (13-40) at 35 years. Comparing the patients who required THA with those who achieved joint preservation, the odds ratio was 2.030 ($p=0.048$) for a preoperative Lateral Center-Edge angle of <5 degrees compared to ≥ 5 degrees. The odds ratio for age was 3.070 ($p=0.00297$) for patients ≥ 39 years compared to those <39 years. For postoperative Acetabular Roof Obliquity, the odds ratio of ≥ 5 degrees was 3.18 ($p=0.000865$) compared to <5 degrees.

Conclusion: Thirty years after RAO, favorable joint preservation had been maintained in 80% (61-91) of patients at grade 0 pre-surgery and in 74% (57-85) at grade 1.

Keywords:

osteotomy, hip, joint preservation

EHS23-2143

Poster

Joint preservation

Comparison of postoperative 5-week bone union between Rotational Acetabular Osteotomy (RAO) and Spherical Periacetabular Osteotomy (SPO). - Does a different approach allow for a different bone union in the early phase after acetabular osteotomy? -

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Objectives: Spherical Periacetabular Osteotomy (SPO) is a new procedure of acetabular osteotomy that employs a similar cutting plane to Rotational Acetabular Osteotomy (RAO). The major difference of these two procedures is that SPO is performed through the anterior approach while RAO through the lateral approach, which may damage the blood supply to the acetabular bone. Early bony union was compared between the two procedures in this study.

Methods: Twelve patients (12 hips) of post-RAO and fifteen patients of post-SPO (15 hips) who consented to take a computed tomography (CT) image about 5 weeks after the surgery, were enrolled in this study. All patients in both groups were female. Bone union was defined as the findings in which cancellous bone continuity between the fragment bone and the host bone was recognized partially in any CT slice. Statistic analysis was performed with the paired T-test or x2 test.

Results: The mean age at surgery was significantly higher in the SPO group (30.8 vs. 38.2 years old; $p = 0.04$). The mean duration for taking CT from the surgery was not significantly different between the RAO and SPO groups (34.5 vs. 36.3 days; $p = 0.172$). There was no significant difference in the amount of change in lateral center-edge angle and acetabular roof obliquity between the two groups before or after surgery. Bone union was observed in 7 of 12 cases (58.3%) in the RAO group and 14 of 15 cases (93.3%) in the SPO group, with the SPO group having a significantly higher bone union ($p = 0.03$).

Conclusion: SPO is a procedure without detaching the gluteal muscles and might contribute to preservation of blood flow and early bone union. Different approaches in acetabular osteotomy may result in the different early postoperative bone union.

Keywords:

Hip preserving surgery, Periacetabular osteotomy, Hip arthritis, Developmental dysplasia of the hip joint

EHS23-2335
Joint preservation

Oral

Optimierung der Kopfüberdachung durch 3fach Beckenosteotomie bei DDH und Retroversion

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Objectives: Hip dysplasia and focal acetabular disorders, such as retroversion, are a prearthrotic deformity, followed by disturbed femoral head coverage. Which improvements can be expected from a triple pelvic osteotomy (3PO)?

Methods: From 2010 to 2018 we routinely indicated correlative 3PO, when patients were symptomatic because of DDH or focal acetabular disturbance due to retroversion. If there was also femoral retrotorsion, this was corrected at the same time by means of derotation osteotomy. Patients above 11 years were included in this study. Radiographic angles as LCE, AI and acetabular index of depth to width (ADW) were measured before and after surgery. We assigned our patients to the "DDH" group or to the "Focal" group. The routine functional assessment included HSS score parameters. Statistics were calculated with SPSS.

Results: 18 patients were operated with the 3PO technique, 10 x DDH, 8 x Focal group. Average follow up was 40 and 41 months. Mean age: 21,7y and 30,3y. 60% in the DDH and 75% in the Focal group received additional corrective osteotomy of the femur. Average pre-surgery LCE angle, AI and ADW index for DDH were: -2.7°, 23,0° and 17.8. For Focal-group patients: 18.3°, 13.0° and 27.8. Post surgery DDH: 29.6°, 4.2°, 24,0. IN the Focal group: 36.1°, 1.7°, 30.9. All changes were highly significant (p< 0.01). HSS-Scores increase in the DDH group from 41.7 to 88,0 and in the Focal group from 49.4 to 89.6 points at average.

Conclusion: In patients with DDH and Focal disturbances, 3PO technique in combination with additional femur correction offers a high potential to correct pathological angles and to improve depth of the acetabulum as well. HSS scores were a little worse than that of routine primary hip replacement surgery.

Keywords:

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EHS23-2118
Joint preservation

Oral

Comparison of wear and migration between an isoelastic monoblock cup and a modular metal-back cup using EBRA: Mid-term results of a matched-pair analysis

List of authors:

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Objectives: Long-term survival rates are one of the main requirements in total hip arthroplasty (THA). Subsequent aseptic loosening of the cup due particle-induced osteolysis and stress-shielding of the surrounding bone remains one of the main reasons for complications. In revision cases, a good bone stock is mandatory for sufficient anchorage of the cup. The design of the acetabular cup most likely to provide a good bone stock is still controversial.

Methods: This retrospective matched-pair study analysed 98 THA cases treated with two different cementless cups. In the vitamys group, the RM Pressfit vitamys cup was implanted. This is an isoelastic titanium coating cup with vitamin E-infused highly-crosslinked polyethylene (VEPE). In the Fitmore group, the Fitmore cup was implanted. This is a modular metal-back cup with a titanium shell and with two sharp-edged fins. The polyethylene is made of ultra-high molecular weight polyethylene (UHMWPE). Acetabular cup migration and polyethylene wear were measured using the "Einzel-Bild-Röntgen-Analyse" (EBRA) software

Results: Mean follow-up time was 73.2 months in the vitamys group and 60.5 months in the Fitmore group. HHS showed a major improvement in both groups without significant differences. In the vitamys group the mean cup migration was 1.67mm and the mean wear rate was 0.37mm. In the Fitmore group the mean cup migration was 1.24mm and the mean total wear rate was 0.35mm.

Conclusion: Our results could not support the hypothesis that vitamys cup can prevent acetabular stress shielding with reduced wear rates and cup migration compared to Fitmore cup. Long-term data will be useful to determine the effect of modularity, isoelasticity and vitamin E stabilisation on cup loosening and survival rates.

Keywords:

vitamys, fitmore, VEPE, vitamin E, HXLPE, UHMWPE, THA

EHS23-2341
Joint preservation

Oral

Effects of Iloprost Infusion following Core Decompression or Isolated Core Decompression for ARCO I and II Stage Patients.

List of authors:

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Objectives: Bone marrow edema (BME) is a self limited pathology. However it may progressive and lead to osteonecrosis. In this study, we aimed to compare clinical and functional results of BME and early stage FHAVN patients who were treated with iloprost infusion following core decompression or only core decompression.

Methods: Association Research Circulation Osseous (ARCO) classification was used and ARCO I and II were included. ARCO I patients divided Stage 1 Group 1 (iloprost infusion and core decompression) and stage 1 Group 2 (isolated core decompression). ARCO II patients were grouped in the same way. Iloprost infusion was performed five days. Functional outcomes were evaluated with VAS (Visual Analogue Scale) and HOS (Hip Outcome Score) scores at preoperative(preop), and postoperative(postop) 12th months.

Results: Anatomical localization and maximum extension of preop BME in transverse and sagittal sections were significantly decreased in all groups in the postop 3rd month MRI. There was a significant improvement in VAS and HOS scores in all groups compared to preop values. Collapse and progression to prosthesis in ARCO I group I was 5%, %12 in ARCO I group 2. In ARCO II patients, 16.5% and 22% respectively.

Conclusion: In addition to core decompression, iloprost infusion is more effective in pain control in the early postop period and functional results at 1 year. While iloprost infusion had lower progression and prosthesis rates in ARCO I group, similar rates of progression were detected in ARCO II patients.

Keywords:

iloprost, bone marrow edema, femoral head collapse, core decompression

EHS23-2083
Joint preservation

Oral

What is the value of a hip specific MRI in the management of patients with symptomatic hip dysplasia undergoing combined hip arthroscopy and peri-acetabular osteotomy? A multi-center trial.

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Objectives: The goal of this study was to (1) evaluate utility/value of MRI in patients undergoing hip arthroscopy at time of PAO, and (2) determine whether MRI findings of labral pathology can predict outcome.

Methods: A prospective randomized controlled trial was conducted at tertiary institutions, comparing patients with hip dysplasia treated with isolated PAO versus PAO with hip arthroscopy. This study was a subgroup analysis on 74 patients allocated to PAO and hip arthroscopy [mean age 26 years (range:16-44); 89.2% females]. Patients underwent radiographic and hip specific MRI assessment to detect labral/cartilage pathology. Clinical outcome was assessed using international Hip Outcome Tool-33 (iHOT-33).

Results: Fifty-five patients (74%) were pre-operatively diagnosed with labral tear on MRI. Among these, 41 underwent labral treatment (74%); whilst among those without a labral tear on MRI, 42% underwent labral treatment. MRI had high sensitivity (84%), but low specificity (56%) for diagnosing labral pathology. At 1.9 years follow-up (range:1.0-3.2), there was no difference in pre-operative [31.3 (range:2.8-67.8) vs. 37.3 (range:9.8-61.4); p=0.123] and post-operative iHOT-33 [77.7 (range:9.6-100.0) vs. 75.2 (range:25.2-97.5; p=0.676] between patients with and without labral pathology on MRI as well as those with or without labral treatment.

Conclusion: MRI had limited value in the management of patients with hip dysplasia. A high sensitivity, but low specificity, introduces the risk of over-treatment. MRI findings of labral pathology could not predict outcome of combined hip arthroscopy and PAO.

Keywords:

Hip dysplasia, Peri-acetabular osteotomy, Hip arthroscopy, Labral tear, Magnetic Resonance Imaging

EHS23-2318
Joint preservation

Poster

A learning curve analysis for periacetabular osteotomy

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Objectives: Periacetabular osteotomy (PAO) is a well-established surgical procedure for re-orientation of the acetabulum in the presence of pathomorphologies related to dysplasia. PAO bears the reputation of being a powerful, yet complex procedure with a corresponding learning curve. The aim of this study was to determine the necessary number of procedures needed to reach for a significant drop in the duration of the procedure to be noted.

Methods: The first 97 periacetabular osteotomies performed independently by a single senior surgeon were evaluated in terms of operative time, hospital stay, CRP increase and need for blood transfusion. The cumulative summation (CUSUM) analysis was used to determine the learning curve.

Results: The learning curve was found to be 26 cases. Mean surgical time for all cases was 92 ± 31.5 min. Mean duration for the first 26 PAOs was 123 ± 35 min. This dropped to a mean of 80 ± 21.1 min for the subsequent 71 cases. The length of stay and opioid intake did not significantly differ ($p=n.s$). Patients for whom the duration of surgery was less than 90 minutes were discharged 1 day earlier.

Conclusion: After a learning curve of 26 cases, surgical time for a PAO procedure dropped to <90 minutes. Short surgical duration showed benefits regarding earlier patient recovery. This highlights the need for high-volume centers to ensure efficiency and improved outcomes in terms of patient recovery.

Keywords:

Learning curve, PAO, safety, joint preservation

EHS23-2054
Joint preservation

Poster

Basic concept of Three zone planning - Pelvic osteotomy for adult DDH -

List of authors:

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Objectives: There are various methods of pelvic osteotomy. However, often the legs become very short after surgery, which is very difficult to predict. We will explain the basic concept of pelvic osteotomy using the newly devised Three zone (3Z) planning and verify the preventive effect of leg shortening by pre- and post-operative X-ray evaluation.

Methods: The anterior approach with resection of the ASIS reported by Hara et al. was used in 7 cases, and the bikini approach was used in 4 cases. Use OrthoMap 3D navigation (Stryker) for 3Z planning and surgery. It is divided into three zones, the superior zone (SZ), the joint zone (JZ), and the inferior zone (IZ), and the osteotomy line was planned cylindrical in the SZ, mid-anteroposterior to the posterior column while maintaining a quadrilateral plane (QLS) in the JZ, and spherical with a radius of QLS from the center of the femoral head in the IZ. From July 2019 to June 2022, 11 patients (9 females, 2 males) underwent pelvic osteotomy in our department. Radiographic evaluations were performed to measure CE, ARO, leg shortening and femoral head internalization preoperatively and postoperatively.

Results: Age 38.8 ± 13 years, BMI 23.8 ± 4 , intraoperative bleeding 804 ± 526 ml, operative time 247 ± 39 minutes, preoperative CE $10.6 \pm 8^\circ$, preoperative ARO 21.1 ± 10 , postoperative CE $30.4 \pm 6^\circ$, Postoperative ARO $0.5 \pm 6^\circ$, CE corrected angle $19.8 \pm 7^\circ$, ARO corrected angle $20.6 \pm 10^\circ$, leg shortening -0.9 ± 2 mm, medialization -4.4 ± 2 mm.

Conclusion: Pelvic osteotomy with 3Z corrects the CE angle and prevents short legs. This method quantifies the planning of pelvic osteotomy and provides a basic concept for planning osteotomy designs. You can adjust the osteotomy correction angle and leg length by changing the parameters.

Keywords:

Pelvic osteotomy, DDH, Joint preservation

EHS23-2149
Joint preservation

Poster

Arthroscopic labral repair combined with less invasive open-shelf acetabuloplasty for patients with developmental dysplasia of the hip

List of authors:

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Objectives: Hip arthroscopy has become widely used for labral tears. However, DDH may cause instability due to insufficient bony coverage of the femoral head, thus causing excessive stress on the repaired labrum and cartilage. We devised a combined hip arthroscopic labral repair and a less invasive open-shelf procedure using a small skin incision as an anterolateral portal in hip arthroscopy.

Methods: A skin incision measuring 7 cm was made for shelf acetabuloplasty. After traction on the leg, hip arthroscopy was performed with this skin incision as the ALP and MAP using minimum capsulotomy without interportal capsulotomy. Labral repairs were performed by placing two or three suture anchors. After releasing traction, shelf acetabuloplasty was performed using the modified Watson-Jones approach. A bone graft is impacted into the rim of the acetabulum just above the repaired labrum. Furthermore, bioabsorbable screws and plates were implanted to cover and stabilise the new shelf.

Results: In total, 13 hips with DDH underwent the procedure for labral tears. All patients were females, with a mean age of 30 years. The mean follow-up period was 33 months. The mean Harris hip score improved from 74.2 to 93.6 and Oxford Hip score improved from 32.4 to 19.3. According to the Tönnis classification, the grade of arthritis preoperatively was grade 0 for nine hips and grade I for three hips. No radiographic progression of OA was observed.

Conclusion: This novel procedure may improve the stability of the repaired labrum with a bony covering in a minimally invasive manner. Moreover, the shelf procedure can be performed under direct vision in a comparatively safe and precise manner. It is possible that this novel procedure could be an effective treatment for labral tears with DDH.

Keywords:

Hip arthroscopy, Developmental dysplasia of the hip, Shelf procedure

EHS23-2020
Joint preservation

Oral

Place of conservative surgery in the bone necrosis of sickle cell origin

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Objectives: To know if the conservative treatment of necrosis of sickle cell origin is effective or not compared to other osteonecrosis.

Methods: The series included 26 patients, 9 with sickle cell origin and 17 with idiopathic osteonecrosis. An average follow-up of 3 years prospectively during which we evaluated the differences in age and sex as well as the clinical and radiological evolution, it is considered as failure once the necrotic bone part evolves towards degradation and destruction. The prognosis is evaluated according to the survival curve produced by the SPSS version 20 software.

Results: The female sex is more frequent in the sickle cell group, for the other group the sex ratio is equal to 1. The average age is almost the same for the two groups. The failure rate in the sickle cell group is 2/9 (22.22%) and for the other group is 3/14 (21.42%).

For the survival curve, survival is better for the idiopathic group compared to the sickle cell group but without significant difference

Conclusion: Conservative treatment by decompression drilling retains its interest for osteonecrosis of the femoral head post sickle cell disease, particularly the early stages before collapse.

Sickle cell origin does not influence the prognosis of osteonecrosis as demonstrated in the majority of the literature.

Keywords:

Hip preservation , osteonecrosis , sickle cell disease

EHS23-2060
Joint preservation

Poster

Hip ultrasound guided injection with high density ialuronic acid: one year follow up

List of authors:

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* = presenting author

Objectives: The viscosupplementation treatment of the hip with ultrasound guided ialuronic acid injection is nowadays a recognized procedure among the conservative treatments for hip arthrosis. However, the effectiveness of this procedure is still debated for long time benefits. The aim of this study was to evaluate at one year the outcome of hip injections.

Methods: Starting from 2021 we prospectively evaluated , 85 patients with hip arthritis (Tonnis score 1 to 2) that received 2 ultrasound guided joint injection of high density ialuronic acid, collecting data (Harris Hip Score modified (mHHS), and Visual Analogic Scale (VAS) at the time of the first treatment and 1 year later.

Results: Of 85 patients, after 1 year with 6 lost at the follow up, 13 sustained or were listed for surgery; 6 out of 13 still were anyway satisfied with the treatment.

The data distribution has been evaluated with the Wilcoxon test to assess the score difference and the mHHS and VAS score were statistically significant (respectively from 60,17 to 62,1 and from 6,09 to 4,97) with a $p > 0,05$. No adverse events were encountered or registered.

Conclusion: The hip injection with ialuronic acid is a safe procedure, effective to alleviate pain and improve functionality in the early stages of hip arthritis. In selective atients while in waiting list for surgery, it can be consider in order to alleviate the painful hip.

Keywords:

hip, joint preservation, hip injections

EHS23-2068
New technologies

Poster

Clinico radiological results on 3D printed trabecular titanium cups in primary surgery

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Objectives: Aseptic cup loosening is one leading reason to acetabular failure in primary Total Hip Replacement (THR). 3D printed porous trabecular-titanium cup (TTC) with additive manufacturing, selective laser melting may provide good initial stability and secondary fixation by bone generation and remodelling due to highly interconnected porous structure and anatomical load transfer.

Assess early outcomes of a new 3D printing porous TTC cup in primary THR.

Methods: Prospectively included 62 primary THR between August/December 2020. All cases implanted with a TRASER Cup polar flattered 3D printed (PermedicaTM, Italy). Harris Hip Score (HHS) used pre and postop, 6 months and yearly. Patients satisfaction registered using Maudsley Rodes Scale Postop, 6 months and yearly. X-Rays evaluated to determine migration, loosening and gap filling. Complications and revisions were recorded.

Results: We included 47 male cases, median age 58.9 years SD 8.7 years. At a minimum of 2 years follow-up HHS improved from 43.1 to 94.2 ($p < 0.001$). Satisfaction score was good in 14% and excellent in 86% of cases.

Radiolucent lines appeared in zone 2 (flattered zone) in 15 cases (24%) and all but one disappeared by the 6th month. One cup developed progressive radiolucent lines with laboratory and punctum positive for infection. 2 years survivorship due to any cause of failure was 98.4%. When aseptic loosening of the acetabular component was used as failure endpoint, 2 years survivorship rate was 100%.

Conclusion: The studied implant shows acceptable early clinical and radiological results in primary THA with low rates of aseptic loosening. However, should be taken carefully due to the short follow-up and further studies on specific implants are needed to define long lasting survivorship.

Keywords:

3d printed, trabecular titanium, total hip replacement

EHS23-2228
New technologies

Oral

Two-Year Outcomes of a Novel Dual Mobility Construct in Total Hip Arthroplasty

List of authors:

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Objectives: Total hip arthroplasty (THA) is a common surgical procedure used to treat various hip pathologies. Dual mobility (DM) systems have been introduced in recent years as an alternative to conventional THA. This study aimed to evaluate clinical outcomes of a novel DM system introduced in 2020 at a single academic institution.

Methods: This was a retrospective descriptive study conducted from 2020-2022 at a single academic institution. 102 patients (71 primary, 31 revision) who underwent THA using the novel DM system with at least 2 years of follow up were included. Demographic information and perioperative outcomes were collected utilizing the electronic medical record (EMR). The indications for both primary and revision THA were recorded. Primary outcomes included revision rates, dislocation rates, and implant component survivorship. Patient Reported Outcome Measures (PROMs) were recorded. Implant survival was analyzed using the Kaplan-Meier method.

Results: The average survival of the overall cohort was 2.23 ± 0.45 years. The mean age at the time of surgery was 63.6 ± 10.9 years. Nine patients were revised (8.8%, 9/102), three for dislocation (2.9%, 3/102), three for aseptic loosening (2.9%, 3/102), three for infection (2.9%, 3/102), and one for mechanical instability (1%, 1/102). PROMs demonstrated clinically significant changes at all time points from preoperative scores. Kaplan-Meier analysis showed a two-year survivorship of 93.1% from all-cause revision and 96.1% from acetabular cup revision.

Conclusion: This study demonstrated favorable outcomes of a novel DM system for THA, with satisfactory implant survival, revision rates, and patient-reported outcome measures (PROMs) at a short term follow-up evaluation.

Keywords:

Total Hip Arthroplasty, Dual Mobility

EHS23-2199
New technologies

Oral

Length of Stay and Discharge Dispositions Following Robotic-arm Assisted Total Hip Arthroplasty Versus Conventional Technique and Predictors of Delayed Discharge

List of authors:

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* = presenting author

Case Study: Objective

In-hospital length of stay (LOS) and discharge dispositions in joint arthroplasty could act as surrogate measures for surgical success and provide major cost saving for healthcare providers. The aim of this study was to compare LOS, discharge dispositions, and predictors of longer hospitalization, in robotic-arm assisted Total Hip Arthroplasty (RO THA) and conventional THA (CO).

Methods

Patients of any age undergoing primary THA (RO THA=267, CO THA=1,465) between 2019 and 2023 were included. Patient demographics, LOS, need for Post Anaesthesia Care Unit admission (PACU), 30-days readmission, and discharge dispositions were collected. Univariate and multivariate logistic regression models were employed to identify factors and patient characteristics related to delayed discharge.

Results

The median LOS in the RO THA group was 54 hours (interquartile 34, 78) versus 60 (51, 100) in the CO THA group ($p < 0.001$). Discharge dispositions were comparable. PACU admission and 30-days readmission rate were lower in the RO THA group, however differences did not reach statistical significance. In the multivariate model, age, need for PACU admission, ASA score > 2 , female gender, general anaesthesia and utilisation of the conventional technique were significantly associated with LOS > 2 days.

Conclusion

Our study showed that robotic-arm assistance was associated with a shorter LOS after primary THA with no difference in the discharge dispositions. Our findings suggest that robotic-arm assistance bears the potential to reduce the economic impact on health care systems and partly tackle the upsurge of THA demand. However, this shall be proven by long-term cost effectiveness analyses and data from randomized controlled studies.

Keywords:

Length of Stay, Robotic THA, Outcomes

EHS23-2218
New technologies

Oral

Functional cup positioning in total hip arthroplasty using robotic-arm-assistance

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Objectives: The most important factor for achieving stability in total hip arthroplasty (THA) is accurate implant positioning tailored to individual patient phenotype. It is widely accepted that no universal target exists and variations in spinopelvic mobility mandate adjustments to the surgical plan, bringing to the fore the concept of functional component positioning. This study evaluates functional outcomes and patient-reported outcome measures (PROMs) utilising robotic-arm-assistance (RAA) to achieve functional implant positioning.

Methods: This prospective cohort study includes 150 patients undergoing primary uncemented THA. RAA was utilised to execute the patient-specific plan after attaining CT scan and sitting and standing lateral lumbar radiographs. Radiological parameters pertaining to implant positioning were recorded. The Oxford Hip Score (OHS), Hip Disability and Osteoarthritis Outcome Score (HOOS) and Forgotten Joint Score (FJS) were assessed pre-operatively and at one year.

Results: Mean inclination was 41.9 ± 3.7 , mean anteversion 21.3 ± 2.5 and mean combined version 33.4 ± 7.5 . After one year, median HOOS was 94.4 (Q1, Q3 80 to 98.8), median OHS 47 (Q1, Q3 42 to 48) and median FJS 93.7 (Q1, Q3 77.1 to 100). Improvement from baseline was statistically significant for all PROMs and ROM. No dislocations occurred during the follow up period.

Conclusion: Functional implant positioning utilising RAA yielded excellent PROMs and functional outcomes at one year post-operatively. Patient-specific component positioning was significantly affected by individual spinopelvic motion. Tailored implant positioning and RAA may offer a viable solution in reducing dislocation rates, however comparative studies with larger sample sizes are key for validation.

Keywords:

Robotic, total hip arthroplasty, functional cup positioning, dislocation, spinopelvic

EHS23-2189
New technologies

Oral

BETTER FUNCTIONAL OUTCOMES WITH SUPERPATH APPROACH AS COMPARED TO CONVENTIONAL APPROACHES AFTER BILATERAL HIP ARTHROPLASTY

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Objectives: To determine whether patients with bilateral total hip arthroplasties (THA) have different functional outcomes with Supercapsular percutaneously assisted total hip (SuperPath®) arthroplasty compared to posterior/direct lateral (conventional) approach.

Methods: Between 2018-22, 57 patients previously implanted using conventional approach underwent THA using SuperPath®. Retrospectively patients answered questions regarding their experience and functional recovery. Differences were analyzed by two-sample t-test. A sample size of 16 in SuperPath® group was required to identify a significant difference between the two approaches.

Results: At the time of SuperPath®, patients had a mean age of 67.6 ± 12.3 years and had been implanted with the conventional approach on their contralateral side for 8.1 ± 5.2 years. Crutch usage was significantly reduced from 68% of patients using them for an average of 31 days after conventional surgery to 35% of patients using them for 14 days after SuperPath® surgery ($p=0.004$). Patients returned to walking normally and driving by 23 days ($n=40$) after SuperPath®, which was significantly faster than conventional surgery taking 36 ($n=20$; $p=0.0002$) and 42 ($n=22$; $p=0.02$) days to walk and drive, respectively. About 80% patients were satisfied with SuperPath®, while only 3.5% preferred conventional surgery.

Conclusion: Patients with bilateral THAs prefer SuperPath® over conventional approaches, citing less trauma and faster recovery. Even with a significant increase in age ($p=0.005$), patients recovered almost 2 weeks faster after SuperPath® as compared to their conventional surgery. This study is the first to demonstrate early functional recovery with SuperPath® technique compared to conventional approaches in bilateral THA cases in the UK.

Keywords:

Total Hip Arthroplasty, Bilateral THAs, Primary Arthroplasty, Functional Recovery

EHS23-2077
New technologies

Oral

Measurement of contact forces during hip arthroscopy - A novel device

List of authors:

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Objectives: Transducers used in cadaveric works for contact pressure and force measurement are not suitable for arthroscopy.

Checking the post-cam resection contact force may help to detect residual deformity and inadequate hip biomechanics that can be corrected intraoperatively.

We developed a special cannula and used an available transducer (FlexiForce A201, Tekscan) to measure femoroacetabular contact force in hip arthroscopy.

Methods: The device was 3D printed using polylactic acid, as it has biocompatible properties and a low production cost. We performed a cadaver study to evaluate the proof-of-concept of the novel device.

The new cannula and the sensor are introduced in the hip peripheral compartment through the mid-anterior arthroscopic portal. Under arthroscopic control the sensor is advanced into the central compartment.

The cannula handle includes an electronic module to acquire the contact forces data and transmit it in real-time to a central processing unit.

The evaluation was performed with the hip in extension and flexion, in the intact state and after cam resection. A load cell localized in the knee monitors the applied force to warrant the same loading conditions.

Results: The initial version of the cannula had some moisture ingress after handling the device for a long period which was corrected with changes in the sliding mechanism of the sensor and in the printing parameters.

The device can measure the femoroacetabular contact pressure in different hip positions, in the intact hip and after arthroscopic cam resection.

Conclusion: This is the first device to measure femoroacetabular contact force in hip arthroscopy.

Intraoperative force measurements can be another tool to confirm adequate cam resection and optimize hip biomechanics restoration.

Keywords:

femoroacetabular contact force; hip arthroscopy;

EHS23-2078
New technologies

Oral

Simultaneous bilateral Total hip arthroplasty via novel Anterolateral 60 approach

List of authors:

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Objectives: We developed novel MIS approach (AL60) through anterolateral pathway without any special devices. The patient is fixed at 30 degrees on the dorsal side from lateral position.

Although it is difficult to keep the patient's pelvis fixed vertically in the lateral position. Tilting the pelvis back slightly improves the patient's pelvic fixation. Increased pelvic stability improves accuracy of cup placement. In addition, femoral maneuverability is better in the lateral position, any type of femoral stems can be used.

We adopted this approach for simultaneous bilateral THA.

This study is aimed to review the current evidence regarding the outcomes of simultaneous bilateral THA via AL60 approach.

Methods: From July 2015 -the end of July 2021, 100 patients who underwent bilateral THA using AL60 approach were retrospectively assessed. Operative time, intraoperative blood loss, presence or absence of allogeneic blood transfusion, start date of walking, date of acquisition of stable walking with one Tcane or walking without cane, and intraoperative postoperative complications were assessed.

Results: The average surgery time were 133 (87-256) minutes , 419 (30-1680) g blood loss, 1.16 days of walking start, 11.3 days of acquisition of walking ability with one Tcane or free hand walking. Allogeneic blood transfusions were not performed. Complications included intraoperative fractures in 3 cases, postoperative femoral nerve paralysis in 1 case, and iliopsoas impingement in 1 case. None of the patients with DVT or PE had postoperative clinical symptoms.

Conclusion: Surgical time, intraoperative blood loss, and hospitalization period have been shortened over time, and bilateral THA is becoming a safe procedure with this AL60 approach.

Keywords:

MIS　DAA　ALS OCM Simultaneous THA

EHS23-2209
New technologies

Oral

Comparison of limp length discrepancy after total hip replacement with conventional and robotic arm-assisted method

List of authors:

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Objectives: Robotic arm-assisted total hip replacement (THR) is important for accurate and reproducible component placement. However, the margin of error is high in robotic arm assisted THR applications in the preservation and restoration of limb length. In this study, our aim is to compare the existing leg length difference in patients who underwent robotic arm-supported total hip prosthesis before and after the surgery with the conventional methods in the same surgery.

Methods: Twenty patients who underwent unilateral robotic arm-assisted total hip replacement were included in the study. Reconstructed hip CT and pelvis AP radiographs were taken for preoperative planning. The leg length difference was measured by the surgeon using conventional methods from the AP pelvis radiograph and compared with the robotic measurement. The length difference detected by the robot after implantation during the operation was evaluated by the surgeon, and it was checked with measurements made with conventional methods and changed when necessary. The leg length difference was calculated from the postoperative AP pelvis radiograph.

Results: In 20 patients, the sum of the length difference measured on the preoperative robotic data and AP pelvis radiograph was 84 mm, with a mean of 4.2 mm. When the data of the robot is compared with the conventional method during the operation, the total length difference of the robot is 72 mm, with an average of 3.2 mm. The sum of the length difference measured by the surgeon in the postoperative AP pelvis radiograph is 6 mm, with an average of 0.3 mm.

Conclusion: It would be appropriate to compare the length difference evaluated by the robot before the operation with the measurement made with conventional methods on the AP pelvis graphy.

Keywords:

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EHS23-2259
New technologies

Oral

Percutaneous technique improves results of the lateral approach.

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Objectives: Total hip replacement (THR) is one of the most common orthopedic operations.

A popular technique in Europe is the classic lateral approach (AA). By using this, a large part of the gluteus medius muscle is released to obtain good access to the acetabulum. There are little or no dislocations reported, but limping during the first three months is a well known problem. Damage to the gluteus muscle can be limited using the lateral percutaneous assisted approach . In this technique, a second small incision (1 cm) at the anterior border of the femur is made. A canula is placed underneath the muscle and used to pass the reamers in the direction of the acetabulum. By this the results can be improved.

Methods: This study uses a prospective, randomized, parallel-group design with blinded assessment and unblinded treatment to compare the lateral Path approach with the classical anterolateral approach in THR surgery.

All patients will be required to complete the Oxford Hip Score, SF-36, 6mWT, Quadriceps and abductor force.

Functional measurements are recorded. In the TGUG test, the participant is asked to stand up and walk 3 m, turn around and walk back to the chair and to sit down. The score recorded is the time used to complete the test expressed in seconds.

Results: Benefits are multifactorial. Superior results are visible in all clinical tests.

Conclusion: The trend is visible and is encouraging to continue with the lateral path. The impact of change is not only on the level of clinical benefits. LOS, blood loss and impact on blood transfusion, is also important. Avoiding of a steep learning curve with massive impact on the surgeon, the theatre team and hospital.

Keywords:

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EHS23-2182
New technologies

Oral

Understanding the Impact of Fixation Technique on the Achieved Stem Version in Primary Total Hip Arthroplasty (THA)

List of authors:

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Objectives: It is difficult to predict the final version of uncemented stems (Prosthetic Femoral Version PFV) as these are press-fitted to the internal surface of the bone. We aimed to better understand the effect of the fixation type on the PFV.

Methods: This was a case series including a total of 96 consecutive patients (107 hips) who underwent uncemented (n=81 hips) and cemented (n=26 hips) primary THA using the posterior approach. In the uncemented THA group, a straight tapered femoral stem was used, in the cemented THA group a collarless double-tapered femoral stem was used. The surgeon aimed for a PFV of 20°.

Post-operative CT data was used to compare femoral orientation in the two groups by means of 3D image analysis. The outcome measures were, Native Femoral Version (NFV) angles, PFV angles, Clinical outcomes.

Results: NFV in the uncemented group was a mean of 14° (± 9°), in the cemented group was a mean of 13° (± 9°), the difference was not statistically significant (p=0.7).

PFV was a mean of 12° (± 9°) and 23° (± 8°) in the uncemented and cemented groups respectively (p<0.001).

In the uncemented THA group, 36% of the patients had a PFV of < 10°. This percentage dropped to 8% in the cemented THA group.

Satisfactory clinical outcome was recorded without intra-operative fracture and post-operative implant loosening.

Conclusion: The study highlights the need to develop surgical tools that can intra-operatively guide positioning of the stem in both uncemented and cemented techniques.

Keywords:

Primary total hip arthroplasty, Prosthetic femoral version, Uncemented hip surgery, Cemented hip surgery

EHS23-2276
New technologies

Oral

Lateral vs posterior-lateral approach in Robotic Arm-Assisted total hip arthroplasty

List of authors:

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Objectives: The main goal of this study was to compare patient outcomes following robotic-arm assisted THA (RTHA) using the direct lateral (DLA) and the postero-lateral approach (PLA) by analysing the clinical and radiographical data.

Methods: Every RTHA (203 consecutive patients) was performed with the Mako Stryker robotic system. Data about component positioning were retrieved using the MAKO system software.

All patients were assessed using Harris Hip Score (HHS) and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). A radiographic evaluation was done for every patient to assess the incidence of heterotopic ossification (HO).

Results: Accurate component position was achieved according to the pre-operative planning.

Patients in the PLA cohort had higher scores in the post-op WOMAC: $96,2 \pm 8,2$ and $93,6 \pm 10,3$ in the PLA and DLA respectively ($P > 0.05$). No difference was found in the HHS.

There were no cases of dislocation. We found a great incidence of HO in the DLA (59,3%) compared to the PLA (12,6%) but this doesn't seem to be related to a worse clinical outcome.

Conclusion: RTHA provides accurate and reproducible component positioning and a great clinical improvement is achievable with both approaches. Moreover, robotic-assistance allows to perform THA with low rate of complications regardless of the approach.

Keywords:

Direct lateral; Posterior-lateral; RTHA; WOMAC; HHS

EHS23-2278

Oral

Outcomes / proms in Hip surgery

COMPARISON OF BILATERAL TOTAL HIP REPLACEMENT IN SINGLE STAGE AND TWO STAGE RESULTS: EVALUATION IN SINGLE INSTITUTION

List of authors:

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Objectives: Purpose of the study evaluate the outcome of one-stage bilateral THA and in comparison to twostage THA in single admission.

Methods: Method Is divided in two groups (group-1 & group-2)

We compared our Institutional surgery done by Single surgeon Bilateral THR in Single Anesthesia and compared with staged Hip Replacement in same admission in a span of 4-6 days gap. All surgeries were performed in spinal anesthesia with posterior mini incision approach and non cemented HIP implant were used. Patients were divided in 2 groups with all the parameters.

Group 1 - 66 Patients

Group 2 - 104 Patients

Follow up Range - 6Months to 5Years

Results: Results: Is divided in two groups (group-1 & group-2)

We compared simultaneous Single staged Bilateral THR and Staged Bilateral THR in single admission over most of patients of Inflammatory arthritis & AVN and Inflammatory arthritis ,AVN and Osteoarthritis respectively. We concluded by assessing pain, blood loss, patient operating time, blood transfusion post operatively. Though the Hemoglobin level fall in Group-2 is not significant in comparison to Group-1 patients, but in Anesthesia point of view, post-operative Blood Transfusion was required before the 2nd Surgery in Group-2 patients. Group-1 patients were more comfortable, less hospital stay, low hospital cost and low complication rates.

Conclusion: Advantage of Single Staged Bilateral THR in single hospital stay and shorter rehabilitation time, decreased cost of surgery and less time consuming.

Keywords:

Total Hip Arthroplasty, Outcomes, Primary Total Hip Arthroplasty Cementless, Stability, Minimally Invasive Surgery

EHS23-2196

Oral

Outcomes / proms in Hip surgery

Is Total Hip Arthroplasty Fixation Associated With Osteoblasts Activity In Patients With Osteonecrosis Of The Femoral Head? A Prospective Case-Control Study

List of authors:

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* = presenting author

Objectives: We asked if THA fixation in patients with ONFH is worse than in those with OA

Methods: We carried out a prospective comparative case (OA)-control (ONFH) study of patients undergoing THA between 2017-2019. The minimum follow-up was 2 years. Inclusion criteria were patients with uncemented THA, younger than 70 years old, a Dorr femoral type C and idiopathic ONFH. We compared the clinical and radiological results related with implant positioning and fixation. Osteoblastic activity was determined by mineralization assay on primary cultures of osteoblasts isolated from bone samples collected from the intertrochanteric area

Results: Group 1 (ONFH) included 18 patients and group 2 (OA), 22. Average age was 55.9 years old in group 1 and 61.3 in group 2 ($p=0.08$). The mean clinical outcome score was 17.1 in group 1 and 16.5 in group 2 ($p=0.03$). There were 5 cases (28%) of femoral stem subsidence greater than 3mm within 6 first months in group 1 and 1 case (4.5%) in group 2 ($p=0.05$)

Conclusion: Although there were no significant differences related to clinical results, bone fixation was slower, and a greater subsidence was observed in patients with ONFH. Greater femoral stem subsidence was associated with a lower capacity for mineral nodule formation in cultured osteoblasts

Keywords:

Primary Hip Arthroplasty, Osteonecrosis Of Femoral Head, Osteoblasts Activity

EHS23-2157

Oral

Outcomes / proms in Hip surgery

RM Pressfit Vitamys: The 10-Year Follow-up

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Objectives: The RM Pressfit vitamys is a titanium particle coated monoblock cup made of vitamin E blended highly cross-linked polyethylene. We addressed the following questions: (1) What are the clinical and (2) radiographic outcomes ten years after implantation, and (3) what is the revision rate?

Methods: This prospective study has investigated 162 cases (hips) in which the vitamys cup was used. Mean age was 67.2 (standard deviation [SD] 9.5) years, and mean BMI was 27.3 (SD 4.7) kg/m². Anchoring screws were used in two cases. We evaluated preoperative and follow-up data at six weeks, one, five, and ten years. Complete follow-up consisted of Harris Hip Score (HHS), pain and satisfaction on a visual analogue scale (VAS), radiographic evaluation, complications, and revision rate.

Results: At the ten-year follow-up (mean 120.5 months, range 118 - 126 months), 99 cases were available. (1) Mean HHS after ten years was 94.8 (SD 9.9), rest pain 0.2 (SD 0.6), load pain 0.5 (SD 1.5) and satisfaction 9.5 (SD 1.1). Mean improvement compared to preoperative values was +33.7 (SD 16.8), -3.3 (SD 2.7), -6.0 (SD 2.4), and +5.7 (SD 2.6) respectively. (2) In the radiographic evaluation, no loose cups were detected, but acetabular lucent lines were observed in five cases and acetabular osteolysis in one case. (3) The cumulative revision rate was 2.0% (95%CI 0.0 - 4.2%). One cup was reorientated and fixed with screws three days after implantation. One cup was revised due to a psoas impingement.

Conclusion: The RM Pressfit vitamys cup continues to show promising long-term results with good clinical and radiographic outcomes and a low revision rate.

Keywords:

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EHS23-2139

Oral

Outcomes / proms in Hip surgery

Restoring Global Offset And Lower Limb Length In Total Hip Arthroplasty With A 3 Offset Option Double-Tapered Stem. A Monocentric Five-Years Follow-Up Experience

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Case Study: Background

A proper restoration of hip biomechanics is fundamental to achieve satisfactory outcomes after total hip arthroplasty (THA). A global hip offset (GO) postoperatively reduction of more than 5 mm was known to impair hip functionality after THA. This study aimed to verify the restoration of the GO radiographic parameter after primary THA by the use of a cementless femoral stem available in three different offset options without length changing.

Methods

From a consecutive series of 201 patients (201 hips) underwent primary cementless THA in our centre with a minimum 3-year follow up, 80 patients (80 hips) were available for complete radiographic evaluation for GO and limb length (LL) and clinical evaluation with Harris hip score (HHS). All patients received the same femoral stem with three different offset options (option A with - 5 mm offset, option B and option C with + 5 mm offset, constant for each sizes) without changing stem length.

Results

Mean GO significantly increased by + 3 mm ($P < 0.05$) and mean LL significantly decreased by + 5 mm ($P < 0.05$) after surgery, meaning that postoperatively the limb length of the operated side increased by + 5 mm. HHS significantly improved from 56.3 points preoperatively to 95.8 postoperatively ($P < 0.001$). Offset option A was used in 1 hip (1%), B in 59 hips (74%) and C in 20 hips (25%).

Conclusions

The femur is lateralized with a mean of + 5mm after surgery than, the native anatomy, whatever type of stem was used. Thus, the use of this 3-offset options femoral stem is effective in restoring the native biomechanical hip parameters as GO, even if 2 offset options were considered sufficient to restore GO.

Keywords:

Total Hip Arthroplasty, Offset, Global Offset, Leg Length, Hip Parameters

EHS23-2104

Oral

Outcomes / proms in Hip surgery

Outcomes of Revision Total Hip Arthroplasty in Nonagenarians: A Comparative Analysis of Complications and Survival Rates.

List of authors:

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Objectives: With an aging population, the likelihood of hip arthroplasty failure in patients over 90 increases. However, there is limited research on revision total hip arthroplasty (RTHA) in this age group. This study evaluated the complications and mortality rates of RTHA in nonagenarian patients and compared them to those in their 80s.

Methods: We identified 102 RTHA performed on 29 nonagenarians and 73 octogenarians at our institution between 2015 and 2020. Age, gender, body mass index (BMI), ASA score, and Charlson Comorbidity Index (CCI) were assessed after preoperative evaluation using an institution-specific clinical pathway. The mean follow-up was 28 months for each group ($p=0.73$). Functional outcome was determined using the Harris Hip Score (HHS). Adverse medical and orthopaedic events, as well as mortality were evaluated. A logistic regression model was used to predict complications.

Results: Both groups had similar postoperative HHS improvements ($p=0.57$), but nonagenarians had a higher incidence of in-hospital medical complications compared to octogenarians (27.6% vs. 9.6%, $p=0.73$). There were no significant differences between the two groups regarding repeat revisions ($p=0.3$), reoperations ($p=0.29$), or 1-year mortality ($p=0.45$). Logistic regression analysis identified ASA III score and severe CCI as significant predictors of in-hospital complications (OR 2.4, $p=0.045$ and OR 2.03, $p=0.041$, respectively).

Conclusion: Nonagenarians may benefit from RTHA without a significant increase in postoperative complications compared to patients under 90. Employing multimodal perioperative care protocols is paramount for developing best practices and guiding clinical decision-making in RTHA for extremely elderly patients.

Keywords:

Revision total hip arthroplasty; Nonagenarians; Complications; Survival rates

EHS23-2242

Oral

Outcomes / proms in Hip surgery

Modular dual mobility cup in primary hip arthroplasty: Mid-term Outcomes at a minimum 5-year follow-up

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Objectives: The dual mobility cup (DM) was conceived in Lyon in 1974 by Prof. Gilles Bousquet and André Rambertal. The main purpose is to reduce implant instability. Since then, the concept of dual mobility has undergone various changes, with the introduction of modular dual mobility. The study aimed to evaluate the clinical and radiographic results of patients undergoing dual mobility total hip replacement with a modular acetabular cup with a minimum follow-up of 5 years.

Methods: A retrospective study included patients who underwent modular dual mobility total hip replacement in a single center from 2015 to 2017. The patients were re-contacted and their quality of life was investigated using the pain NRS and two patient-reported outcome measures (PROMs): modified Harris Hip Score (mHHS) and Forgotten Joint Score (FJS). Data collected included implant survival, intraoperative complications, and osteolysis.

Results: A total of 112 patients were eligible for the study, of which 85 adhered to the protocol. The mean follow-up was 74 months. The mean age of the patients at the time of surgery was 71.38 years and 61% were female. Implant survival was found to be 97%. The complications recorded are an intraprosthetic dislocation after a traumatic event and a malseating of the metal insert of the double modular mobility which was revised early. The patients obtained excellent results at the mHHS and at the FJS, with an average pain of 0.2 NRS at the operated hip and general satisfaction in all cases examined.

Conclusion: Dual mobility hip prosthesis appears to be an excellent treatment option. However, careful monitoring is necessary to confirm the results obtained, to evaluate the appearance of any wear and the level of blood ions.

Keywords:

dual mobility, modular cup, MDM

EHS23-2123

Oral

Outcomes / proms in Hip surgery

Deviation of Pain Trajectories in Total Hip Replacements: An Analysis of Patient Reported Outcomes

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Objectives: The aim of this study was to identify the presence of distinct patient pain trajectories after total hip arthroplasty (THA), and to determine which patient characteristics are associated with a suboptimal trajectory.

Methods: This retrospective cohort study analysed all THA patients who completed PROMIS pain intensity questionnaires from 10/2015-05/2022. These were collected prior to surgery and over a two-year follow-up.

Iterative latent class growth analysis (LCGA) was conducted, with optimal model fit determined by BIC, LMR-LRT, class posterior probabilities and entropy values. Multinomial logistic regression was performed using the 3-step LCGA approach.

Results: The four-class model had the best fit for the 3266 eligible patients. Class sizes were 4.6% (C1), 2.0% (C2), 91.7% (C3), 1.7% (C4). C3 was the considered the standard trajectory and the reference in the regression model.

C1 and C2 exhibited high levels of baseline pain, with C1 showing the highest pain scores at the 24-month follow-up, whilst C2 demonstrated recovery comparable to the standard. African American patients had a 2.83x ($p < .001$) associated risk of allocation to the C1 group, and 1.11x ($p < .05$) for the C2 group. There was a 3.00x ($p < 0.001$) risk of allocation to the C1 group for smokers.

The C4 group showed a steady trajectory, with low pain levels at both baseline and 24-month measurements. Underweight patients ($BMI < 18.5$) had an 8.05x ($p < .001$) higher risk of following this trajectory.

Conclusion: This study successfully identified four distinct pain trajectories following THA. These findings can help inform preoperative counselling and personalized pain management strategies for THA patients, particularly for patients with identified risk factors for a suboptimal pain trajectory.

Keywords:

Latent Class Growth Analysis, LCGA, Growth Mixture Modelling, GMM, THA, LMR-LRT, BIC, Entropy, PROMIS intensity, THA pain trajectories, THA pain outcomes, outcomes, pain

EHS23-2323

Oral

Outcomes / proms in Hip surgery

Rates of complication and readmission within 90 days of 1299 THAs with ERAS procedures

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Objectives: The objective of this study was to analyze rates of complication and rehospitalization within 90 days after THA performed in ERAS procedures, as well as their average length of stay (LOS).

Methods: A retrospective monocentric observational study was conducted on prospective data collected preoperatively, intraoperatively and postoperatively (GRACE-Audit). Inclusion criteria were all patients who underwent primary THAs between October 2018 and November 2022. Exclusion criteria were all revision THA. Operative time (OT), complications, and readmissions within 90 days, and average LOS were collected.

Results: A total of 1299 THAs were included. Mean age was 65.4 years. 1235 patients (95.1%) (Group A) had an OT < 2h and 64 patients (4.9%) (Group B) had an OT > 2h. The overall complication rate for the whole THA group was 0.9% (11 patients). In group A, 5 complications (0.4%) were found compared to 6 postoperative complications (9.4%) in group B which was statistically significant ($p < 0.0001$). The readmission rate within 90 days of surgery for the hip Group was 1.0% (12 patients). There was no significant difference for readmission rate between group A with 1.0% (12 patients) and Group B with 0% ($p = 1$). The average LOS was 2.5 days.

Conclusion: Rates of complication and readmission within 90 days after THA are very low (< 1%). There were more complications for THA with OT > 2h. ERAS is a safe procedure with an average LOS < 3 days in a university hospital.

Keywords:

ERAS; complications; readmissions; primary THA

EHS23-2057

Poster

Outcomes / proms in Hip surgery

MEASUREMENT PROPERTIES OF PERFORMANCE-BASED MEASURES TO ASSESS PHYSICAL FUNCTION IN TOTAL HIP ARTHROPLASTY

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Objectives: Total hip replacement (THR) patients' pain, range of motion, physical function (PF), and functional status should be assessed comprehensively during the postoperative period. Therefore, patient's clinical conditions are monitored by patient-reported outcome measures (PROMs) and physical performance-based (PPB) tests. Recent studies of questionnaires that only provide data on the patient's perception of their PF have shown that actual functional recovery is overestimated by PROMs. PPB tests are one of the most popular, practical, and inexpensive of these objective assessment tools. PPB tests should be analyzed by demonstrating their reliability and validity because new test procedures should be reliable and valid to provide a precise evaluation. The aim of our study is to examine the measurement properties of PPB measures to evaluate PF in people with THR.

Methods: PubMed, Web of Science, Scopus were searched in March 2023. Clinical trials on the psychometric properties of PPB tests for measuring PF in people with THR were included.

Results: From 1737 articles, we found 26 PPB tests used to measure functional outcomes in THA. The most commonly used of these tests were 6MWT and TUG. It was seen that 7(26.0%) of the performance tests were valid, 9 (34.6%) of them were reliable and only 3(11.5%) of them had responsiveness.

Conclusion: According to the results of our study, studies examining the psychometric properties of PPB tests used in patients with THA are limited. We recommend using tests with adequate psychometric properties to assess measurement characteristics such as validity, responsiveness, and reliability in people with THA. Moreover, studies investigating the measurement properties of tests used to evaluate PF in patients with THA are needed.

Keywords:

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EHS23-2134

Oral

Outcomes / proms in Hip surgery

CERAMIC Vs Me-XLPE IN FURLONG-HAP ACTIVE: COMPLICATIONS AND LONG-TERM RESULTS

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Objectives: Survivorship, complications, clinical and radiographic results in 2 groups of uncemented Furlong, ceramic-ceramic (CeCe) vs metal-crosslink polyethylene (Me-XLPE) after 10-years.

Methods: Prospective, non-randomized comparison of 2 series of hydroxyapatite-coated Furlong Active implanted with identical protocol (1 surgeon, 1 hospital) from 2006 to 2014.

CeCe (Bilox Forte/Delta) in 35 cases of 54+/-11 years (25-69) (21 males), Me-XLPE in 65 of 69+/-9 years (42-81) (36 males); different age ($p < 0.00001$), not gender ($p = 0.7$). Head diameter: 28mm in 19, 32mm in 9, 36mm in 7 CeCe hips; 28mm in 63, 32mm in 1, 36mm in 1 Me-XLPE hips.

Follow-up: 10.5+/-3.1 years (1-15) in ceramic, 9.8+/-3.8 years (2-15) in Me-XLPE.

Results: Survivorship after 15 years: without surgery/closed reduction, 91% ceramic, 84% Me-XLPE; without component exchange, 94% ceramic, 94% Me-XLPE.

Ceramic joints: 2 infections, 1 dislocation, 1 Vancouver-C fracture. Me-XLPE: 2 infections ($p = 0.6$); 7 dislocations ($p = 0.3$); 4 Vancouver-B fractures ($p = 0.7$).

Harris Hip Score at final follow-up 93+/-14 (23-100) in ceramic and 94+/-9 (65-100) in XLPE joints ($p = 0.6$).

Wear: 0.06+/-0.4mm (0-1.5) (0.006mm/year) in ceramic, 0.16+/-0.5mm (0-2) (0.016mm/year) in Me-PE ($p = 0.30302$).

Osteolysis: 8 Charnley-De Lee zones (6 patients) (17%) of ceramic and 25 zones (15 patients) (23%) of XLPE cups ($p = 1$).

Conclusion: After 10 years, metal-XLPE and ceramic-ceramic joints in Furlong Active show no differences in complications, clinical score, wear, osteolysis, or survivorship without component exchange. But survivorship without surgery or closed reduction is different because of the high rate of dislocation in metal-poly joints.

Keywords:

Total Hip Arthroplasty, Ceramic-Ceramic, Cross-Link Polyethylene, Survivorship, Long-Term Results

EHS23-2065

Oral

Outcomes / proms in Hip surgery

The direct superior approach in total hip arthroplasty: a systematic review

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Objectives: Evolution of the surgical approach for total hip arthroplasty (THA) has led to the development of minimally invasive Direct Superior Approach (DSA). It is hypothesized that the DSA may result in reduced postoperative pain, less intraoperative blood loss, lower complications (e.g. dislocation) and shorter hospital stay compared to conventional approaches. The aim was to provide an overview of current evidence on clinical, functional and radiological outcomes in THA performed using the DSA.

Methods: A systematic review was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A comprehensive search of Medline, Embase, Web of Science, Cochrane Central Register of Controlled Trials (CENTRAL) and Google Scholar was performed to identify studies evaluating the clinical, functional and radiological outcomes of the DSA. All studies that assessed the outcomes of the DSA in primary THA were included.

Results: A total of 15 studies including 1,901 patients operated through the DSA were included. Qualitative synthesis demonstrated a low risk of postoperative complications, accurate implant positioning, short length of hospital stay and short learning curve. With regard to PROMs, slightly better functional scores were seen in the early postoperative period compared to the posterolateral approach. A considerable heterogeneity in blood loss and operative time was seen between the included studies.

Conclusion: The DSA in THA seems to be a safe approach offering potentially enhanced short term advantages in THA patients. More adequately powered, randomized prospective studies are needed to evaluate long-term outcomes.

Keywords:

DSA, Transpiriformis, Dislocation

EHS23-2137

Oral

Outcomes / proms in Hip surgery

Psychological and clinical issues in octogenarians and nonagenarians patients addressing elective total hip arthroplasty.

List of authors:

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Case Study: Introduction

Elective orthopaedic procedures, and particularly total hip arthroplasty (THA), in octogenarians and nonagenarians patients are burdened of several implications. Besides the comorbidities and the anesthesiological issues, legal implications are present. Some literature data show the clinical improvement of THA in elderly patient but the psychological aspects are not yet evaluated. Aim of the study is to evaluate the clinical aspects and the psychological impact in daily living in octogenarians and nonagenarians patients addressing THA.

Methods

We conducted a retrospective evaluation of 81 THA in 81 patients of age more than 85 years with a minimum follow-up of 6 months. Clinical aspects were evaluated using the Hip disability and Osteoarthritis Outcome Score (HOOS). The psychological issues were evaluated with the Short Form 12 (SF-12) using both the Physical Component Summary (PCS) and the Mental Component Summary (MCS).

Results

From the starter cohort of 81 patients, 8 patients were died for causes unrelated to surgery, 13 were lost to follow-up, 1 patient was revised for periprosthetic fracture. 59 patients composed the final cohort. Mean HOOS rose from $25,20 \pm 17,81$ to $93,49 \pm 5,21$ with statistically significant distribution both in the global score than in all of the different subscales. The PCS raised from $28,89 \pm 4,64$ to $50,90 \pm 4,97$ and the MCS from $39,83 \pm 9,71$ to $56,58 \pm 5,99$, but none of them showed a statistically significant distribution.

Conclusion

THA in octogenarians and nonagenarians patients could be a safe procedure with positive results especially for clinical issues, but also in psychological aspect, even without a significant distribution.

Keywords:

Total Hip Arthroplasty, Octogenarians, Psychological Impact, Elective Orthopaedic Procedure.

EHS23-2006
Periprosthetic fractures

Poster

Periprosthetic fractures around the hip joint

List of authors:

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Objectives: Periprosthetic femur fractures (PPFF) represent a challenging aspect of traumatology. There is an increasing incidence of PPFF due to the growing number of joint arthroplasties performed, predominantly in elderly patients. The Vancouver classification is used for grading and selecting the treatment option based on the evaluation of stem stability and bone quality.

Methods: We present a retrospective case series of 32 patients with PPF treated in a single center. Between 2015 and 2022 thirty-two patients (19 female, 13 male, mean age 72 years) with PPFF, were admitted. The fracture type was assessed according to the Vancouver classification and an appropriate surgical approach was performed.

Results: Based on Vancouver system, fractures were classified as follows - 6 type A (18%), 23 type B (71%), 3 type C (9%). We identified one case of interprosthetic femoral fracture (IPFF). 40% of fractures were treated with open reduction and internal fixation (ORIF) with extramedullary devices - plates, cables or combination of both. In 32% of cases long-stem revision arthroplasty was performed. Type A fractures accounted for 28% of the cases and were managed with cerclage wiring. Due to the surgical treatment anatomical alignment was restored in all cases. In 1 patient with type C, transversed PPFF fixed with plate, had nonunion with refracture and implant failure, treated with intramedullary allograft- fibula and longer plate. One patient had postoperative PPFF 1 day after THA using anterior approach and was treated conservatively with success.

Conclusion: Periprosthetic femur fracture is a clinically challenging issue. Choosing the optimal treatment strategy, based on the type of fracture and the condition of the patient, is vital for successful outcome.

Keywords:

Periprosthetic fracture, hip, complications,

EHS23-2290
Periprosthetic fractures

Oral

Periprosthetic Fractures of the hip, a dangerous complication increasing mortality in Hip Arthroplasty patients

List of authors:

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Objectives: To characterize the patient with periprosthetic fracture after hip arthroplasty.

Methods: We reviewed all patients admitted with periprosthetic fractures (total or hemiarthroplasty of the hip) in our centre between 2008 and 2020. For each patient was retrieved demographic and radiographic information.

Results: 52 patients were included in the study, the mean age was 80 years. The mortality rate was 34,6% and on average occurred 5,5 months after the traumatic event. Higher mortality was associated with older age, longer waiting time to surgery and with lower preoperative hemoglobin levels. In 67,3% of the cases, the fracture occurred in uncemented femur stems. The most frequent pattern according to the Vancouver classification was B1 in 42,3%. No association between the Vancouver classification and the preoperative Dorr classification was found. Also, no association between the Vancouver classification and the mean blood loss was found.

Conclusion: Periprosthetic fractures around femoral components after hip arthroplasty are a growing and devastating orthopedic complication. There is high morbidity and mortality associated with this injury, usually in older and more fragile patients, with studies reporting mortality rates of similar magnitude to hip fracture patients. Surgery in the first 48 hours is known to improve survival rate at 1 year, as longer waiting periods are associated with more perioperative complications and more frail patients, which corroborates our findings. However, lower pre-operative hemoglobin levels are also associated with the need for blood transfusion and higher mortality. Our findings support the similarity of this type of fracture in complexity and morbidity to the fracture of the native proximal femur.

Keywords:

Periprosthetic Fractures, Hip Arthroplasty, Hip Fracture, Femur Fracture, Mortality

EHS23-2343

Periprosthetic fractures

Oral

Management of simultaneously bilateral Total Hip Arthroplasty periprosthetic fractures.

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Case Study: With the number of Joint Arthroplasties being performed continuously rising globally the possibility of periprosthetic fracture follows as well. Given the patient's characteristics, mainly age and comorbidities, prevention of secondary fall prevention is of paramount importance. Once taken place though, a decision making process should be followed taking into consideration the medical status of the patient and the pre-injury walking status.

We present a case of a simultaneously bilateral Total Hip Arthroplasty periprosthetic femoral fractures in a 92 year old female patient sustained a fall from standing height. On the right side the pre-existing THA had a cemented femoral stem as opposed to the left side. Considerations regarding the treatment management included simultaneously open reduction and internal reduction of the fractures versus simultaneously total hip revision surgery versus staged revision. Given the patient's medical status, she was consented for simultaneously open reduction and internal reduction of the fractures. Once being medically optimized, she underwent open reduction and internal reduction of the fractures with cerclage wires and periprosthetic plate bypassing the fracture lines. The patient was mobilized (bed mobility and rising) post-op way 2nd. Upon discharged to a rehabilitation center she was followed as per the Department's protocol. Three months (until now) post-op she is doing fine.

Keywords:

simultaneously bilateral, periprosthetic fractures, THA

EHS23-2100
Postop complications

Oral

THE ROLE OF ENDOSCOPY IN THE ASSESSMENT OF OCCULT GI BLEED CAUSING REFRACTORY ANAEMIA IN FRACTURE NECK OF FEMURS

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Objectives: The reported incidence of perioperative acute upper gastrointestinal bleeding varies from 1 to 15%. The aim of our study is to find out the usefulness of endoscopy in finding gastrointestinal causes leading to the occult loss of blood causing irreversible anaemia in post operative fracture neck of femurs.

Methods: A retrospective case-control study was conducted of patients admitted to the orthogeriatric unit for surgical management of neck of femur fracture. A total of 1863 cases were admitted with neck of femur fractures, of which 918 (49.3%) patients had post operative anaemia. 45 (5%) patients with refractory anaemia were referred for endoscopy to find any gastrointestinal cause of bleeding contributing to refractory post operative anaemia. Patient demographics including age, sex, fracture pattern and pre-existing anaemia were recorded. The co-morbidities including anaemia, heart disease, chronic kidney disease and oral anticoagulants at the time of admission were noted.

Results: There were 11 (24%) males and 34 (76%) females. The average age was 82.3 years (range 73-94). Eleven (patients 24%) had iron deficiency anaemia, 9 (20%) was on oral anticoagulants and 6 (12%) had systemic malignancy. The mean post operative hemoglobin at the time of referral for endoscopy was 77.3 g/dL. Endoscopy revealed normal findings in 27 (60%), esophagitis/gastritis in 8 (20%) and hiatus hernia in 7 (16%) of patients. None of the patients were diagnosed to have a demonstrable source of active gastrointestinal bleeding or malignancy causing the drop in haemoglobin post-op.

Conclusion: In the diagnosis of resistant and refractory post operative anemia following fracture neck of femur surgery the use of endoscopy to diagnose a treatable cause of anaemia is not effective.

Keywords:

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EHS23-2108

Postop complications

Oral

Pseudotumour after a hybrid ceramic on ceramic total hip arthroplasty: a case report

List of authors:

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Case Study: Objectives

The aim of the abstract is to present an uncommon case of pseudotumour in a hybrid ceramic on ceramic (CoC) total hip arthroplasty (THA).

Methods

In 2005, a 36-year-old woman underwent the implantation of a hybrid CoC hip arthroplasty (biolox delta ceramic cup and alumina ceramic head), due to an avascular necrosis of the left femoral head.

She presented to A&E in June 2022 because of fever and left hip swelling. The scar was completely healed. Left hip flexion was painful (<90°) with an antalgic gait. Blood exams showed leucopenia and increased inflammatory indices.

A US-guided sample was performed on the soft-elastic swelling. X-rays didn't show any signs of osteolysis. The CT scan revealed a periprosthetic collection (20x13cm). The MRI showed that the collection was intrapelvic.

The patient underwent a revision THA (November 2022). A soft-elastic pseudotumour was found. The liquid and the periprosthetic tissues were tied off and sent to microbiological and histological examination. No macroscopical signs of infections were visible.

Acetabular cup was removed and a new one was implanted (G7 multihole 56 mm, PE insert, delta revision biolox 36 M). The femoral stem was stable so revision was not necessary.

Results

All preoperative and intraoperative cultures were negative for infections. Histological examination confirmed the suspicious of pseudotumour. The postoperative course proceeded without complications.

Conclusion

The abstract presents a unique case of symptomatic adverse local reaction in a patient with CoC THA. It shows that ceramic is probably not completely inert. According to literature just few cases are described. None of them developed after the use of hybrid components (biolox-alumina).

Keywords:

ceramic on ceramic; hybrid components; pseudotumour; hip arthroplasty;

EHS23-2101

Postop complications

Oral

Post Operative Drop in Haemoglobin Is Associated With Increased Morbidity And Mortality In Fracture Neck Of Femurs

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Objectives: Post-operative anaemia in hip fracture patients is associated with increased risk of blood transfusion, poorer outcomes, increased morbidity, and mortality. Our aim is to measure the drop in haemoglobin(Hb) post-operatively in hip fracture surgery and its impact on length of stay, morbidity and 30-day mortality

Methods: A retrospective study of neck-of-femur patients looking at pre-op and discharge haemoglobin levels, taking into consideration conditions that could affect Hb, and adverse effects peri-operatively. Data collected from Medway, Clinic letters, ICE and NHFD database.

Results: 257 patients were included in the study. Mean age was 82 (range 43-100). Pre-operatively 60 (23%) had normal Hb, 34 (13%) had borderline, and 163 (64%) had severe anaemia. 131 (51%) had hemi-arthroplasty, 61 (24%) had DHS, 45 (18%) had IM nail and 20 (7%) had THR. Normal Hb was found in 62 patients (24%), 33 (13%) had borderline and 162 (63%) had severe anaemia at discharge. 30 patients (11.7%) had post-op transfusions and 7 were prescribed oral iron. Readmission rate was 4.3% (11 patients) of which 8 (73%) had severe anaemia. Average length of stay in patients with severe anaemia was 21 days. Overall 30-day mortality was 17%(43 patients); in patients with severe anaemia, mortality was 50% (21 patients).

Conclusion: Most patients (63%) had severe anaemia at discharge. There was a significant drop of Hb post-operatively especially THR and hemi-arthroplasty. Our study demonstrates pre-surgical anaemia in hip fracture patients is associated with increased hospital morbidity and mortality. Identification of anaemia at admission and discharge provides an opportunity for treatment to avoid transfusions and improve patient outcomes.

Keywords:

Post op, Anaemia, Proximal femurs fractures, Outcomes

EHS23-2099

Postop complications

Oral

Which one is the lesser evil? - Periprosthetic Fracture following Anterior Approach or Dislocation after Posterior Approach?

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Objectives: The most common approaches in total hip arthroplasty (THA) have different complication profiles: anterior-approach (AA-THA) has an increased risk of periprosthetic fractures (PPF); posterior-approach (PA-THA) is associated with higher dislocation risk. However, little is known on impact of these complications on outcome. This study aims to compare outcome of patients who suffered PPF after AA-THA with those that sustained dislocation after PA-THA.

Methods: This is a retrospective, single-center, multi-surgeon, consecutive case-series of primary THA patients. In a cohort of 9,867 patients who underwent THA, 80 fulfilled the approach-specific, post-operative complication criteria, of which 45 were PPF after AA-THA and 35 with dislocation after PA-THA (age 68.0 years (range: 38.0-88.1), 57.5% women). Outcome included complication- and revision rates, and patient-reported outcomes including Oxford Hip Score (OHS).

Results: At 5.8 years follow-up (range: 2.0-18.5), reoperation was more common in the dislocation after PA-THA group (23/35 vs. 21/45; $p=0.089$). Change of surgical approach occurred in 16/21 of patients with PPF after AA-THA, but none in those with dislocation after PA-THA. Following re-operation, complication rate was greater in the PPF group (11/21 vs. 4/23; $p=0.012$). At latest follow-up, OHS were superior in the PPF after AA-THA group [42.6 (range:25.0-48.0) vs. 36.6 (range: 21.0-47.0); $p=0.006$].

Conclusion: Dislocation following PA-THA is more likely to require revision. However, PPF following AA-THA requires more often a different surgical approach and is at higher risk of complications. Despite the increased surgical burden post-operative PROMs are better in the peri-prosthetic fracture group, especially in cases not requiring reoperation.

Keywords:

Total hip arthroplasty, anterior approach, peri-prosthetic fracture, posterior approach, dislocation, outcome, complications

EHS23-2035

Oral

Postop complications

No Difference in Major Adverse Events and Readmission Rates Following Simultaneous vs Staged Bilateral THA: A Matched-Cohort Analysis

List of authors:

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Case Study: Objectives: There is still debate regarding the rationale for one-stage bilateral THA. We compared readmissions, adverse events, and overall length of stay (LOS) in patients with one-stage bilateral vs staged THA.

Methods: We identified 84 patients (168 hips) who underwent one-stage bilateral THA. Patients (50% males) had a mean age of 57.4 ± 12 years and body mass index of 27.9 ± 4 . Mean preoperative hemoglobin was 14 ± 1.3 g/dL. They were matched 1:1 on the basis of sex, age, preoperative hemoglobin and year of surgery (± 3 years) to a consecutive cohort of 82 patients (164 hips) undergoing staged bilateral THA (mean of 7 ± 3.6 months between procedures; maximum: 12 months). Mean follow-up was 39 ± 17 months for each group ($p=0.882$). 90-day readmissions were computed and adverse events were calculated with the Dindo-Clavien classification. A logistic regression model was used to predict readmissions.

Results: No between-group differences were found in readmissions (7 vs 5; $p=0.27$), adverse events (15 vs 13; $p=0.78$), and total number of transfusions (7 vs 4; $p=0.099$). No between-group differences were found in postoperative hemoglobin levels either after the first (11.24 ± 1.5 vs 11.22 ± 1.3 g/dL; $p=0.93$) or second procedure (11.24 ± 1.5 vs 11.23 ± 1.2 g/dL; $p=0.97$). Total surgical time (109.3 ± 30 vs 132 ± 37 minutes; $p=0.001$) and LOS (3.31 ± 1.6 vs 5.67 ± 2.2 days; $p=0.001$) were lower in the one-stage bilateral THA group. After adjusting for confounders, readmissions were not increased by undergoing one-stage bilateral THA (OR 0.35; 95%CI 0.08–1.5; $p=0.16$).

Conclusions: One-stage bilateral THA was not associated with increased risk of adverse events and readmissions, proving to be a safe procedure while decreasing surgical time and LOS.

Keywords:

adverse events; postoperative complications; staged THA; one-stage bilateral THA

EHS23-2000
Postop complications

Poster

Varus stem positioning in THA in patient with low Critical trochanteric angle.

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Objectives: Critical trochanteric angle(CTA) is the angle between femoral shaft axis and vertex between lateral and superoposterior facet of the greater trochanter. It is important for primary total hip replacement when using full coated collarless straight hydroxyapatite stems which leading to stem malalignment. Normal radiological angle is 25 degrees (+-5). Angles around and under 20 resulting in varus and above 30 in valgus.

Varus and valgus malposition also lead to offset difference from the planning with possibility in abductor weakness and changing in varus and valgus angle of the stem, which may lead to Leg length discrepancy.

Methods: Last couple of years we had 30 varus malpositioned stems in THA using the same implant. Only modified Handing approach was used and there was no difference in entry point when opening femoral canal. This led us to retrospective controlled study where we followed these cases.

Results: In all 28 patients - 30 cases of varus stem positioning, we measured lower than normal CTA combined with coxa vara and high offset. It was visible in patient with low CTA, performing second THA, when in first one stem was in varus and CTA was not measured and not taken into attention.

Patient with varus positioning of the stem had no complaints and clinical difference in first 5 years.

Conclusion: In every case CTA must be measured, especially in coxa vara and high offset patients. If CTA is lower than 20 degrees, anatomical or curved stems needs to be used or special preparation of the proximal femur- lateralized entry point of the femoral canal. This may lead to loosening of the offset itself. 3D preoperative planning gives visualization of the proximal femur, offset, angles and heliotorsion, which can help choose best implant for the patient.

Keywords:

varus, offset, THA, complication, Critical trochanteric angle.

EHS23-2087

Postop complications

Oral

Perioperative Complications after Hip and Knee Revision Arthroplasty in the over 80 Years Old Population: A Retrospective Observational Case-Control Study

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Objectives: The number of joint revision arthroplasties has increased in the elderly population, which is burdened by several perioperative risks.

Methods: Patients who underwent hip and knee revision arthroplasty were retrospectively included, and they were divided into two groups by age: under 80 years old (Group 1) and above 80 years old (Group 2). Patients were matched by gender, diseased joint, preoperative diagnosis, type and period of surgery. The primary outcome was to compare local and systemic perioperative complication rates. The secondary outcome was to compare the 30-day, 90-day, and 1-year readmission rates.

Results: In total, 74 patients in Group 1 and 75 patients in Group 2 were included. Postoperative anemia affected 13 patients in Group 1 (17.6%) and 25 in Group 2 (33.3%, p 0.027); blood units were transfused in 20 (26.7%) and 11 (14.9%, p 0.076) patients, respectively. In Group 1, two (2.7%) patients reported wound infection. In Group 2, eight (10.7%) patients presented hematomas, and two (2.7%) patients reported dislocations. No significant differences in the two groups were observed for the hospital readmission rate at 30 days, 90 days, and 1 year. Readmission at 30 days occurred in 1 patient (1.4%) in Group 1 and 5 patients (6.7%) in Group 2 (p 0.208); 90-day readmission occurred in 2 patients (2.7%) in Group 1 and 6 patients (8.0%) in Group 2 (p 0.273); and 1-year readmission occurred in 8 patients (10.8%) in Group 1 and 7 patients (9.3%) in Group 2 (p 0.784).

Conclusion: The revision arthroplasty procedure in patients over 80 years old is not associated with a higher risk of perioperative complications, or higher readmission rate compared with younger patients.

Keywords:

hip; knee; octogenarians; perioperative complication; readmission rate; revision arthroplasty

EHS23-2004

Postop complications

Oral

Frequency And Timing Of Postoperative Complications After Outpatient Total Hip Arthroplasty

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Objectives: To 1) compare the rate of complications between outpatient and inpatient THA; 2) determine the timing of complications and readmission following outpatient THA; and 3) compare the timing of complications and readmissions between outpatient and inpatient THA.

Methods: Primary THA patients were identified in the 2012-2019 NSQIP database. The NSQIP database uses trained reviewers to collect more than 100 perioperative variables from more than 500 institutions in the United States.

Outpatient procedure was defined as having a hospital length of stay (LOS) of 0 days. For each of nine different 30-day complications, the median postoperative day of diagnosis was determined. Multivariable regressions were used to compare risk of each complication between outpatients versus inpatients. Further, multivariable Cox proportional hazards modeling was used to test whether there is a difference of timing for each complication as stratified by outpatient or inpatient status.

Results: Median day of diagnosis after outpatient THA for readmission was 12.5, surgical site infection 15, urinary tract infection 13.5, deep vein thrombosis 13, myocardial infarction 4.5, pulmonary embolism 15, sepsis 16, stroke 2, and pneumonia 6.5. Outpatients had lower relative risk (RR) of readmission (RR=0.73), surgical site infection (RR=0.72), and pneumonia (RR=0.1), all $p < 0.05$. There was no statistically significant difference in timing of each complication between outpatients versus inpatients ($p > 0.05$).

Conclusion: Timing of complications appear to be similar between outpatient and inpatient procedures. Consideration should be given to lowering thresholds for diagnostic testing after outpatient THA for each complication during the time periods identified here to be of greatest risk.

Keywords:

outpatient; total hip arthroplasty; timing; complications

EHS23-2286

Poster

Proximal femoral fractures

Platelet Aggregation Inhibitors and Anticoagulants Delay Surgery for Hip Fractures

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Objectives: To analyze the influence of antithrombotic medication in delaying surgery for fragility hip fractures.

Methods: Retrospective review of electronic patient records admitted to our Clinic over 21 months.

Results: Out of 312 cases over 55 years, 90 were on chronic antithrombotic medication. There were no differences between the medicated group and controls (n = 222) regarding age, gender, type of fracture and Hb. Surgery was significantly delayed in the medicated group: 4(3-6) days compared to 2(1-4): 3(1-4) days for acetylsalicylic acid (n=44), 6(5.25-7.75) days for clopidogrel (n=15), 4.5(4-7) days for acenocoumarin (n=18) and 5(4-7.25) days for novel direct oral anticoagulants (n=13).

Conclusion: Platelet aggregation inhibitors and anticoagulant use among fragility hip fracture patients is common, which may significantly lengthen time to surgery.

Keywords:

hip fracture, anticoagulant medication, osteoporosis

EHS23-2028
Proximal femoral fractures

Poster

Pelvic perforation and Atypical Intrapelvic migration of a cephalic hip screw (Cut-though?) In failed intertrochanteric hip fracture fixation. Two cases report.

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Objectives: Cephalomedullary nails (CMN) and Dynamic Hip System (DHS), are commonly used for the treatment of intertrochanteric hip fractures. Pelvic perforation and Intrapelvic migration by cephalic screw is a rare complication. We reported and describe two cases in which the hip screw disengaged in the opposite direction, migrated through the hip joint, and came to rest inside the pelvic cavity instead of migrated to lateral femoral side. Total hip arthroplasty may be used as a salvage procedure in these patients.

Methods: 2 female patients, 76 and 79-year-old, were converted to hip arthroplasty after failed surgical treatment of an intertrochanteric hip fractures. The first patient treated with PFNA and the second one, treated with DHS, both with intrapelvic migration of a cephalic hip screw. Considering that the implant failed and the fracture still be nonunion, we choose to do, though a posterolateral approach, removed all the material, a cementless total hip arthroplasty as the salvage procedure, with a long distal femoral stem fixation and allograft in the acetabulum defect.

Results: At the latest follow up of 6 and 24 months after total hip arthroplasty, the patients had no pain or loosening of the prosthesis. No infection or dislocation and re-admission had not happened. Postoperative HHS was 85 and 87.

Conclusion: The short-term survivorship of conversion hip arthroplasty after surgical treatment of an intertrochanteric fracture is an excellent solution, regardless of original failed fracture fixation method. If early complications, can be minimized, the likelihood of successful outcome is high. The risk of intraoperative femoral fracture or dislocation postoperative published are higher than usual. Like the revision total hip arthroplasty.

Keywords:

Pelvic perforation, Intrapelvic migration, cut-through

EHS23-2175
Proximal femoral fractures

Oral

Total hip arthroplasty after failed fixation of a proximal femur fracture: single incision surgical technique and preliminary results

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Objectives: Post-traumatic arthrosis and aseptic necrosis of the femoral head are fearful and frequent complications after triple screw osteosynthesis in sub-capital fractures. Classically, the removal of the fixation devices and the subsequent restoration with direct anterior access is performed with two separate incisions.

The study aims to present a technical variant that allows the use of direct anterior access with a standard incision and the preliminary results.

Methods: Only patients who underwent total hip replacement surgery and removal of fixation devices between May 2020 and December 2021 were analyzed.

The differences between preoperative and last follow-up in the following PROMS were evaluated: modified Harris Hip Score, Hip Disability and Osteoarthritis Outcome Score, and Visual analog scale. Radiographs at the last follow-up were also evaluated for the presence of periprosthetic fractures and subsidence.

Results: In the period analyzed, 15 patients were treated with the proposed technique, 99% of whom were female. There were no complications in the immediate postoperative period or intraoperative periprosthetic fractures. In all cases, a significant improvement of the PROMS analyzed was observed. In addition, no signs of early mobilization, periprosthetic insufficiency fractures, and greater trochanter fractures were observed at the latest follow-up.

Conclusion: The proposed technical variant appears to be effective and reproducible in the treatment of proximal femur fracture outcomes. Particular attention must be paid by the surgeon to managing the bone fragility of the proximal femur to avoid further complications.

Keywords:

total hip arthroplasty, proximal femur fracture

EHS23-2039

Poster

Proximal femoral fractures

Total hip arthroplasty following failed intertrochanteric hip fracture fixation treated with a cephalomedullary nail

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Objectives: Different Cephalomedullary Nails (CMNs) are commonly used for the treatment of intertrochanteric hip fractures. Total hip arthroplasty (THA) may be used as a salvage procedure when fixation fails in these patients. The aim of this study was to analyze the complications and outcome of THA following failed intertrochanteric hip fracture fixation, using modular tapered fluted titanium stem.

Methods: 18 consecutively operated patients for failed proximal femoral nail treated with single stage procedure of nail extraction and conversion THA, were included in this retrospective study. (From 2014 to 2022). Mean age at the time of arthroplasty was 77 years (range, 67 to 85 years). 14 females. All patients received metal-on-polyethylene bearing with big head size (36 mm), with uncemented press-fit acetabular cup and modular tapered fluted titanium revision stem. All patients were assessed preoperatively and postoperatively using the Harris Hip Score (HHS).

Results: The mean duration of follow-up was 32 months (range: 6-72 months). The mean preoperative HHS was 34, and the mean HHS at final follow-up of at least one year was 87. There was a clinically significant improvement in the HHS from preoperatively to final follow-up postoperatively. At the final follow-up, 15 patients (83%) had a good or excellent outcome and 3 patients died (17%) after 14, 19 y 42 months of operated. No infection. No dislocation. None of the patients required revision surgery

Conclusion: HHS has adequate responsiveness for assessing the functional outcome of Conversion THA. We believe the use of an uncemented cup and uncemented modular tapered fluted titanium revision stem when failed CMN fixation in intertrochanteric hip fractures, is an excellent option.

Keywords:

Conversion total hip arthroplasty; Revision stem; Failed proximal femoral nailing; Harris hip score; Salvage total hip arthroplasty.

EHS23-2202

Short stems

Oral

Mid-term outcomes of a multicentric study on the use of a short hip stem.

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Objectives: To analyse the mid-term clinical results after total hip replacement using a short hip stem.

Methods: A prospective and multicentric study with a minimum one-year follow-up was conducted to analyse the clinical outcomes (Harris Hip Score and WOMAC), complications, and survival in patients who were implanted with the same short hip stem (Furlong Evolution). Comparisons between groups were carried out using Student's t-test, Pearson's X2 test - or Fisher's exact test - and one-way repeated measures ANOVA. Survival was analysed using Kaplan Meier methodology.

Results: A total of 545 patients (395M/150F) from three different hospitals were included, with a mean follow-up of 58 (12-119) months. The mean age was 53.8 (19-82) years, with a mean weight of 83.5±17.4 kg and a mean BMI of 27.9±4.3 kg/m². The most common aetiologies were primary osteoarthritis (N=242), secondary to femoroacetabular impingement (N=104), and avascular necrosis (N=89).

All functional assessment scores showed statistically significant improvements ($p < 0.05$) up to one year, after which they stabilized ($p > 0.05$). The mean preoperative Harris Hip Score was 49.9 and increased to 95.5 at one year. WOMAC decreased from 10.2 preoperatively to 0.8 at one year. WOMAC stiffness decreased from 5.1 to 0.5 and WOMAC functional capacity decreased from 40 to 4.2 at one year.

The 5-year survival rate was 99.1%, with a mean survival of 118 months. No statistically significant differences were found between the different pairs of friction employed. Only 1.1% of patients presented complications during the follow-up.

Conclusion: The short hip stem has proven to be an effective and safe treatment alternative in mid-term.

Keywords:

total hip replacement; short hip stem

EHS23-2208

Short stems

Oral

Medium term result of a metaphyseal fitting short stem

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Objectives: This is a prospective study that aims to report the medium-term clinical and radiological results of a metaphyseal fitting short term in primary THA.

Methods: Between September 2013 and February 2015, 76 consecutive patients (80 hips) underwent THA with Minima® S (LimaCorporate, San Daniele del Friuli, Italy). There were 22 (28%) women and 58 (72%) men, with mean age of 54±10 years. Clinical assessment by means of HHS, TUG, VAS, HOOS, UCLA, and radiological assessment through standard anteroposterior and axial X-rays were performed preoperatively (T0), at 6 weeks (T1), 6 (T2), 12 (T3), 24 (T4) months, and between 5 and 8 years (T5).

Results: Mean HOOS function ADL raised from 41 at T0 to 92 at T2 and 91 at T5, HOOS function SR from 22 at T0 to 78 at T2 and 82 at T5, HOOS pain from 39 preoperatively to 92 at T2, demonstrating significant early pain relief, and remained unchanged at the last FU. UCLA activity improved from 5 at T0 to 9 at T2 and 10 at T5, whereas TUG improved from 16 at T0 to 11 at T2 and 10 at T5. Mean HHS raised from 49 at T0 to 96 at T2, remaining stable at T5. VAS decreased from 8 at T0 to 1 at T2 and T5, HHS and UCLA pain improved from 13 and 3 preoperatively to 43 and 9, respectively, at the last FU. X-rays showed good implant stability and physiological load transfer, with 7.4% of patients showing unprogressive radiolucent lines in Gruen zone 3,4,5, and 18.5% of patients showing cortical hypertrophy mainly in zones 3 and 5. The survivorship with stem revision as endpoint was 100%.

Conclusion: The Minima stem showed good clinical and radiological results in the medium term FU. Proper indication and precise surgical technique are mandatory. Further data are warranted to confirm these results also in the long term.

Keywords:

Total hip arthroplasty, short stem, minima, proms

EHS23-2116

Short stems

Oral

Short-stem total hip arthroplasty following failed internal fixation in proximal femur fractures

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Objectives: Secondary osteoarthritis, malunion, or nonunion after failed internal fixation of the proximal femur is challenging with high complication rate. To date, there are no studies converting osteosynthesis to short-stem total hip arthroplasty (THA). This study aimed to highlight and evaluate short-stem THA use in demanding revision surgeries after failed osteosynthesis.

Methods: This study investigated 27 patients who underwent one-stage conversion total hip arthroplasty (CTHA) using a cementless short stem. Full weight-bearing was permitted. Patient reported outcome measurements were obtained, including the Harris hip score (HHS), the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), as well as pain and satisfaction on the visual analogue scale (VAS). Radiological follow-up was also performed.

Results: We identified 18 patients with femoral neck fracture (FNF) and 9 patients with intertrochanteric fracture (ITF). Internal fixation in all patients with ITF was performed by intramedullary nailing. In the FNF group, 11 patients were treated with a dynamic hip screw and 7 patients with cannulated screw fixation.

Mean follow-up was 30.56 months. Mean HHS at follow-up was 96.78 and improved significantly. Reduced pain and satisfaction were achieved in all cases. One patient required early revision surgery due to dislocation and greater trochanter fracture, which included the implantation of a cemented dual mobility acetabular component and a cerclage of the greater trochanter. None of the short stems required revision.

Conclusion: The clinical and radiological results were encouraging. Furthermore, the low rate of complications demonstrated that short-stem THA is a safe and successful treatment in a selected population for CTHA.

Keywords:

short-stem, THA, femur fracture, optimism

EHS23-2008

Short stems

Poster

Short stems in THA

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Objectives: Short cementless stems became more popular in THA last decade. When they are used according to the indication, they are perfect substitute in young active patient. They provide excellent fixation while preserving the bone. Short stems can be used in posttraumatic and dysplastic femurs while performing different minimally invasive approaches to the hip joint.

Methods: We analyzed retrospectively data of patients who have undergone THA between 01/01/2018 and 31/12/2022. 251 THA was performed with gender distribution - 144 male and 107 female. Age variety between 16 and 70 average 41. All of the patient had type A or type B according to DORR classification.

4 stem systems were used- Medacta AMIS 56, Zimmer Fitmore 28, Mathys Omtimys 4 and anatomic stem Symbios SPS 163. First is full coated short stem, rest of stems are metaphyseal stems

Results: Harris Hip score improved from average 45 to average 93. In all cases stems had excellent bone fixation with primary stability. On the follow up X-ray after surgery, on 1 month, 6 month and 1 year, 2,3,4 and 5 year, there were no sign of loosening, subsidence and rotation. 7 intraoperative periprosthetic fractures, 1 patient with periprosthetic fracture on the first post operative day, treated conservatively.

27 of the stems were implanted in varus malposition, 21 - undersize.

No revision of the stems and no infection cases are observed in this study.

Conclusion: Short stems gives us good fixation with preserving much bone for further revision. This study shows no disadvantages in short stem THA. It is perfect option for young, active patients with good bone quality.

Keywords:

THA, short stem, anterior approach, young patients, good bone quality

EHS23-2205

Trauma of pelvis and/or hip joint

Oral

Total Hip Arthroplasty Or Hemiarthroplasty For Hip Fracture In Patients Over 75 Years Of Age

List of authors:

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Objectives: Compare the incidence of complications, revision rate, survival, functional status and the ability to walk between patients over 75 years treated with total hip arthroplasty (THA) or Hemiarthroplasty (HA) for femoral neck fractures (FNF).

Methods: Retrospective cohort study of patients admitted at our institution between 2015 and 2017 with intracapsular femoral neck fractures with 75 years of age or older, with previous ambulatory capacity treated with THA or HA.

Results: In total, there were 150 patients with a mean age of 84.6 years (81.3% female and 18.7% male) and a mean follow-up of 47.2 (SD±29.6) months. Of these 150 patients, 119 were submitted to HA and 31 to THA. The majority of arthroplasties were performed through posterior approach. Mean age at admission was significantly higher for HA than THA (respectively 85.5±5.1 and 81.1±4.6, p<.001). After surgery, 92.9% of THA kept the ability to walk autonomously with or without walking aids, compared to 73.2% in the HA group (p<.001). Infection rate was 0.8% for HA and 0% for THA (p=.609). Dislocation rate was 10.1% for HA and 12.9% for THA (p=.651). Periprosthetic fracture occurred in 2 patients in the HA group (1.7%) and in 1 patient with hybrid prosthesis in the THA group (3.2%) (p=.584). Revision rate was 6.8% for HA and 9.7% for THA (p=.583). At the end of the study 74.2% of THA patients were alive compared to 23.5% in the HA group (p<.001).

Conclusion: In selected cases, THA seems to be also a good option for FNF treatment for patients over 75 years old.

Keywords:

Femoral Neck Fracture, Total Hip Arthroplasty, Hip Hemiarthroplasty, Elderly

EHS23-2074

Trauma of pelvis and/or hip joint

Oral

Femoral fracture in lower limb amputee patients: Series of 12 cases and review of the literature

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Objectives: The aim of this study was to describe a case series of lower limb amputated patients and associated femoral fracture at one institution. In addition, to review the literature of the last ten years of lower limb amputee patients with associated femoral fracture.

Methods: This is a case series study. A total of 12 patients and 15 femoral fractures with lower limb amputation were included. Patients with amputations below the tibial malleolus were excluded, as well as patients undergoing prosthetic surgery due to osteoarthritis. Through the patients' medical records, the following data were collected: demographic data; amputation-related data (location, cause, time since amputation and functional status); fracture data (location, mechanism, traction, type of surgery and complications); and finally, functional outcomes after treatment.

Results: 7 patients presented infracondylar amputation and 5 patients' supracondylar amputation, being the most common cause of amputation the vascular disease. We found 6 pertrochanteric fractures, 5 subcapital, 3 subtrochanteric, 1 supracondylar and one sequel of a pertrochanteric fracture, being fall from height the most frequent mechanism. No complications related to surgery or during follow-up were found. Mortality at one year postoperatively was absent and the overall functional outcomes were satisfactory.

Conclusion: This case series study is one of the largest series currently conducted. Despite the challenge of a lower limb amputee patient with femoral fracture, in most cases the patient returns to his baseline pre-fracture condition. Preoperative and individualized planning is crucial as well as close monitoring during rehabilitation.

Keywords:

Femoral fracture; hip fracture; amputee

EHS23-2300

Trauma of pelvis and/or hip joint

Oral

Outcomes and complications in unstable intertrochanteric hip fractures in the elderly treated with primary hip replacement using a titanium modular conical stem

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Objectives: The study aimed to evaluate the mortality and the outcomes of patients that underwent total hip arthroplasty after unstable intertrochanteric hip fractures using a titanium modular conical stem.

Methods: In this study, 36 patients with a pattern of fracture 31-A2.3 (according to AO/OTA classification) were enrolled. The average age was 77.23 years (range 68-95). The mean value of the Charlson Comorbidity Index was 5.2 and the mean value of ASA score was 2.4. The mean follow-up was 35 months. The femoral stem used was available in 3 lengths, 140 mm, 180 mm, and 220mm; the different proximal bodies can be used to change length and offset. In 12 cases the greater trochanter was fixed with a plate and wires. All procedures were performed in lateral decubitus using a posterolateral approach distally extended as required.

Results: The 30-day and 1-year mortality were 7% and 11% respectively. A significant correlation was found between ASA score and mortality. The mean Harris Hip Score was 76 points. The overall complication rate was 12%: we recorded 1 implant dislocations, 1 periprosthetic infection, 1 greater trochanter fracture and 1 periprosthetic fracture.

Conclusion: Unstable proximal femoral fractures treated with THA and modular conical stem result in good clinical and radiological outcomes. THA provides better functional outcomes and earlier mobilization when compared to intramedullary nailing in elderly patients with an unstable intertrochanteric femoral fracture. Furthermore, studies and longest follow-up are required to confirm those promising results.

Keywords:

modular femoral stem; unstable intertrochanteric fractures;

EHS23-2241

Poster

Trauma of pelvis and/or hip joint

Subtrochanteric fractures: when osteosynthesis goes wrong, what to do next?

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Objectives: We aim to demonstrate an effective technique in revision osteosynthesis after implant failure in subtrochanteric fracture due to oligotrophic pseudoarthrosis.

Methods: A 74y man admitted in the emergency department in July 2021, was diagnosed with a subtrochanteric fracture, and treated with a long cephalomedullary nail with 11 mm diameter.

After seven months, the patient presented with hip pain, and the x-ray showed an implant failure and oligotrophic pseudoarthrosis. Harris Hip Score (HHS) was 29. Pre-op infection screening was negative and surgery was proposed.

At surgery implant was completely removed and nonunion site debrided. ORIF with 1/3 tubular plate was performed. Femoral riming, autograft application and nailing with 13 mm diameter long cephalomedullary nail was done.

Results: Intra-op microbiologic test was negative.

Protective partial weight bearing was prescribed for 6 weeks, and then progressive weight bearing.

After 1 year of follow-up, the patient had no major complaints, walks without crutches, presents with radiographic signs of union, and an HHS of 95,40.

Conclusion: After exclusion of infection, an osteosynthesis error due to malreduction and undersizing of the diameter of the implant was presumed as the cause of this complication.

Joint integrity, bone stock and quality of reduction should be accounted for the treatment decisions. Deformity correction, stability and biology are paramount for successful treatment of this cases.

The plate, in addition to providing greater mechanical stability, helps in reduction and works as a poller screw for the new path of the nail.

At initial treatment of subtrochanteric fractures, correct technique, reduction and the implant selection are crucial in prevent this complication.

Keywords:

Subtrochanteric fractures, failure, pseudoarthrosis, osteosynthesis

EHS23-2098

Trauma of pelvis and/or hip joint

Oral

THE DEFINING FACTORS IN THE DEVELOPMENT AND OUTCOMES OF POST OPERATIVE DELIRIUM IN PROXIMAL FEMUR FRACTURES

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Objectives: Delirium is common in elderly patients undergoing surgery for proximal femur fractures, the rates ranging from 4 to 53%.

The aim of the study is to find the incidence, identifiable causes, reasons for prolonged length of hospital stay, calculate short and long-term mortality and the factors contributing to mortality of post-operative delirium in proximal femoral fractures

Methods: The data for the study was obtained from NHFD (National Hip Fracture Database) and internal hospital computer systems. After screening, 175 patients were found to have developed post-operative delirium. Patients aged 65 years or above who sustained a proximal femur fracture and underwent surgery and scored more than 4 in the 4AT assessment were included in the study.

Results: The mean age for patients with delirium was 84.82 years. 124 patients (70.8%) had dementia (patients who scored ≥ 6 on AMT score) compared to 108 (25.5%) patients without delirium ($p < 0.05$). The patients who developed delirium there were 68 (38.9%) with ASA grade 4 and 94 (22, 3%) without delirium ($p < 0.05$). The average length of stay after developing post-operative delirium was 19.69 days compared to 17.4 days for patients without delirium. The mortality at 30 days and one year was 10.9% and 37% in patients who had post-operative delirium compared to 2.1% and 2.8% to those without delirium respectively.

Conclusion: Post-operative delirium is three times more common in hip fractures. The factors leading to high mortality were mental illness, post-operative anaemia, lower respiratory tract infection, urinary tract infection, acute kidney injury, cardiovascular disease and general anaesthesia.

Keywords:

Delirium, Post op, proximal femur fractures, Outcomes

EHS23-2062
Miscellaneous topics

Poster

Fixate before it is too late

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Case Study: Objectives: Rare case of bilateral femoral incomplete atypical fractures successfully treated with cephalomedullary long nail fixation.

Methods: A 58-year-old women presented with prolonged bilateral thigh and right groin pain without previous trauma. She was being treated with bisphosphonates for osteoporosis. On radiographs she had a dreaded black line at the proximal femur diaphysis accompanied by lateral cortical thickening bilaterally. Magnetic Resonance (MR) confirmed bilateral stress fracture of the proximal third of the femur with corresponding Fredericson grade (FG) 1 on the left and 3 on the right. MR also revealed a stress fracture of the left femoral neck FG 4b, that was not visible on the radiograph.

Results: She was submitted to percutaneous cephalomedullary long nail fixation. Two days after surgery she was discharged and started physical therapy protocol. She returned to work 6 months after surgery. At 1 year follow-up she has bone healing of both femurs.

Conclusions: Long-term bisphosphonate may lead to unusual stress fractures and subsequent atypical fractures in the subtrochanteric and diaphyseal regions of the femur. Frequently, patients with symptomatic stress fractures remain undiagnosed or misdiagnosed for various lengths of time until a complete femoral fracture occurs. It is recommended prophylactic nail fixation for incomplete atypical fracture before a painful completed fracture occurs with its attendant greater morbidity. Surgeons and other physicians should be aware of this complication, as they are likely to encounter such patients due to the millions of patients on bisphosphonate medications.

Keywords:

Prophylactic Femoral Nailing, bisphosphonates, atypical fractures

EHS23-2167
Miscellaneous topics

Poster

Femoral head autograft for acetabular reconstruction in developmental dysplasia of the hip: Study at cup CE angle 0 degrees

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Objectives: Femoral head autograft, in cases of long-term or large bone defects, collapse of the grafted bone or loosening of the cup becomes a problem. The purpose of this study was retrospectively to examine the case of femoral head autograft with the cup CE angle 0° or less over 10 years.

Methods: We investigated 108 hips that underwent THA with femoral head autograft for DDH with a cup CE angle 0° or less. The mean age at surgery was 56.3 years, and the mean follow-up period was 13 years. The average cup CE angle was -9.2°. Cementless cups were used except 4 cases. The control group was 40 hips with cup CE angle greater than 0°. We assessed cup inclination angle, bone union, high-level placement, the grafted bone collapsing, cup loosening and revision. Student's t test was used to determine significance between groups.

Results: The mean cup inclination angle was 40.2° in the 0° or less group and 39.1° in the control group, there was no significant between both groups (P=.21). All the grafted bones were healed in both groups. The high-level placement was 4 hips, 1 hip respectively. In all cases, there was no collapse of the grafted bone. Three patients in the 0° or less group underwent revision surgery, none of which was due to loosening cups. The infection case of them needed impaction bone graft for the reconstruction of the cup at the reoperation, while the other two cases didn't require additional bone grafts or support rings.

Conclusion: Even if the cup CE angle was less than 0°, the healing of the grafted bone and the fixation of the cup were good for a long time. In order to reconstruct the hip joint function, it is important to set the cup in anatomical acetabular position, and femoral head autograft is also useful for preserving bone stock.

Keywords:

femoral head autograft, acetabular reconstruction, developmental dysplasia of the hip, total hip arthroplasty

EHS23-2128

Miscellaneous topics

Oral

Pelvic resection and complex tumor hip arthroplasty: our center's experience

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Case Study: Pelvic resection is a limb salvage procedure used in pelvic neoplasms, severe trauma or infection. The advancements in the surgical technique and the appearance of megaprotheses permitted improving functional outcomes and survivorship, although increasing the risk of complications.

We present two cases of pelvic resection and reconstruction with tumor prostheses performed at our center.

The first case was of a 51-year-old female who presented at consultation with left hip pain and claudication from several months. She performed an x-ray that revealed a lytic lesion in her left acetabulum. The CT scan and the MRI revealed a 7x4cm lytic expanding lesion in the posterior wall of the acetabulum. The biopsy and images were compatible with chondrosarcoma. The patient was submitted to a type II resection (Enneking and Dunham clas.) and an endoprosthetic reconstruction with a cementless stemmed-cone acetabular component fixed in the ilium and cementless femoral stem with dual mobility head. The bony resection showed clear margins. At two-year follow-up the patient is walking without aid and is autonomous for the daily activities with no signs of disease recurrence.

The second case was of a 16-year-old girl diagnosed with Ewing's Sarcoma of the left ilium. She was submitted to neo adjuvant chemotherapy before surgery and then to a type I + II resection. The reconstruction was performed with a custom-made prostheses with screws fixation of the acetabular component in the sacrum and a cementless femoral stem. The bony resection showed clear margins. At two-year

follow-up the patient walks with one aid and presents Trendelenburg gait. She shows no signs of local recurrence and remains in chemotherapy treatment, with good improvements.

Keywords:

Pelvic resection; complex tumor hip arthroplasty; custom-made prostheses; oncology orthopedic surgery

EHS23-2072
Miscellaneous topics

Oral

Efficacy and safety of duloxetine in hip osteoarthritis: Systematic review and meta-analysis

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Objectives: The primary objective of this study was to evaluate the efficacy and safety of duloxetine for chronic pain control of hip osteoarthritis (OA).

Methods: A meta-analysis using PubMed, Embase, Scopus, and the Cochrane Collaboration Library database was carried out. We included studies focusing on patients with hip OA in adults on the waiting list for joint arthroplasty. Outcomes were efficacy assessed by pain and functional scores and safety evaluated by adverse events. We included randomized clinical trials. No date limit was specified. Data was extracted from published reports and combined using Review Manager 5.4. (PROSPERO: CRD42022375273).

Results: A total of three RCTs were included from a pool of 585 (mean age 62.3 yo). There were no significant differences in WOMAC pain at 3-8 weeks (SMD 0.25, 95%CI -0.00 to 0.51). There were significant differences in favor of duloxetine in WOMAC pain at 13 weeks (SMD -0.24, 95%CI -0.41 to -0.07). There were significant differences with respect to functional WOMAC (MD -2.22, 95%CI -3.73 to -0.72) and WOMAC stiffness (MD -0.37, 95%CI -0.58 to -0.15). Perceived improvement was significantly higher in the duloxetine group (OR 3.16, 95%CI 2.11 to 4.73).

Conclusion: In conclusion, duloxetine decreased pain on the WOMAC scale at 13 weeks in patients with hip OA. In addition, functionality, stiffness sensation and perceived improvement showed greater benefit in the group treated with duloxetine. Adverse events were significantly higher in the duloxetine group, although most of the complications were mild.

Keywords:

Duloxetine; hip osteoarthritis; multimodal pain control; meta-analysis

EHS23-2221
Miscellaneous topics

Poster

Non-traumatic ceramic head fracture in ceramic-polyethylene total hip arthroplasty: a case report

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Objectives: Implant failure is one of complications of total hip arthroplasty (THA). We report a unique case of fourth-generation delta ceramic head fracture 6 years after operation.

Methods: 81-year-old female patient was admitted to our hospital for chronic thigh pain without trauma. Six years earlier, she underwent primary THA. She was diagnosed with anterior dislocation by plain radiography and computed tomography. We tried manual reduction without success. During the open reduction, we find both ceramic head fracture and polyethylene liner failure so switch to revision surgery with another delta ceramic and polyethylene liner.

Results: See above

Conclusion: Conclusion: The fourth-generation delta ceramics has reduced the risk of head fractures to 0.03-0.05%. This case report presents an unexpected failure of THA due to the fourth-generation ceramic head fracture and the vitamin E-infused highly crosslinked polyethylene liner failure. We must consider several strategies for revision surgery.

Keywords:

-

EHS23-2011

Hip-spine relationship

Poster

THA in patients with ankylosing spondylitis

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Objectives: Ankylosing spondylitis (AS) is a systemic rheumatic disease, which affects the entire human body, predominantly the musculoskeletal system with severe joint involvement. The affected joints are characterized with persistent inflammation and progressive structural damage, which eventually leads to joint fusion.

Methods: We report a series of 11 cases of male patients with AS, (mean age 50 years, Body Mass Index (BMI) under 20 kg/m²) who underwent Total Hip Arthroplasty (THA) in the last 5 years. Nine of them had clinical and radiographic signs of advanced coxarthrosis, the other two were admitted to our trauma center with a femoral neck fracture. We performed a modified Hardinge anterolateral approach to total hip replacement. In eight of the cases a Dual Mobility Hip implant was used, the other three were treated with a standard hip implant. Considering the bone stock cementless fixation was applied in nine of the patients, and cemented fixation in the other two.

Results: After THA an improvement in movements and restoration of normal daily activities were observed. A hip dislocation occurred in one of the patients. Dislocation after THA in patients with AS are due to the abnormal spinopelvic sagittal anatomy (extremely tilted backward pelvis) and loss of normal spinopelvic mobility. Postoperative Physiotherapy is also challenging regarding the limited spinal mobility and chest expansion.

Conclusion: THA provides improvement of mobility and pain relief in patients with AS. An individual and well-timed approach is needed due to the greater risk of complications and the progressive course of the disease resulting in joint fusion and contractures.

Keywords:

complex THA, Ankylosing spondylitis, spino pelvic kinematic, hip instability

EHS23-2053
Miscellaneous topics

Poster

Serum presepsin failed to detect periprosthetic joint infection after hip arthroplasty

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Objectives: The purpose of this study was to investigate the normative perioperative plasmatic levels of presepsin in patients undergoing primary total hip arthroplasty (THA) and investigate whether presepsin levels can discriminate the presence of periprosthetic joint infection (PJI) after THA.

Methods: In study 1, we measured serum presepsin, white blood cells (WBC), C-reactive protein (CRP), the erythrocyte sedimentation rate 1 hour value (ESR-1h) the day before surgery, and 1, 3, 5, 7 and 14 days after surgery in 31 primary THA cases between May and September 2015. In study 2, during the period between May 2015 and September 2018, we identified five cases diagnosed as PJI without bacteremia were enrolled for the accuracy test for PJI diagnosis using the same parameters in study 1. The discrimination of the PJI was tested using the receiver operating characteristic (ROC) curve and area under the curve (AUC) for each parameter between five cases with PJI and 31 preoperative cases from study 1.

Results: In study 1, significant changes in values from the baseline were observed in WBC at day 1, in CRP during days 1 to 7, and in ESR-1h during days 3 to 7 after surgery; however, presepsin levels were not significantly different from the baseline throughout the monitoring period. In study 2, the AUCs of CRP (1.0, $p < 0.001$) and ESR-1h (0.83, $p < 0.05$) in the ROC curve were considered to discriminate PJI, but those of presepsin (0.51, $p = 0.96$) and WBC (0.65, $p = 0.28$) failed to discriminate PJI.

Conclusion: These results indicate that serum presepsin is not significantly affected by surgical invasion of THA and serum presepsin is not useful for PJI diagnosis.

Keywords:

presepsin, periprosthetic joint infection, total hip arthroplasty

EHS23-2261

Oral

Dissatisfied patient

Dissatisfied patient after conservative surgery by core decompression

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Objectives: The objective of the study is to know the rate of dissatisfaction for this surgical technique.

Methods: We prospectively followed the evolution of 90 hips with osteonecrosis of the femoral head in adults operated on, all by simple core decompression, then we followed the clinical and radiological evolution and we noted the degree of primary satisfaction (just after postoperative) and secondary satisfaction (after one year of evolution) according to a questionnaire with a binary result by yes or no and the results were analyzed by statistical software (SPSS 2.0).

Results: A rate of 6.7% (6/90) and the rate of primary dissatisfaction and 35.6% (32/90) of secondary dissatisfaction with a significant difference $p < 0.0005$. By comparing primary or secondary satisfaction with pain intensity according to the visual pain scale, we find no statistically significant relationship.

Conclusion: We consider the state of satisfaction or not as subjective criteria of the patient as well as the degree of pain felt in direct or distant postoperative.

The literature highlights the subjective nature of satisfaction or not, and surgical revision for failure of conservative treatment must imperatively be associated with clinical and radiographic signs of aggravation.

Keywords:

Dissatisfied , core decompression

EHS23-2176
Dissatisfied patient

Oral

Anterior hip pain after total hip arthroplasty: diagnostic algorithm, etiology, prevention and treatment strategies

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Objectives: Anterior hip pain after total hip replacement surgery is a disabling clinical entity that is difficult to interpret. Unfortunately, the literature is not univocal in the definition and treatment of the problem.

The study aims to identify the causes of anterior pain, proposing a diagnostic algorithm together with preventive and treatment strategies.

Methods: The patients who underwent total hip arthroplasty surgery between 2013 and 2018 were retrospectively reviewed. Patients were asked a specific question about the possible presence of pain and/or discomfort in the anterior inguinal region after the index surgery to stratify them into groups.

Pre- and post-operative radiographs were then analyzed looking for specific causal patterns.

Results: Two types of causes have been identified: intra-articular and extra-articular.

The first group includes malpositioning of the cup in reduced anteversion, the presence of unremoved osteophytes in the anterior acetabular region, the presence of cement residues in the anterior acetabular region when using cemented cups, and the use of large heads. The second group belongs to the excessive increase of the femoral offset; excessive femoral stem anteversion; the presence of heterotopic ossifications in the region of the lesser trochanter; iatrogenic lesions of the rectus femoris and excessive limb lengthening.

Conclusion: Anterior pain after hip replacement is an identifiable and definable clinical entity. A knowledge of its possible causes is necessary for correct preoperative planning and surgical execution aimed at decreasing the percentage of onset.

Keywords:

Anterior pain, total hip arthroplasty, complication

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THA pain outcomes	EHS23-2123	Total hip arthroplasty.	EHS23-2212
THA pain trajectories	EHS23-2123	Total Hip Arthroplasty / Cementless . .	EHS23-2141
THA revision	EHS23-2014	Total hip replacement	EHS23-2068
	EHS23-2282		EHS23-2202
timing	EHS23-2004		EHS23-2247
Titanium	EHS23-2127		EHS23-2280
	EHS23-2129		EHS23-2322
titanium cages	EHS23-2331	Total Hip Revision	EHS23-2088
Total hip arthroplasty	EHS23-2004		EHS23-2138
	EHS23-2012	trabecular metal	EHS23-2088
	EHS23-2013	Trabecular metal augments	EHS23-2140
	EHS23-2016		EHS23-2262
	EHS23-2033	Trabecular metal shell	EHS23-2262
	EHS23-2034	trabecular titanium	EHS23-2068
	EHS23-2038		EHS23-2289
	EHS23-2043	transfemoral approach	EHS23-2235
	EHS23-2046	Transfer learning	EHS23-2287
	EHS23-2052	Transfusion	EHS23-2224
	EHS23-2053	transpiriformis	EHS23-2065
	EHS23-2061		EHS23-2066
	EHS23-2079	transplant patient	EHS23-2073
	EHS23-2099	transverse acetabular ligament	EHS23-2255
	EHS23-2102	trauma	EHS23-2130
	EHS23-2106	Treatment prediction	EHS23-2059
	EHS23-2114	tribology	EHS23-2238
	EHS23-2120	triple taper stem	EHS23-2063
	EHS23-2134	trochanteric reduction osteotomy	EHS23-2215
	EHS23-2137	Tumor	EHS23-2029
	EHS23-2138		EHS23-2130
	EHS23-2139		EHS23-2229
	EHS23-2145	Two-stage revision	EHS23-2061
	EHS23-2167	two stage	EHS23-2007
	EHS23-2169	type II avascular necrosis	EHS23-2263
	EHS23-2171		EHS23-2268
	EHS23-2173	Type of anesthesia	EHS23-2338
	EHS23-2175		
	EHS23-2176	U	
	EHS23-2186	UHMWPE	EHS23-2118
	EHS23-2187	Uncemented hip surgery	EHS23-2182
	EHS23-2189	undisplaced	EHS23-2041
	EHS23-2190	unexplained	EHS23-2326
	EHS23-2205	unselected patients	EHS23-2293
	EHS23-2208	unstable intertrochanteric fractures ...	EHS23-2300
	EHS23-2216	Urinary tract	EHS23-2075
	EHS23-2218		
	EHS23-2224	V	
	EHS23-2227	Vancouver B2	EHS23-2055
	EHS23-2228	Vancouver B3	EHS23-2055
	EHS23-2237	various grain allograft	EHS23-2024
	EHS23-2255	varus	EHS23-2000
	EHS23-2278	varus derotation osteotomy	EHS23-2268
	EHS23-2288	VEPE	EHS23-2117
	EHS23-2291		EHS23-2118
	EHS23-2292	version control	EHS23-2145
	EHS23-2321	Vitamin E	EHS23-2117
	EHS23-2330		EHS23-2118
	EHS23-2338	vitamys	EHS23-2117
	EHS23-2339		EHS23-2118
total hip arthroplasty (THA)	EHS23-2248		



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W

WOMAC EHS23-2276
worse than death EHS23-2310

X

X-ray radiographs EHS23-2287

Y

Young patients EHS23-2008
EHS23-2026
EHS23-2186

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A

Abdelaal, Ahmed	EHS23-2131
Abdelaziz, Hussein	EHS23-2326*
Abdelhameed, Mohammed Anter	EHS23-2140
Abdelnasser, Mohammad Kamal	EHS23-2140*
Abe, Satomi	EHS23-2167*
Afghanyar, Bedjan	EHS23-2117
Afghanyar, Yama	EHS23-2089
	EHS23-2116*
	EHS23-2117*
	EHS23-2118*
Afzal, Irrum	EHS23-2181*
	EHS23-2203
Agricola, Rintje	EHS23-2059
Ahmad, Sufian	EHS23-2244
	EHS23-2318
Ahmed, Hamida	EHS23-2080
Ahmed, Maryam	EHS23-2092
Akrivos, Vasileios	EHS23-2332
aksakal, ahmet murat	EHS23-2209
	EHS23-2219
Alajji, Mohammad	EHS23-2323
Albani-Forneris, Agustín	EHS23-2104
Albani Forneris, Agustín	EHS23-2186*
	EHS23-2187*
Albareda Albareda, Jorge	EHS23-2202
Albers, Christoph Emanuel	EHS23-2130
Albert-Ullibarri, Alberto	EHS23-2033
Albert Ullibarri, Alberto	EHS23-2202
Aldridge, William	EHS23-2080*
	EHS23-2085*
Alías, Alfonso	EHS23-2198*
ALLACHE, KACI	EHS23-2020*
	EHS23-2261*
Al Otti, Dalia	EHS23-2200*
Alves Batista, Nuno	EHS23-2111
	EHS23-2121
Alzohiry, Mohamed	EHS23-2131
Amemiya, Erica	EHS23-2145
Andrade, Tony	EHS23-2346
Andronic, Octavian	EHS23-2301
Anosov, Viktor	EHS23-2263
	EHS23-2268
Anthony, Christopher	EHS23-2295
Anto, Joseph	EHS23-2101
Aprato, Alessandro	EHS23-2161
Aráujo, Teresa	EHS23-2165
Ardiri, Damiano	EHS23-2300
Artiaco, Stefano	EHS23-2108
Ashkenazi, Itay	EHS23-2224
	EHS23-2225
	EHS23-2226
	EHS23-2227
	EHS23-2228
Asopa, Vipin	EHS23-2177*
	EHS23-2203
Assyov, Sasho	EHS23-2330
Ast, Michael	EHS23-2004
Attarde, Dheeraj	EHS23-2156

Audenaert, Emmanuel	EHS23-2316
Azevedo, Joana	EHS23-2205

B

Bagaria, Vaibhav	EHS23-2287
Baig, Khurram	EHS23-2312
Balaji, Gautham	EHS23-2156
Balfagón, Antonio	EHS23-2073
	EHS23-2074
Bandeira Rodrigues, Eurico	EHS23-2205
Bankes, Marcus	EHS23-2327
	EHS23-2328
	EHS23-2346
Baptista, Mário	EHS23-2119
Barbaglia, Victoria	EHS23-2035
Barbero, Ruth	EHS23-2135
Barbosa, Tiago	EHS23-2119
	EHS23-2205
Barion, Giacomo	EHS23-2232
Barreau, Xavière	EHS23-2291
	EHS23-2292
Barrés, Mariano	EHS23-2073
	EHS23-2074
Barrow, Jonathan	EHS23-2163
Bastian, Johannes Dominik	EHS23-2130
Battaglia, Antonino Giulio	EHS23-2056*
	EHS23-2060*
	EHS23-2208
Baumgärtner, Ralf	EHS23-2157
Beatti, Matias	EHS23-2028
Beaule, Paul	EHS23-2083
	EHS23-2099
	EHS23-2107
	EHS23-2109
	EHS23-2110
	EHS23-2121
	EHS23-2122
	EHS23-2266
Beck, Martin	EHS23-2157
	EHS23-2216
Becker, Alexander	EHS23-2044*
Becker, Nils	EHS23-2244
	EHS23-2313*
	EHS23-2318
Beckmann, Nicholas	EHS23-2229*
Bedino, Paolo	EHS23-2161
BEHERA, SANJIB KUMAR	EHS23-2278*
Belzile, Etienne	EHS23-2083
Benzemrane, Mohamed Amine	EHS23-2020
	EHS23-2261
Bertugli, Enrico	EHS23-2276
Betz, Ulrich	EHS23-2260
Bezza, Alessandro	EHS23-2174
B Gonçalves, Sergio	EHS23-2077
Bhargava, Kartik	EHS23-2314
	EHS23-2315
Bian, Henry	EHS23-2296
Biggi, Stefano	EHS23-2137
	EHS23-2138

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Bingham, Josh	EHS23-2139	Cacciola, Giorgio	EHS23-2201
Blümel, Stefan	EHS23-2106		EHS23-2281*
Board, Tim	EHS23-2154		EHS23-2282
	EHS23-2092		EHS23-2289*
	EHS23-2103	Camera, Andrea	EHS23-2300
	EHS23-2156		EHS23-2137*
	EHS23-2163		EHS23-2138*
	EHS23-2327		EHS23-2139*
	EHS23-2346	Canale, Carlos	EHS23-2027
Boddice, Timothy	EHS23-2295*		EHS23-2039
Bolder, Stefan	EHS23-2066		EHS23-2040
	EHS23-2237		EHS23-2043
	EHS23-2229		EHS23-2052
Bollmann, Jakob	EHS23-2137	Capuzzo, Andrea	EHS23-2137
Bolognesi, Giorgio	EHS23-2322		EHS23-2138
Bordes, Maxence	EHS23-2273		EHS23-2139
Bordini, Barbara	EHS23-2237*	Carlos Zacaron Junior, Luiz	EHS23-2069
Bos, Pelle	EHS23-2113		EHS23-2091
Boschung, Adam	EHS23-2285	Carrera, Anna	EHS23-2247
Boudali, Mounir	EHS23-2004*		EHS23-2280
Bovonratwet, Patawut	EHS23-2084	Castagnini, Francesco	EHS23-2273
Braem, Annabel	EHS23-2080	Catani, Fabio	EHS23-2276*
Braimah, Fatima	EHS23-2269		EHS23-2277*
Branco, Ricardo	EHS23-2198	Cattaneo, Gabriele	EHS23-2137
Bravo, Adriana	EHS23-2247*		EHS23-2138
Broch, Albert	EHS23-2280		EHS23-2139
	EHS23-2294*	Cavaignac, Etienne	EHS23-2338
Brodth, Steffen	EHS23-2030		EHS23-2342
Brouze, Iris	EHS23-2170	Cavaliere, Francesco	EHS23-2282
Brown, Justin	EHS23-2025	Cavaliere, Pietro	EHS23-2281
Brunner, Alexander	EHS23-2222		EHS23-2282
	EHS23-2281		EHS23-2289
Bruschetta, Antongiulio	EHS23-2282		EHS23-2300
	EHS23-2289	Chai, Yuan	EHS23-2254
	EHS23-2300		EHS23-2257
Budde, Stefan	EHS23-2313		EHS23-2285*
Büttner, Matthias	EHS23-2260	Chan, Ping Keung	EHS23-2233
Buijs, George S.	EHS23-2248	Chan, Wai Kwan Vincent	EHS23-2233
Bukkems, Esther	EHS23-2288	Chaudier, Philippe	EHS23-2323
Buljubasich, Martin	EHS23-2031	Chen, Aaron	EHS23-2004
	EHS23-2035	Cherkezov, Nikolay	EHS23-2330*
	EHS23-2186	Cheung, Amy	EHS23-2233
Burke, Michaela	EHS23-2122	Cheung, Man Hong	EHS23-2233
Busch, Vincent	EHS23-2288	Chiari, Catharina	EHS23-2179
Buttaro, Martín	EHS23-2031	Chimeno, Clara	EHS23-2198
	EHS23-2034	Chiron, Philippe	EHS23-2342
	EHS23-2035	Chiu, Kwong Yuen	EHS23-2233
	EHS23-2041	Chompoosang, Thakrit	EHS23-2024*
	EHS23-2046		EHS23-2147*
	EHS23-2104	CIRIELLO, VINCENZO	EHS23-2212
	EHS23-2141		EHS23-2214
	EHS23-2169	Civinini, Roberto	EHS23-2173
	EHS23-2190		EHS23-2236
Buttaro, Martin	EHS23-2186	Claydon-Mueller, Leica	EHS23-2302
	EHS23-2187	Claydon - Mueller, Leica Sarah	EHS23-2301
		Clode Araújo, Teresa	EHS23-2217*
C		Clohisy, John	EHS23-2083
Cabello, Joan	EHS23-2215	Cnudde, Peter	EHS23-2246*
Cabello-Gallardo, Joan	EHS23-2197	Cobb, Justin	EHS23-2019

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Colom, Juan Francisco	EHS23-2045	Derksen, Alexander	EHS23-2244
Comba, Fernando	EHS23-2104	deSmet, Koen	EHS23-2313
	EHS23-2031	Deurinck, Johnny	EHS23-2366
	EHS23-2034	Devalia, Kailash	EHS23-2339
	EHS23-2035		EHS23-2098
	EHS23-2041		EHS23-2102
	EHS23-2046	Devries, Zachary	EHS23-2109
	EHS23-2104		EHS23-2110
	EHS23-2141	Diaz-Dilernia, Fernando	EHS23-2035
	EHS23-2169		EHS23-2046*
	EHS23-2186	dikmen, göksel	EHS23-2341
	EHS23-2187	Dikmen, Goksel	EHS23-2331
	EHS23-2190	Di Laura, Anna	EHS23-2127
Cordero-Ampuero, José	EHS23-2134*		EHS23-2129
	EHS23-2135*		EHS23-2152
Correia, Guilherme	EHS23-2062*		EHS23-2153
	EHS23-2119		EHS23-2180*
	EHS23-2205*		EHS23-2182*
Corten, Kristoff	EHS23-2136		EHS23-2183*
Cossetto, David	EHS23-2255	Di Loreto, Andrea	EHS23-2172
Costa, André Miguel	EHS23-2119	Di Matteo, Vincenzo	EHS23-2087*
Costa, Francisca	EHS23-2128	Di Petrillo, Francesco	EHS23-2192
Courtin, Cyril	EHS23-2291	Di Pilla, Marina	EHS23-2087
	EHS23-2292	Divecha, Hiren	EHS23-2163
	EHS23-2293	Di via, Danilo	EHS23-2232
Coutandin, Marcel	EHS23-2116		EHS23-2235
Cubberley, Rachael	EHS23-2301		EHS23-2242
Cunha, Paulo	EHS23-2205		EHS23-2243
Currie, Susan	EHS23-2023		EHS23-2245
		Donaire-Hoyas, Daniel	EHS23-2033
		Donaire Hoyas, Daniel	EHS23-2202
		Drees, Philipp	EHS23-2116
			EHS23-2117
			EHS23-2118
			EHS23-2260
			EHS23-2128
		Duarte, Filipe	
D			
D'Amelio, Andrea	EHS23-2161*	E	
D'ANDREA, FEDERICO	EHS23-2214	Eckhard, Lukas	EHS23-2251
D'Andrea, Federico	EHS23-2192		EHS23-2260*
D'Apolito, Rocco	EHS23-2056	Ekhtiari, Seper	EHS23-2264
	EHS23-2060	Elgabry, Ahmed	EHS23-2231
	EHS23-2208*	Elhiny, Mohammad	EHS23-2172
			EHS23-2174
Daisuke, Soma	EHS23-2143	Eppel, Benjamin	EHS23-2017
Dan, Junpei	EHS23-2149	Erard, Julien	EHS23-2323
	EHS23-2178*	Ettema, Harmen	EHS23-2066
			EHS23-2237
Dantas, Pedro	EHS23-2077*	F	
	EHS23-2165	Fabião, Luís	EHS23-2062
	EHS23-2217		EHS23-2234*
Dargel, Jens	EHS23-2117		EHS23-2241*
Das, Dirk	EHS23-2059	Façanha, Ana	EHS23-2234
da Silva Sena, Leonardo	EHS23-2069		EHS23-2241
	EHS23-2091	FALEZ, FRANCESCO	EHS23-2212
		Farey, John	EHS23-2257
Davie, Ryann	EHS23-2004	Favazzi, Carlo	EHS23-2088
De Angelis, Sara	EHS23-2152*	Fazal, Ali	EHS23-2206
	EHS23-2153		
Dedeogullari, Emin	EHS23-2107		
Dedukh, Ninel	EHS23-2188		
De Geyter, Jasper	EHS23-2084		
Deleanu, Bogdan	EHS23-2286*		
de Mees, Tim	EHS23-2288*		
De Meo, Federico	EHS23-2281		
	EHS23-2282*		
	EHS23-2289		
	EHS23-2300*		

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Fernández-Valencia, Jenaro	EHS23-2198	GARCIA REY, EDUARDO	EHS23-2168
Ferre, Fabrice	EHS23-2338	Garcia Rey, Eduardo	EHS23-2114*
Ferreboeuf, Béatrice	EHS23-2323	Gautier, Emanuel	EHS23-2029
Ferrer, Josep	EHS23-2215		EHS23-2146
Ferrer-Rivero, Josep	EHS23-2197	Gehrke, Thorsten	EHS23-2326
	EHS23-2201*	Geisbüsch, Andreas	EHS23-2229
Ferrer-Rivero, Robert	EHS23-2201	Gerasimenko, Mikhail	EHS23-2263
Fessy, Michel	EHS23-2322		EHS23-2268
	EHS23-2323	Gercek, Erol	EHS23-2116
Fidanza, Andrea	EHS23-2192		EHS23-2117
FIDANZA, ANDREA	EHS23-2214		EHS23-2118
Fieiras, Cecilia	EHS23-2186	Ghiga, Lucian	EHS23-2286
Field, Richard	EHS23-2177	Ghijssels, Stijn	EHS23-2084
	EHS23-2181		EHS23-2200
Fioruzzi, Alberto	EHS23-2172	Giai Via, Riccardo	EHS23-2108
	EHS23-2174	Giardina, Federico	EHS23-2273*
	EHS23-2175	Giebel, Gregor	EHS23-2016
	EHS23-2176*	Giles, Sergio	EHS23-2198
	EHS23-2232	Gill, Kathryn	EHS23-2092
	EHS23-2235	Giribono, Matteo	EHS23-2238
	EHS23-2238	Gkekas, Nifon	EHS23-2332
	EHS23-2242*	Glod, Fabrice	EHS23-2204
	EHS23-2243		EHS23-2218
	EHS23-2245*	Godoy-Monzon, Daniel	EHS23-2068*
Fischer, Maximilian	EHS23-2151	Gómez-Álvarez, Jorge	EHS23-2070
	EHS23-2262*		EHS23-2072
Flörkemeier, Thilo	EHS23-2313	Gonçalves, Daniel	EHS23-2269
Follet, Louis	EHS23-2084*	Gonçalves, Sergio	EHS23-2077
Fontalis, Andreas	EHS23-2199	Gonçalves, Sérgio	EHS23-2165
	EHS23-2204		EHS23-2217
	EHS23-2218	González-Fernández, Enrique	EHS23-2134
Foruria, Xabier	EHS23-2033		EHS23-2135
Foster, Ryan	EHS23-2111	Graham, Ryan	EHS23-2111
Frada, Tiago	EHS23-2234	Grammatopoulos, George	EHS23-2031
	EHS23-2241		EHS23-2099
FRANCESCO, DI PETRILLO	EHS23-2212		EHS23-2106
Franco, Piero	EHS23-2173*		EHS23-2107
	EHS23-2236*		EHS23-2109
Franken, Veerle	EHS23-2154*		EHS23-2110
Frantz, Taylor	EHS23-2339		EHS23-2111
Freitas, Rolando	EHS23-2269		EHS23-2120
Frolova, Alina	EHS23-2128		EHS23-2121
Fu, Chun Him, Henry	EHS23-2227		EHS23-2122
Fu, Henry	EHS23-2233*	Grant, Helen	EHS23-2023
Fujii, Hideki	EHS23-2145	Grappiolo, Guido	EHS23-2081
Fukui, Makoto	EHS23-2094*		EHS23-2082
	EHS23-2095		EHS23-2087
	EHS23-2143		EHS23-2088
G		Green, Justin	EHS23-2344*
Galletta, Claudia	EHS23-2122	Grigouriou, Emmanouil	EHS23-2112
Galley, Julien	EHS23-2029	Grutters, Rian	EHS23-2288
Gambaro, Francesco Manlio	EHS23-2082*	Guazzoni, Edoardo	EHS23-2088*
Gambhir, Anil	EHS23-2092	Guimarães Consciência, Jose	EHS23-2077
	EHS23-2156		
Garcia, Alexander	EHS23-2170	H	
Garcia-Mansilla, Agustin	EHS23-2068	Habibi, Akram	EHS23-2224
	EHS23-2169		EHS23-2225
García-Rey, Eduardo	EHS23-2196		EHS23-2226
			EHS23-2227

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Haddad, Fares	EHS23-2228	EHS23-2016
	EHS23-2199	EHS23-2171
	EHS23-2204	EHS23-2239*
Haddad, Fares S	EHS23-2218	Hofer, André
Haefeli, Pascal C.	EHS23-2157	Holc, Fernando
Haertlé, Marco	EHS23-2244*	Hollenbeck, Justin
	EHS23-2318*	Holleyman, Richard
Hailer, Nils	EHS23-2246	
Hanke, Markus	EHS23-2025*	
	EHS23-2097	
	EHS23-2113	
	EHS23-2207	
Hanke, Markus Simon	EHS23-2130	Homm, Paul Milan
Hannink, Gerjon	EHS23-2064	Honke, Hidefumi
Harada, Naoki	EHS23-2145	Horton, Isabel
Haragus, Horia	EHS23-2286	
Hardt, Sebastian	EHS23-2003	
	EHS23-2015*	
	EHS23-2016	
	EHS23-2171	Hothi, Harry
	EHS23-2239	
Hariskov, Nikola	EHS23-2006	
	EHS23-2007	
	EHS23-2008	
	EHS23-2011	
	EHS23-2014	
Harris, Peter	EHS23-2177	Hube, Robert
Harrison, Peter	EHS23-2295	Huespe, Iván
Hart, Alister	EHS23-2152	
	EHS23-2153	Huguet, Juan Luis
	EHS23-2180	
	EHS23-2182	
	EHS23-2183	Hurschler, Christof
Hart, Alister J.	EHS23-2127	
	EHS23-2129	
Hashimoto, Kohei	EHS23-2053*	I
	EHS23-2054	ICHIKAWA, RIICHIRO
Hastie, Graham	EHS23-2163	Ichiseki, Toru
Have, Bas	EHS23-2079	
Hayama, Tetsuo	EHS23-2145	Iida, Hirokazu
Heers, Guido	EHS23-2089	
Heesterbeek, Petra	EHS23-2288	Ikemoto, Tatsunori
Heimann, Alexander	EHS23-2044	Ikeuchi, Masahiko
Heimann, Alexander Frank	EHS23-2029*	
	EHS23-2030*	Iliev, Alexander
	EHS23-2032*	Innmann, Moritz
Henckel, Johann	EHS23-2127	Innocenti, Matteo
	EHS23-2129	
	EHS23-2152	Inoue, Masahiro
	EHS23-2153	Ivanov, Plamen
	EHS23-2180	
	EHS23-2182	
	EHS23-2183	
Hepinstall, Matthew	EHS23-2224	
Hess, Rolf	EHS23-2216	Iwase, Toshiki
Heuberger, Roman	EHS23-2146	Iza, Kattalin
Hideaki, Iwata	EHS23-2126	
Hipfl, Christian	EHS23-2003	J
	EHS23-2015	Jansen, Bart

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Jeffers, Jonathan	EHS23-2019	Konstas, Athanasios	EHS23-2343*
Jehan, Shah	EHS23-2080	Koshy, George	EHS23-2098
Jenkins, Evan	EHS23-2285		EHS23-2100
Jenkinson, Mark	EHS23-2023*		EHS23-2101
Jingjit, Warakorn	EHS23-2012		EHS23-2102
Jones, Samantha	EHS23-2203	Koutalos, Antonios	EHS23-2332*
Jones, Simon	EHS23-2080	Koyluoglu, Yilmaz Onat	EHS23-2331
Jordan, Stevan	EHS23-2231*	Krüger, David	EHS23-2171
Jutte, Paul	EHS23-2055	Krull, Paula	EHS23-2016
	EHS23-2065	Kucheria, Rakesh	EHS23-2231
		Kulkarni, Ashwin	EHS23-2189*
K		Kutzner, Karl Philipp	EHS23-2089*
Kader, Deiry	EHS23-2203		EHS23-2116
Kalchschmidt, Klaus	EHS23-2335		EHS23-2117
Kaneuji, Ayumi	EHS23-2094		EHS23-2118
	EHS23-2095		
	EHS23-2143	L	
Kanno, Taiki	EHS23-2167	La Bionda, Fabio	EHS23-2056
Karachalios, Theofilos	EHS23-2332		EHS23-2060
Karatas, Yagmur	EHS23-2331	La Camera, Francesco	EHS23-2081
Karatosun, Vasfi	EHS23-2057*		EHS23-2087
	EHS23-2185*		EHS23-2088
Karaytug, Kayahan	EHS23-2331	Lamo-Espinosa, Jose María	EHS23-2070
karaytug, kayahan	EHS23-2341		EHS23-2072
Karunaseelan, Kabelan	EHS23-2019	Larrazabal, Ane	EHS23-2230
Kasai, Toru	EHS23-2126	Latallade, Valentino	EHS23-2041
Kawaguchi, Yasuhiko	EHS23-2145	Latorre, Marcos	EHS23-2031
Kawahara, Norio	EHS23-2094		EHS23-2141*
	EHS23-2095	Lawrence, Kyle	EHS23-2225
	EHS23-2143		EHS23-2226*
Keel, Marius Johann Baptist	EHS23-2130	Lebrun, Drake	EHS23-2004
Kenanidis, Eustathios	EHS23-2317*	Legarreta, María José	EHS23-2230
	EHS23-2321*	Lehner, Burkhard	EHS23-2229
Kerkhoffs, Gino M.M.J.	EHS23-2248	Leopold, Vincent Justus	EHS23-2003*
Khalifa, Ahmed	EHS23-2131*		EHS23-2015
Khanduja, Vikas	EHS23-2264		EHS23-2016*
	EHS23-2301*		EHS23-2171*
	EHS23-2302		EHS23-2239
	EHS23-2310	Lerch, Till	EHS23-2025
	EHS23-2311		EHS23-2044
	EHS23-2312		EHS23-2097*
	EHS23-2316		EHS23-2112*
	EHS23-2327		EHS23-2113*
	EHS23-2328		EHS23-2207
	EHS23-2345		EHS23-2222
	EHS23-2346	Liechti, Emanuel Francis	EHS23-2207
Kievit, Arthur J.	EHS23-2248	Likhacheuski, Yury	EHS23-2263
Kim, Paul	EHS23-2106		EHS23-2268
Kim, Young-jo	EHS23-2112	Limmahakhun, Sakkadech	EHS23-2012*
kimura, Satomi	EHS23-2126	Limone, Beatrice	EHS23-2108*
Kitajima, Hironori	EHS23-2095	Lin, David	EHS23-2266
	EHS23-2143*	Link, Björn-Christian	EHS23-2157
Kitcharanant, Nitchanant	EHS23-2012	Lixa, João	EHS23-2128*
KLEIN, Aurélien	EHS23-2322		EHS23-2290*
Klonschinski, Thomas	EHS23-2260		EHS23-2325*
Kobayashi, Fumito	EHS23-2061	Lizano-Díez, Xavier	EHS23-2197
	EHS23-2063		EHS23-2201
Kodama, Takao	EHS23-2221		EHS23-2215
Kohan, Surya	EHS23-2186	Löchel, Jannis	EHS23-2003

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Logroscino, Giandomenico	EHS23-2192	EHS23-2073*	
LOGROSCINO, GIANDOMENICO	EHS23-2212	EHS23-2074*	
	EHS23-2214	EHS23-2075*	
Lopes, Jorge	EHS23-2128	Marletta, Daniela	EHS23-2289
	EHS23-2290	Marot, Vincent	EHS23-2338
	EHS23-2325	Marqués López, Fernando	EHS23-2202
Lopes, Miguel	EHS23-2062	Martinez, Ezequiel	EHS23-2169*
	EHS23-2234		EHS23-2190
	EHS23-2241	Martinez-Lotti, Agustin	EHS23-2035
Loppini, Mattia	EHS23-2081*	Martinez Maluge, Francisco	EHS23-2027
	EHS23-2082		EHS23-2028
	EHS23-2087		EHS23-2039
	EHS23-2088		EHS23-2040
Lorente, Alejandro	EHS23-2075		EHS23-2043
Lorente, Rafael	EHS23-2075		EHS23-2052
Lu, Víctor	EHS23-2301	Martins, Jorge	EHS23-2077
Lucero, Carlos	EHS23-2104*	Martorell-de Fortuny, Lucas	EHS23-2215
	EHS23-2141	Mas-Martínez, Jesús	EHS23-2197
	EHS23-2169	Mascarenhas, Vasco	EHS23-2077
	EHS23-2190*	Massè, Alessandro	EHS23-2108
Lucero, Nicolas	EHS23-2041		EHS23-2161
Lutschounig, Marie-Christine	EHS23-2179	Mastri, Pierluigi	EHS23-2192*
Lyman, Stephen	EHS23-2346	Masuda, Takeshi	EHS23-2167
		Matziolis, Georg	EHS23-2294
M		Mau, Hans	EHS23-2326
Macaulay, William	EHS23-2224	Mazomenos, Evangelos	EHS23-2204
	EHS23-2225	Mazzoleni, Manuel Giovanni	EHS23-2172*
	EHS23-2228		EHS23-2174*
Macedo-Campos, Vítor	EHS23-2062		EHS23-2175
Macedo-Campos, Vitor	EHS23-2234		EHS23-2176
	EHS23-2241		EHS23-2232
Macmillan, Sandy	EHS23-2023		EHS23-2235
Maeda, Akihiko	EHS23-2078*		EHS23-2238
Maes, Vincent	EHS23-2255*		EHS23-2242
	EHS23-2257	Mcbryde, Callum	EHS23-2346
	EHS23-2285	Meek, Dominic	EHS23-2023
	EHS23-2296*	Meftah, Morteza	EHS23-2228
Makarov, Vasyl	EHS23-2188*	Meier, Malin Kristin	EHS23-2207*
Malheiro, Nuno	EHS23-2269		EHS23-2222*
Malik-Tabassum, Khalid	EHS23-2092*	Melsheimer, Oliver	EHS23-2016
Malviya, Ajay	EHS23-2310	Merle, Christian	EHS23-2120
	EHS23-2311	mertens, peter	EHS23-2259*
	EHS23-2312	Mikami, Takashi	EHS23-2167
	EHS23-2314	Milev, Radoslav	EHS23-2006
	EHS23-2315		EHS23-2011*
	EHS23-2316	Milev, Stanislav	EHS23-2330
	EHS23-2327	Milligan, Kenneth	EHS23-2083
	EHS23-2328	Milonakis, Nikolaos	EHS23-2317
	EHS23-2344		EHS23-2321
	EHS23-2345	Minville, Vincent	EHS23-2338
	EHS23-2346	MIZUSHIMA, MASAKI	EHS23-2340*
Mancino, Fabio	EHS23-2199*	Möller, Alexander	EHS23-2151
	EHS23-2204*	Möller, Jens	EHS23-2118
Manktelow, Andrew	EHS23-2266	Monk, Paul	EHS23-2120
Marcovigi, Andrea	EHS23-2276	Montalti, Maurizio	EHS23-2273
	EHS23-2277	Moreira, André	EHS23-2205
Marcucci, Massimiliano	EHS23-2173	Moreira, Elsa	EHS23-2269
Mariscal, Gonzalo	EHS23-2070*	Morengi, Emanuela	EHS23-2082
	EHS23-2072*		EHS23-2087

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Moreta, Jesús	EHS23-2033*	Parmar, Deovrat	EHS23-2206
	EHS23-2164	Pascual Espinosa, Jose Manuel	EHS23-2068
	EHS23-2230	Payo, Jorge	EHS23-2134
Moreta Suárez, Jesús	EHS23-2202		EHS23-2135
Morishima, Takkan	EHS23-2053	Peeters, Wouter	EHS23-2136*
	EHS23-2054*	Peirano, Favio	EHS23-2021*
Muller, Jacobus H	EHS23-2293		EHS23-2027*
Muñoz-Mahamud, Ernesto	EHS23-2198		EHS23-2028*
Murali, Priya	EHS23-2189		EHS23-2039*
Murmann, Valerie	EHS23-2032		EHS23-2040*
mutlu, muren	EHS23-2193*		EHS23-2043*
	EHS23-2195*		EHS23-2052*
	EHS23-2209*	Pellecchia, Tomas	EHS23-2028
	EHS23-2219*	Peñalver, Pablo	EHS23-2134
			EHS23-2135
N		Pereira, João	EHS23-2205
NAGATANI, TORU	EHS23-2340	Pereira, Pedro	EHS23-2290
Nakamura, Tomohisa	EHS23-2061	Pereira, Tiago	EHS23-2269*
	EHS23-2063	Perez-Abdala, Juan Ignacio	EHS23-2034
Nasser, Rima	EHS23-2019*	Pérez-Carro, Luís	EHS23-2197
Nåtman, Jonatan	EHS23-2246	Perez Abdala, Juan Ignacio	EHS23-2187
Navarro-Cano, Ester	EHS23-2247	PÉREZ BARRAGANS, FÁTIMA	EHS23-2168
	EHS23-2280*	Pérez Barragáns, Fátima	EHS23-2196*
Nero, Lucca	EHS23-2311	Perka, Carsten	EHS23-2003
Ng, Aaron	EHS23-2080		EHS23-2015
	EHS23-2085		EHS23-2016
	EHS23-2295		EHS23-2171
Nijhof, Marc	EHS23-2288		EHS23-2239
Niki, Hisateru	EHS23-2126	Peters, Rinne	EHS23-2055
Nikolchenko, Olga	EHS23-2188		EHS23-2065
Nishimura, Haruki	EHS23-2170		EHS23-2066
Nöbauer-Huhmann, Iris-Melanie	EHS23-2179		EHS23-2079*
Nogier, Alexis	EHS23-2291*		EHS23-2237
	EHS23-2292*	Phan, Philippe	EHS23-2111
	EHS23-2293*	Philippon, Marc J	EHS23-2170
Nonnenmacher, Lars	EHS23-2151*	PIERLUIGI, MASTRI	EHS23-2212
	EHS23-2262		EHS23-2214
Novais, Eduardo	EHS23-2112	Pignatti, Giovanni	EHS23-2243
		Pilot, Peter	EHS23-2013
O		Pinho, André	EHS23-2128
Oe, Kenichi	EHS23-2061*		EHS23-2290
	EHS23-2063		EHS23-2325
Özdemir, Erim	EHS23-2026*	Pinho, Pedro	EHS23-2119
Ojaghi, Reza	EHS23-2106	Plagge, Jochen	EHS23-2313
Okanoue, Yusuke	EHS23-2149*	Plastow, Ricci	EHS23-2199
	EHS23-2178		EHS23-2204
Omran, Kareem	EHS23-2123*	ploynumpon, patcharavit	EHS23-2024
Otani, Takuya	EHS23-2145*		EHS23-2147
Otsuki, Yosuke	EHS23-2061	Poglia, Pietro	EHS23-2089
	EHS23-2063	Poitras, Stephane	EHS23-2083
Ozaki, Yusuke	EHS23-2126	Poolman, Rudolf W.	EHS23-2079
Ozcan, Damla	EHS23-2057	Porter, Martyn	EHS23-2156
	EHS23-2185	Postnikov, Yury	EHS23-2198
Ozden, vahit emre	EHS23-2341*	Predescu, Vlad	EHS23-2286
OZDEN, Vahit Emre	EHS23-2331*	Pronk, Yvette	EHS23-2013*
		Pumberger, Matthias	EHS23-2003
P			EHS23-2015
Palazola, Allison	EHS23-2282	Punnoose, Anuj	EHS23-2302*
Pap, Geza	EHS23-2089	Puteo, Nicole	EHS23-2273

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Putzeys, Pierre EHS23-2204
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Rabitsch, Lukas EHS23-2179
Raj, Rhody David EHS23-2218*
Rajahraman, Vinaya EHS23-2224

RAJEEV, AYSHA EHS23-2098*

EHS23-2100*
EHS23-2101*
EHS23-2102*

Rakhra, Kawan EHS23-2109
EHS23-2110
EHS23-2121

Ramalho Silva, Eduardo EHS23-2165*

Ramasundaram, Ramesh EHS23-2231

Ramazzotti, Joil EHS23-2056

EHS23-2060

Ramesh, Angelika EHS23-2152

EHS23-2153*

Ramírez, Luis EHS23-2198

Ramos-Pascual, Sonia EHS23-2291

EHS23-2292

EHS23-2293

Randelli, Filippo EHS23-2172

EHS23-2174

EHS23-2175

EHS23-2176

EHS23-2232

EHS23-2235

EHS23-2238

EHS23-2242

EHS23-2243

EHS23-2245

Raya Roldan, David EHS23-2202*

Reddy, Anand EHS23-2100

Regenbrecht, Bertram EHS23-2258

Rehbein, Philipp EHS23-2117

Reina, Francisco EHS23-2247

EHS23-2280

Reina, Nicolas EHS23-2338*

EHS23-2342*

Rentenberger, Colleen EHS23-2179

Ricardo Neto, Sergio EHS23-2069

EHS23-2091

Richter, Jens EHS23-2335*

Rijnen, Wim EHS23-2026

Rijnen, Wim H.C. EHS23-2064

Rocha, Pedro EHS23-2165

Rodrigues, Catarina EHS23-2269

Rohe, Sebastian EHS23-2294

Rolfson, Ola EHS23-2246

Royer, Andreas EHS23-2229

Rozell, Joshua EHS23-2224

EHS23-2225

EHS23-2228

Runraksar, Suchate EHS23-2012

Rushton, Alison EHS23-2302

Rutgers, Marijn EHS23-2079

S

Sá, Pedro EHS23-2269

Saez-de-Ugarte-Sobrón, Oskar EHS23-2164

Saffarini, Mo EHS23-2291

EHS23-2292

EHS23-2293

Saito, Mitsuru EHS23-2145

Saito, Takanori EHS23-2061

EHS23-2063

Sakalouski, Aleh EHS23-2263*

EHS23-2268*

Saldaña, Laura EHS23-2114

Salvador, Antoni EHS23-2247

EHS23-2280

San-Julián, Mikel EHS23-2070

EHS23-2072

SÁNCHEZ MATEOS, JORGE EHS23-2168*

Sánchez Mateos, Jorge EHS23-2196

Santos Moreira, André EHS23-2119*

Sanz-Reig, Javier EHS23-2197

Saouti, Rachid EHS23-2248

Saracco, Michela EHS23-2192

SARACCO, MICHELA EHS23-2212*

EHS23-2214*

Sasaki, Toshie EHS23-2221*

Sates, Filip EHS23-2200

Schafroth, Matthias U. EHS23-2248

Schaible, Samuel EHS23-2130*

Scheerlinck, Thierry EHS23-2339

Scheys, Lennart EHS23-2200

Schmaranzer, Ehrenfried EHS23-2222

Schmaranzer, Florian EHS23-2025

EHS23-2044

EHS23-2113

EHS23-2207

EHS23-2222

Schmidt-Braekling, Tom EHS23-2099

Schneider, Michael EHS23-2116

Scholz, Johann EHS23-2239

Schreiner, Markus EHS23-2179

Schreurs, B. Willem EHS23-2064

Schreurs, Berend Willem EHS23-2055

EHS23-2066

EHS23-2237

Schreurs, Wim EHS23-2013

EHS23-2026

Schwab, Joseph M EHS23-2029

EHS23-2030

EHS23-2032

Schwarze, Michael EHS23-2313

Schwarzkopf, Ran EHS23-2123

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Secci, Gregorio	EHS23-2236	Stefanou, Nikolaos	EHS23-2332
Selleri, Filippo	EHS23-2277	Stefanov, Vladimir	EHS23-2000
Shah, Aishwarya	EHS23-2206*		EHS23-2005
Sharrock, Martin	EHS23-2103*		EHS23-2006
Shen, David	EHS23-2251		EHS23-2007
Shen, Tony	EHS23-2004		EHS23-2008
Siebelt, Michiel	EHS23-2059		EHS23-2011
Siebenrock, Klaus	EHS23-2044		EHS23-2014
Siebenrock, Klaus Arno	EHS23-2025	Steinbrück, Arnd	EHS23-2016
	EHS23-2097	Steinke, Hubert	EHS23-2146
	EHS23-2113	Steppacher, Simon	EHS23-2025
	EHS23-2130		EHS23-2044
	EHS23-2207		EHS23-2097
Silva, Eduardo	EHS23-2217		EHS23-2113
Silva, Luís Miguel	EHS23-2062		EHS23-2207
	EHS23-2234		EHS23-2222
	EHS23-2241	Stetzelberger, Vera M	EHS23-2170*
Silva, Miguel	EHS23-2290	Stevens, Martin	EHS23-2055
	EHS23-2325		EHS23-2065
Silva Correia, Guilherme	EHS23-2234	Su, Edwin	EHS23-2004
	EHS23-2241		EHS23-2227
Silveira Maciel, Vinicius	EHS23-2069	Suciu, Oana	EHS23-2286
	EHS23-2091	Sunil Kumar, K H	EHS23-2310*
Siney, Paul	EHS23-2156		EHS23-2311*
	EHS23-2163		EHS23-2312*
Sitnik, Alexandre	EHS23-2268		EHS23-2314*
Slullitel, Pablo	EHS23-2031*		EHS23-2315*
	EHS23-2034*		EHS23-2316*
	EHS23-2035*		EHS23-2327
	EHS23-2041*		EHS23-2328
	EHS23-2046		EHS23-2345
	EHS23-2104	Suzuki, Masahiro	EHS23-2167
	EHS23-2110	Szarek, Adrian	EHS23-2003
	EHS23-2141		
	EHS23-2169	T	
	EHS23-2186	Takahashi, Eiji	EHS23-2094
	EHS23-2187		EHS23-2095*
	EHS23-2190		EHS23-2143
Smitton, Laura	EHS23-2085	Takahashi, Nobunori	EHS23-2053
Sobau, Christian	EHS23-2017		EHS23-2054
Sochart, David	EHS23-2177	Takeuchi, Tetsuya	EHS23-2145
	EHS23-2203	Tannast, Moritz	EHS23-2029
Sogawa, Shohei	EHS23-2061		EHS23-2030
	EHS23-2063		EHS23-2032
Soma, Daisuke	EHS23-2094		EHS23-2044
	EHS23-2095		EHS23-2097
Somers, Jan	EHS23-2036*		EHS23-2113
	EHS23-2037*		EHS23-2146
Speirs, Andrew	EHS23-2109		EHS23-2154
Spence, Christopher	EHS23-2203		EHS23-2170
Spera, Marco	EHS23-2082		EHS23-2207
Spycher, Jonathan	EHS23-2216	Tarkan, Sumeyya	EHS23-2185
Stamp, Gregory	EHS23-2314	Tarrago Viana, Mauricio	EHS23-2069
	EHS23-2315		EHS23-2091
	EHS23-2345*	Tate, Rothwelle	EHS23-2023
STANISCIA, DONATO	EHS23-2214	Tavares da Silva, Miguel	EHS23-2077
Staniscia, Donato	EHS23-2192	Tavares Rabello, Bruno	EHS23-2069*
Stauffer, Edouard	EHS23-2029		EHS23-2091*
Stavropoulos, Nikolaos	EHS23-2343	Tedino, Riccardo	EHS23-2137

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	EHS23-2138	EHS23-2201
	EHS23-2139	
Teplenkij, Mikhail	EHS23-2148*	
Terrando, Silvio	EHS23-2243	
Teufel, Victoria	EHS23-2216*	
Teulieres, Maxime	EHS23-2338	
te Velde, Jens P.	EHS23-2248*	
Teves, Juan Ignacio	EHS23-2141	
Tey-Pons, Marc	EHS23-2197*	
	EHS23-2201	
	EHS23-2215*	
The, Crystallynn Skye	EHS23-2199	
Thomann, Sergio	EHS23-2216	
Thomas, Jeremiah	EHS23-2225	
	EHS23-2226	
Thut, Titus	EHS23-2089	
Tinner, Christian	EHS23-2130	
Tinoco, João Bartol	EHS23-2119	
Tiwari, Anjali	EHS23-2287	
Torii, Yukio	EHS23-2051	
Tornago, Stefano	EHS23-2137	
	EHS23-2138	
	EHS23-2139	
Torrecillas, Francisco	EHS23-2073	
Toru, Ichiseki	EHS23-2143	
Tourabaly, Idriss	EHS23-2291	
	EHS23-2292	
	EHS23-2293	
Toyoda, Takashi	EHS23-2061	
	EHS23-2063*	
Tozun, I.Remzi	EHS23-2331	
Tozun, Remzi	EHS23-2341	
Traina, Francesco	EHS23-2273	
Tsiridis, Eleftherios	EHS23-2286	
	EHS23-2317	
	EHS23-2321	
Tucker, Keith	EHS23-2177	
Turchetto, Luigino	EHS23-2245	
Tzachev, Nedelcho	EHS23-2000	
	EHS23-2005	
	EHS23-2006	
	EHS23-2007	
	EHS23-2008	
	EHS23-2011	
	EHS23-2014	
U		
Ueno, Takuro	EHS23-2019	
	EHS23-2045*	
Unsworth, Richard	EHS23-2163*	
Unver, Bayram	EHS23-2057	
	EHS23-2185	
Uriarte, Iker	EHS23-2033	
	EHS23-2164	
	EHS23-2230*	
Uriarte-Larrabeiti, Xabier	EHS23-2164*	
User Group, NAHR	EHS23-2327	
	EHS23-2345	
Uzun, Erdal	EHS23-2197	
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Valentini, Giovanni		EHS23-2173
Van Damme, Floris		EHS23-2316
Vandemeulebroucke, Jef		EHS23-2339
Vandeputte, Frans-Jozef		EHS23-2136
van der Koelen, Remy E.		EHS23-2064
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