

ORAL PRESENTATIONS AWARD SESSION

REGISTRY DATA ERRORS IN THE NATIONAL HIP FRACTURE DATABASE

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Introduction: Established in 2007, the National Hip Fracture Database [NHFD] has been the key driving force in improving care for hip fracture patients across the UK. It has facilitated the setting of standards to which all musculoskeletal units are held, and guides service development to optimise outcomes in this cohort. As with any audit, the ability to draw conclusions and make recommendations for changes in practice relies on the accuracy of data collection.

Objectives: This project aimed to scrutinise the data submitted to the NHFD from a Major Trauma Centre, focusing on procedure coding, and discuss the implications of any inaccuracies.

Methods: We performed a retrospective analysis of all procedure coding data entered into the NHFD from July 2009 to July 2014 at Cambridge University Hospitals NHS Foundation Trust. We examined 2038 cases for discrepancies, comparing procedure codes entered into the NHFD with post-procedure imaging and operative notes.

Results: The procedure coding data submitted to the NHFD was highly inaccurate, with incorrect procedure codes in 24% of the 2038 cases reviewed. In particular, coding of cemented total arthroplasty and cemented bipolar hemiarthroplasty, with coding errors in registry data of 41% and 39% respectively. Of the 69 THRs performed only 73% were correctly coded for, and only 650 of the 949 hemiarthroplasties (68%). 16% of cases coded as cannulated hip screws actually underwent primary arthroplasty. Of the 93 deaths during admission, 39 were recorded on NHFD. 10 patients had incorrect discharge dates, resulting in 57 overreported bed days.

Conclusions: This study highlights the inaccuracy of coding data entered into the NHFD from a Major Trauma Centre, with data on arthroplasty being particularly inadequate. The unreliability of procedure data leaves us unable to evaluate surgical treatment strategies using the NHFD. This has worrying implications for standard setting, service development and, consequently, patient care.

ASSESSMENT OF THE RELATIONSHIP BETWEEN PELVIC TILT AND FUNCTIONAL ACETABULAR POSITION WITH EOS 2D/3D TECHNOLOGY

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Introduction: Functional orientation of the pelvis is related to spine sagittal balance and affects the cup orientation after total hip arthroplasty (THA). Sacral slope (SS), rather than the anterior pelvic plane (APP), could represent the actual pelvic orientation. EOS radiography is a 2D/3D technique providing a full body image of the patient in standing and sitting positions. 3D images are patient-specific and take into account orientation of the spine and pelvis.

Objectives: To investigate the variation of pelvic tilt after THA, the relationship between APP and SS, and the relationships of APP and SS with acetabular inclination (AI) and anteversion (AA).

Methods: 50 consecutive patients (M:F = 28:22) underwent EOS radiography in standing and sitting positions before and 3 months after THA. 3D images were performed to measure pelvic tilt angle (PT), APP angle and SS before and after surgery. In postoperative 3D images, values of AA and AI were also measured.

Results: Standing PT angle significantly increased after surgery ($P = 0.03$), but less than 3° . No significant difference was found after surgery in sitting PT angle, standing and sitting APP angle and SS values. No relationship was found between values of APP angle and SS before and after surgery in both positions. SS values correlated with values of AA ($r = -0.61$; $P < 0.0001$;

$R^2 = 0.55$). No correlation was found between values of APP angle and values of AA and AI.

Conclusions: Pelvic parameters do not significantly change after THA. Pre-operative EOS 2D/3D measures the functional pelvis orientation according to the spine sagittal balance for each patient in standing and sitting position. Because of AAP angle changes do not correlate with pelvic orientation changes, functional cup orientation should be preoperatively planned basing on SS. Future navigation systems should include the SS parameter for each patient.

SURROGATE MARKERS OF LONG-TERM OUTCOME IN PRIMARY TOTAL HIP ARTHROPLASTY: A SYSTEMATIC REVIEW

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Introduction: Recent catastrophic failures of Metal-on-Metal (MoM) implants for primary Total Hip Arthroplasty (THA) have highlighted the need for the early identification of failing implants. There have been calls for a phased introduction of implants with close post-market surveillance.

Objectives: We aim to explore if there are validated surrogate markers of long-term outcome in primary THA to use for pre-market testing and post-market surveillance.

Methods: A systematic review of the literature was performed according to PRISMA guidelines. A search strategy was developed for Medline and Embase database. Separate search strategies were devised for Cochrane and Google Scholar databases. Each search was performed to include articles from each database from the date of their inception to 29th January 2015.

Any level of study that investigated a surrogate marker of predicting long-term outcome in primary THA in human was included.

Long-term outcome was defined as revision rate of an implant at ten years according to NICE.

Results: 1,082 studies were identified. We excluded 85 duplicates, 14 animal/in-vitro studies, 78 studies concerning hip fracture Arthroplasty, 231 not concerning primary THA, 328 studies not investigating a method to predict long-term outcome and, 231 studies not investigating revision as the outcome. This left 115 studies to be included for full article review.

Validated surrogate markers included Radiostereometric Analysis (RSA) and Einzel-Bild-Röntgen-Analyse (EBRA) measuring implant migration and wear. In addition, an Oxford Hip Score (OHS) of less than 27 was shown to correlate with higher revision rate.

Conclusions: This systematic review has found only two validated surrogate markers of long-term primary THA outcome: RSA and EBRA measuring implant migration and wear. The potential use of OHS was highlighted for post-market surveillance. However, there a number of patient, surgical and implant related risk factors to be adjusted for in any model used.

FUNCTIONAL AND RADIOLOGICAL OUTCOMES OF CERAMIC ON CERAMIC BEARING (CoC) IN CEMENTLESS TOTAL HIP ARTHROPLASTY: 10 YEARS FOLLOW UP

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Introduction: Ceramic on ceramic (CoC) is attractive alternative bearing surfaces in total hip arthroplasty (THR), which are known to reduce wear due to its chemically and biologically inert properties. Due to the improve manufacturing process of ceramics used in joint arthroplasty; past disappointing experiences like fractures and audible squeaking are gradually becoming obsolete. Although, CoC is gaining popularity among hip surgeons worldwide, there are not many long term follow up studies to compare results with other commonly used bearing surfaces.

Objectives: The objective of our study was to quantify the functional and radiological outcomes of 3rd generation CoC bearing surfaces used in cementless THR with a minimum follow up of 10 years.

Methods: Clinical notes and plain radiographs were reviewed for a total

of 124 hip replacements performed in 107 patients from February 1999 to October 2004. A senior surgeon in a tertiary referral centre performed all the operations. Contacting the patients through email, telephone and post the Oxford Hip Questionnaire were completed. The patients were also directly questioned about the presence of audible squeaking or any other sounds from the hip. The radiographs were evaluated for signs of wear, osteolysis, loosening and heterotopic ossification. The abduction angle of the acetabular component was also measured.

Results: Oxford Hip Scores were obtained for a total of 88 hips. 11 patients had passed away and 7 patients (8 hips) were lost to follow up prior to 10 years. 1 patient had a 2-stage revision to a metal on metal articulation following a deep infection 2 years postoperatively and was thus excluded from clinical analysis (no Oxford Hip Score obtained). All the 11 patients died from other medical co-morbidities while admitted in different specialties or in the community, which was verified by their medical records. The average Oxford Hip Score was 39.7 out of a maximum of 48. Survivorship at 10 years was 94.5% with revision for any cause as the end point. In this series, there was only 1 femoral head fracture, no patients reported any squeaking and there was only 1 revision for aseptic loosening. This revision was performed at 14 years post op.

Conclusions: Our results showed good clinical and radiographic outcomes for this group of patients with ceramic on ceramic hip replacements with cementless fixation with no squeaking, osteolysis or detectable wear.

IS THERE EFFECT OF HYDROXYAPATITE COATING ON THE MIGRATION OF THE SL-PLUS HIP STEM? A RSA, PROSPECTIVE DOUBLE BLIND RANDOMIZED CONTROLLED TRIAL

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Introduction: An on-going discussion is whether using a hydroxy-apatite coating enhances the ingrowth and longevity of a femoral stem in total hip arthroplasty. The best way to predict speed of ingrowth and long-term outcome is by performing a radio stereo metric analysis study. In order to study the effect of hydroxyapatite (HA) coating on the migration of the SL-PLUS hip stem, a single center RSA, prospective double blind randomized controlled trial is being conducted at the Slotervaart Center of Orthopedic Research and Education (SCORE), Amsterdam. The primary objective is to investigate the early migration of the hydroxyapatite (HA)-coated SL-PLUS stem compared to the Standard (non-coated) SL-PLUS stem by means of RSA.

Methods: RSA images were obtained direct postoperative and at 6 weeks, 12 weeks, 6 months, 12 months and 24 months. HOOS scores were obtained preoperative and at each follow up.

Translations and rotations of the hip stem were calculated using a coordinate system with its origin in the center of the stem model in the baseline evaluation and the X- and Y-axis parallel to the X- and Y-axis of the calibration box. Aligning the patient with the coordinate system of the calibration box allows describing the migrations of prosthesis components using anatomical directions. Migration results from patients with a left-sided prosthesis were recalculated following the conventions as presented in the ISO standard guidelines (ISO 16087, 2013) in order to describe the migration in anatomical terms for a right-sided prosthesis.

The migration of the hip stem was calculated with respect to the largest set of available matching bone markers in all FU moments (minimum: 4 markers) and meeting the ISO criteria for rigid body matching (Mean Error of rigid body fitting (ME) less than 0.35 mm, condition number less than 120 m-1) (ISO 16087, 2013).

Results: Demography was not different between the two groups. The main outcome, the MTPM (Maximal total points motion) showed no significant difference between the two groups at 24 months. (1,6 versus 1,2 mm). Both groups showed an initial subsidence which stabilises at 3 months for the HA coated and 6 months for the non-HA coated group. After that measurement the MPTM stayed stable in both group.

PROMS showed no difference between the groups. The HOOS_ADL improved 41.2 points (24.5) in the HA+ group and 42.5 (19.8) in the non-HA group ($p = 0.88$). For the HOOS_pain this was 36.6 (23.8) and 42.3 (16.3) respectively ($p = 0.48$).

Discussion: The migration measured with MPTM shows no significant difference between the groups, but even if the difference might have been significant

it is questionable whether it bears any clinical relevance. Both groups show a good stabilisation after initial settling of the implant. Perhaps this settling occurs somewhat faster in the HA-coated group, but the measurement moments or to wide apart to be sure about this statement.

We conclude that adding HA to a Zweymuller type stem as tested has no positive impact on the long term outcome.

ORAL PRESENTATIONS

ARTHROSCOPY AND CONSERVATIVE SURGERY

FAI AND LUMBAR STIFFNESS

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Background: Femoroacetabular impingement (FAI) may be aggravated by lumbar hyperlordosis and/or stiffness: they may increase the frequency of contact between acetabulum and femur neck even in not extreme positions. Aim of this study is to evaluate lumbar hyperlordosis and range of motion in patients with arthroscopically treated FAI and to compare those results with healthy subjects.

Materials and methods: 17 healthy volunteers (control group = CG) and 21 patients with surgically treated FAI (FAIG) were enrolled. Groups have been tested for heterogeneity of age and sex. Hip range of motion, flexibility tests, balance tests, spine morphological analysis with Spinal Mouse; gait analysis, impingement tests and quality of life were evaluated in both groups. Results were statistically analyzed with descriptive and non-parametrical tests.

Results: Two groups were comparable in terms of age and sex. Hip ROM was significantly lower in GFAI, this group showed also lower lumbar ROM, higher values of lumbar stiffness, lower results at Sit and Reach tests and higher pain scores. No other significant differences were found between the two groups.

Conclusions: Patients with FAI do not show higher hyperlordosis angles when compared to healthy subjects but present lower flexibility in lumbosacral movement. Further studies are required to understand the correlation between FAI and those limitations.

CLINICAL AND FUNCTIONAL OUTCOMES OF ARTHROSCOPIC TREATMENT FOR FEMOROACETABULAR IMPINGEMENT FOLLOWING SLIPPED CAPITAL FEMORAL EPIPHYSIS

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Introduction: Slipped capital femoral epiphysis (SCFE) may lead to symptomatic femoroacetabular impingement (FAI). We report our experience, including clinical and functional outcomes, following arthroscopic treatment for the sequelae of SCFE.

Methods: Data was collected prospectively on patients undergoing hip arthroscopy for the sequelae of SCFE (March 2007-February 2013) including demographic data, clinical findings, radiological assessment of deformity (slip angle, alpha angle and head-neck offset ratio) and other factors that may influence outcome. Patients completed the modified Harris hip score (MHHS) and non-arthritic hip score (NAHS) before and after surgery.

Results: Eighteen patients (median age = 16 years) underwent arthroscopy in the six-year period. All patients presented with hip pain and mechanical symptoms, with evidence of FAI (cam or mixed impingement). Initial slip severity ranged from 19-65 degrees (median 40.5 degrees). Patients underwent femoral head-neck offset correction by osteoplasty. Minimum follow up was 23 months. Patients demonstrated significant improvement in hip function post-operatively (mean improvement MHHS = 18.86, NAHS = 19.96). Clinical examination revealed significant improvement in range of flexion and internal rotation, with negative postoperative impingement tests for 14 of 18 patients (78%). Linear regression analysis demonstrated a strong association

($p < 0.05$) between time following SCFE and outcome, with increased time from onset being associated with poorer pre- and postoperative outcomes scores. We found no association between original slip severity and patient reported outcomes (MHHS, NAHS).

Conclusions: Symptomatic FAI following SCFE may be addressed using arthroscopic techniques. Symptomatic FAI after SCFE should be treated promptly to prevent progression to irreversible degeneration and deterioration in hip function.

A NEW MINI-OPEN ANTERIOR-OBLIQUE APPROACH FOR FEMOROACETABULAR IMPINGEMENT

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Femoroacetabular impingement (FAI) causes early hip osteoarthritis. Surgical options include arthroscopy, open or mini-open procedures for cam or acetabular resection, outcome relate to pre and postoperative function, survivorship and incidence of complications.

Objectives: Current options have shown good results but with complications such as nerve injuries and avascular necrosis. We wanted to determine whether our new mini-open approach would provide adequate exposure of the hip to treat FAI and allow return to preoperative activity with minimal complications.

Methods: 110 patients with an average age of 36 years were treated from September 2012 with minimum follow up of 12 months. All had labral changes and 78% had chondral lesions and alpha angle of more than 55 on MRI arthrogram. The mini-open anterior-oblique approach (lateral position and no traction) with 6 cm incision and controlled capsulotomy, labral repair and cam resection was done under fluoroscopy. All patients were evaluated by University of California, Los Angeles (UCLA) activity level and International Hip Outcome Tool (iHOT-12). Data entry to Non Arthroplasty Hip Register was started from mid 2014.

Results: UCLA activity level change from 3.7 to 5.7 and iHOT-12 scores from 32 to 58 were noted indicating a reliable return to preoperative activity levels. 17 patients reported a return to their specific sports. At most recent evaluation, 2 patients had been converted to total hip arthroplasty, 7 had arthroscopic debridement for recurrent symptoms. Complications included iliopsoas tendinitis in 10 cases, trochanteric bursitis in 8 cases which resolved with simple measures. No one developed osteonecrosis and there were no nerve injuries.

Conclusions: The outcome is comparable with existing treatments of FAI without any risks of nerve injury and avascular necrosis. The mini-open anterior-oblique approach for FAI is a safe and effective procedure that allows successful return to high activity levels.

MINIMALLY INVASIVE PERIACETABULAR OSTEOTOMY USING A MODIFIED SMITH-PETERSON APPROACH: TECHNIQUE AND EARLY OUTCOMES

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Introduction: Periacetabular osteotomy has been described as an effective way of treating symptomatic hip dysplasia. We describe a new minimally invasive technique using a modification of the Smith Peterson approach.

Objectives: We performed a prospective, longitudinal, cohort study to see whether there is any compromise in correction using this approach and that the procedure does not have a higher complication rate than that quoted in the literature. We also investigated whether there is an improvement in functional outcome following surgery.

Methods: 189 consecutive patients operated on between March 2010 and March 2013 were included in the study. Patients who had undergone previous pelvic surgery for DDH were excluded. There were 174 females and 15 males. The mean age was 31 years (15-56) and the mean duration of follow-up was 29 months (14-53 months). 90% of cases were Tönnis grade 0 or 1. Twenty-three patients were operated on for primary acetabular retroversion. Functional outcomes were assessed using the NAHS, UCLA and Tegner activity scores.

The surgical procedure is performed through an 8-10 cm skin crease incision; a soft tissue sleeve is elevated from the anterior superior iliac spine. The interval medial to the rectus femoris is developed. The hip joint is not opened and fixation of the osteotomy was with three 4.5 mm cortical screws. A cell saver was routinely used.

Results: For the dysplasia group the mean pre-operative lateral centre edge angle was 14.2° (-5° to 30°) and the mean acetabular index was 18.4° (4° to 40°). Post-operatively these were 31° (18° to 46°) and 3° (-7° to 29°) respectively. An allogenic blood transfusion was required in 3 patients (1.5%). The mean duration of surgery was 105 minutes. There were no major nerve or vascular complications and no wound infections. At the time of last follow-up, we noted a significant improvement in functional outcome scores: UCLA improved by 2.31 points, Tegner improved by 1.08 points, and the NAHS improved by 25.4 points.

Conclusions: We have found this approach to be safe and effective, facilitating early recovery from surgery.

PERIACETABULAR OSTEOTOMY THROUGH A MINIMALLY INVASIVE APPROACH: RADIOLOGICAL CORRECTION AND COMPLICATION PROFILE

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Introduction: Periacetabular osteotomy (PAO) has previously been shown to be a safe and effective treatment for severe hip dysplasia. More recently a minimally invasive approach has been described by Söballe et al in an attempt to reduce complications while still achieving effective acetabular re-orientation.

Objectives: In this study we report the radiological corrections achieved and complication profile of PAO procedures undertaken through the minimally invasive approach.

Methods: 106 PAOs were performed in 103 patients, by the senior author, using a minimally invasive approach from 2007-2015. Pre- and post-operative radiographs were reviewed and the degree of acetabular re-orientation was analysed. Case notes were examined retrospectively to identify haemoglobin levels and any reported complications.

Results: 73 female and 30 male patients underwent PAO procedures at a mean age of 25 years. Pre-operatively the average centre edge angle measured -1.6° with the vertical centre edge angle reading -0.2° . Post-operative radiographs confirmed correction of these values to 28.9° and 31.0° respectively. Sharp's angle was also improved from a mean value of 49.5° to 33.7° . On review of the Tönnis angle this had also been corrected from an average of 24.1° to 8.6° . The average drop in haemoglobin was calculated as 39 g/L with around 50% of the patients requiring a peri-operative blood transfusion. 5 patients reported lateral cutaneous nerve hypoesthesia and 4 had problematic screws. 2 patients underwent washouts as treatment for haematoma and infection. 3 patients had delayed union of the pubic osteotomy and a further patient reported asymptomatic osteotomy non-union.

Conclusions: The minimally invasive approach allows for accurate re-orientation of the acetabulum whilst minimising tissue damage. Our results show successful radiographic correction of the severely dysplastic hip with an acceptable complication profile when compared to previous studies evaluating the traditional approach.

TRANEXAMIC ACID REDUCES THE BLOOD LOSS AND TRANSFUSION REQUIREMENTS FOLLOWING PERIACETABULAR OSTEOTOMY

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Introduction: The efficacy of tranexamic acid (TXA) to reduce blood loss in various surgical procedures has been proven. However, there is little data about the effect of TXA on blood loss, rate of blood transfusion and thromboembolic events during periacetabular osteotomy (PAO). The reduction of blood loss during PAO promotes postoperative mobilization and reduces the risk of complications, associated with blood transfusions. The aim of the following study was to determine, if TXA can reduce both blood loss and the rate of blood transfusions. In addition we analyzed whether TXA was associated with an increased risk of thromboembolic events.

Methods: A consecutive series of 96 PAO procedures was reviewed to compare the groups immediately prior to and following the routine implementation of TXA. The TXA group received a continuous infusion of TXA with a rate of 10 mg/kg/h. The outcome was blood transfusion rate, total blood loss, length of hospital stay, and thromboembolic events.

Results: The rate of autogenic and allogeneic blood transfusion decreased from 62.5% to 12.5% ($p < 0.001$) between the non-TXA and TXA group. The average blood loss (1.9 ± 0.9 vs. 1.5 ± 0.7 , $p < 0.01$) was significantly reduced in the patients receiving TXA. No cases of postoperative thromboembolic events were identified in either group. The hospital stay was reduced from 10 days to 9 days in the TXA group.

Discussion and conclusions: The utilization of TXA reduced the transfusion rate and blood loss after PAO, without additional adverse effects such as an increased rate of thromboembolic events.

TREATMENT OF AVN USING THE CHAMBER INDUCTION TECHNIQUE AND BIOTECHNOLOGIES: INDICATIONS AND CLINICAL RESULTS

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Introduction: The necrosis of the femoral head is a fairly widespread problem especially in young people between 30 and 50 years. Excluding post-traumatic forms, the etiology is not yet fully understood. There is a higher incidence in certain groups of patients as in patients receiving high-dose steroid therapy for long periods. Several studies in the literature show that core decompression is the method of choice for the treatment of necrosis of the femoral head in the early stages, with good clinical results in the short term. For some years we have been performing core decompression in association with biotechnologies implantation (growth factors, mesenchymal stromal cells and bone substitute).

Objectives: To determinate the efficacy of core decompression technique with the use of recombinant morphogenetic proteins, autologous mesenchymal stromal cells (MSCs) and xenograft bone substitute into the necrotic lesion of the femoral head on clinical symptoms and on the progression of osteonecrosis of the femoral head.

Methods: We studied 38 patients and 40 hips with early stages of osteonecrosis of the femoral head.

Results: Core decompression technique with the use of recombinant morphogenetic proteins, autologous MSCs and xenograft bone substitute afforded a significant reduction in pain and in joint symptoms and reduced the incidence of fractural stages. At 34 months, 33 patient reach the clinical and radiographic healing.

Conclusions: This long term follow-up study confirmed that core decompression technique with the use of recombinant morphogenetic proteins, autologous MSCs and xenograft bone substitute might be an effective treatment for patients with early stages of osteonecrosis of the femoral head.

LASER OSTEOPERFORATION – A NOVEL MINIMALLY INVASIVE TECHNIQUE FOR TREATMENT OF AVASCULAR NECROSIS OF THE FEMORAL HEAD

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None of the current treatment modalities have been effective in treating avascular necrosis (AVN) of the femoral head. The main pathology is osteonecrosis due to disruption to the blood supply of the femoral head. Laser therapy is known to stimulate angiogenesis in human tissue.

Laser Osteoperforation, a novel treatment modality, is minimally invasive and potentially can reverse the process of AVN. We observed this on a clinical attachment at the Institute of Laser Surgery and Hospital in Bangladesh. This preliminary study looks at the efficacy of this intervention in treating AVN of the hip.

40 patients with 62 hips with AVN of the hip were included in this study from July 2009 to March 2013. Staging was done with the Ficat system on MRI and plain x-rays.

Under spinal anaesthetic, 16G and 18G spinal needles placed subcortically in the femoral head and neck carried a 0.4 mm quartz monofiber from skin to bone. A 970 nm diode laser performed trans-trochanteric and trans-capital osteoperforation.

Patients had bedrest for 3 weeks followed by progressive mobilization. All patients were followed up for 1 year. Pre and post-operative evaluation was assessed using the Harris Hip Score (HHS), radiographs and MRI scans.

Using the HHS, the outcomes were excellent in 40.3%, good in 21%, fair in 29% and poor in 9.7%. Mean pre-operative HHS was 31.4 and Mean postoperative HHS was 82.4. According to stages - Stage I (n = 15): 80% Excellent, 13.33% Good & 6.67% Fair. Stage II (n = 10): 60% Excellent, 20% Good & 20% Fair. Stage III (n = 17): 23.53% Excellent, 29.41% Good, 4.18% Fair & 5.88% Poor. Stage IV (n = 20): 15% Excellent, 20% Good, 40% Fair & 25% Poor. Radiological improvement was significant. 2 minor complications were seen.

Laser osteoperforation is a safe and minimally invasive way of treating AVN of the femoral head. This study shows positive results. Larger studies are needed but this is a potentially important finding in the treatment of AVN in the hip and other joints.

ORAL PRESENTATIONS

IMAGING, CONSERVATIVE AND PEDIATRICS

DOES THE FEMORAL HEAD/NECK CONTOUR IN THE SKELETALLY MATURE CHANGE OVER TIME?

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Introduction: The purpose of this study was to determine whether anterior/ anterolateral femoral head/neck contour of the hip is static or dynamic over time within the context of the cam deformity.

Methods: From a previously published cohort of 200 asymptomatic patients who had an MRI of their hips, 23 patients were randomly selected: eleven with a cam lesion and twelve with no evidence of a cam lesion in either hip. There were seven females and sixteen males with a mean age of 37.5 years (range 30-56). A repeat MRI or CT scan was then performed at mean time of 5.3 years (range, 2.5-7.2).

Results: The mean alpha angle for the entire cohort was not significantly different between the two time points with alpha angle of $43.4^\circ/53.7^\circ$ (3:00/1:30 positions) and $46.1^\circ/54.2^\circ$ (3:00/1:30 positions), respectively. Subdividing the cohort into cam negative and cam positive groups, there are no significant differences between the two alpha angle measurements. Inter-observer reliability had an intra class coefficient (ICC) at 0.96 (95% CI: .94-.97).

Conclusions: Neither group of patients demonstrated any identifiable change in the alpha angle. Consequently, screening at time of skeletal maturity would be an efficient means of identifying individuals for a possible cam deformity.

HIGH RESOLUTION NON-CONTRAST 3-TESLA MAGNETIC RESONANCE IMAGING OF THE HIP

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Background: Magnetic Resonance Arthrogram (MRA) has been the gold standard imaging of the hip when investigating for acetabular labral tears. MRA requires intra-articular injection of contrast, which can be uncomfortable for the patient and risks introducing infection. It is also proposed that MRA is not reliable for quantifying cartilage damage. High resolution non-contrast 3 Tesla Magnetic Resonance Imaging (HRNC3T MRI) of the hip may allow excellent examination of both the labrum and the cartilage.

This study was performed to assess the sensitivity and specificity of HRNC3T MRI in diagnosing labral tears in the setting of a tertiary referral high volume hip arthroscopy unit.

Methods: 100 patients who had undergone hip arthroscopy under the care of a single surgeon had a HRNC3T MRI pre-op. Four Musculoskeletal Radiology Consultants were involved in reporting these scans. All scans followed the

same scanning protocol. Operation notes and MRI reports were reviewed. Radiological findings were then compared with intraoperative findings.

Results: 85 acetabular labral tears were seen at hip arthroscopy. 59 of these were correctly identified on MRI (sensitivity of 69.1%). 15 patients were found to have no labral tear at arthroscopy. 13 MRI reports correctly reported this (specificity 87.5%). Great variation was seen between Radiologists. (Sensitivity/Specificity: Radiologist A 90.4%/100%, Radiologist B 60.8%/71.4%, Radiologist C 55.5%/100%, Radiologist D 92.3%/100%).

Conclusions: Overall sensitivity of HRNC3T MRI in detecting labral tears in this study is below that reported in the literature. In the hands of 2 reporters with special interest the sensitivity was above 90%, which is comparable to MRA studies. Specificity for all observers was comparable to published reports with MRA. This study shows that 3T MRI can be a reliable investigation, equivocal to MRA but only when observers have appropriate experience and training.

IMAGING OF OCCULT HIP FRACTURES: THE EFFECTIVENESS OF CT AND MRI

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Introduction: Annually, there are 70-75,000 fractured neck of femurs in the UK with up to 10% missed on initial radiographs. Further imaging may be necessary, provided high clinical suspicion of injury. Current guidelines recommend MRI be offered to such patients. Unfortunately in some circumstance MRI may be unavailable, unsuitable or contraindicated and thus modern Computed Tomography imaging may be used as an alternative.

Aims: Retrospectively review patients undergoing CT or MRI scans for suspected hip fracture despite negative or equivocal initial radiographs.

Methods: Patients presenting to hospital with high index of suspicion for hip fracture but negative radiographs, subsequently investigated with CT or MRI, over a 5-year period were included. The results of imaging and the requirement for surgery were recorded.

Results: A total 179 patients met inclusion criteria, 100 scanned with MRI, 77 with CT and 2 with both. The mean age was 82 ± 13 years (IQR 75-88). There was a greater delay in the time taken to obtain an MRI when compared with CT ($3.78 \text{ days} \pm 3.014$ vs. 1.78 ± 1.68 , $p < 0.05$). Occult hip fractures were detected in 71 (39.6%) of which 51 required an operative procedure. Diagnoses relating to soft tissue abnormalities were made in 28 patients with MRI. Fractures of the acetabulum, pubic rami or sacrum were diagnosed in 34 patients. No patient with a negative MRI or CT was readmitted for surgery within 12 months of scan.

Conclusions: CT and MRI can both be equally effective tools in the evaluation occult hip fractures. In order to comply with guidelines for surgical intervention within 48 hours in hip fracture patients, further imaging with either modality to facilitate a diagnosis should be sought early. Radiographically occult hip and occult pelvic fractures are not mutually exclusive. At the local centre CT and MRI did not miss fractures.

RADIOGRAPHIC EVALUATION OF HIP RESURFACING: VALIDATION OF A NEW ZONAL SYSTEM

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Introduction: Metal-on-metal hip resurfacing (MoMHRA) requires a new standardized radiographic evaluation protocol. Evaluation of the acetabular component is similar to total hip arthroplasty but the femoral component requires different criteria. Lucencies around the metaphyseal HRA femoral stem can be described with the femoral zonal system into 3 peg-zones but this doesn't account for bony changes of the femoral neck away from the stem.

Objectives: The aim of this study is to evaluate the efficacy of radiographs in identifying a problem with a resurfaced hip and correlate radiographic features with outcome.

Methods: 611 in-situ HRA (one surgeon) with minimum two radiographs at >12 months postoperatively and 100 revised HRA (55 referred) were assessed for component positioning, reactive lines \pm cortical thickening \pm cancellous condensation (borderline) and lucent lines \pm osteolysis \pm bone resorption (sinister).

Results: Radiological changes were found in 260 cases (36.7%), 151 sinister (21.2%) and 110 borderline (15.5%). 82% of revisions had sinister findings versus 11.3% of in-situ HRA ($p < 0.001$). Of the 52 revised cases with ALTR, 2 had normal Xrays, 3 borderline and 47 sinister (90.4%). Sinister radiographs were significantly associated with lower HHS (mean 85 versus 98) ($p < 0.001$), smaller sizes (median 48 versus 50) ($p < 0.001$) and ASR design (58.8%). A higher number of pathological zones was correlated with risk of revision ($p = 0.006$), ALTR ($p < 0.001$), female gender ($p < 0.001$), smaller size ($p < 0.001$), and lower HHS ($p < 0.001$).

Conclusions: There was a high correlation between radiographic findings, clinical outcome and metal in levels. However, the absence of sinister radiologic findings does not eliminate a problematic HRA and further investigations would be indicated in symptomatic patients.

CLINICAL AND MRI RESULTS IN 67 PATIENTS OPERATED FOR GLUTEUS MEDIUS AND MINIMUS TENDON TEARS WITH A MEDIAN FOLLOW-UP OF 4.6 YEARS

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Introduction: Although various techniques can be used to repair gluteal tendon tears, the long-term outcome is unclear and published studies typically involve only a small number of patients.

Objectives: To determine (1) if functional improvement can be obtained, (2) if the repairs are continuous based on MRI, and (3) which factors determine success.

Methods: Seventy-three patients were operated on between 2003 and 2010. Of these patients, 67 (62 women, 5 men) were available for review consisting of functional clinical tests and MRI of the hip and pelvis. A double-row repair was performed on all tendon tears, no matter the type of injury. Age, body mass index (BMI), fatty degeneration and muscle atrophy were also evaluated to determine if these variables affected the outcome.

Results: The average follow-up was 4.6 years (range 1-8). The pre-operative scores had improved at the last follow-up: (1) pain (VAS): 8.7 ± 1.1 versus 1.7 ± 2.7 at the follow-up, ($P < 0.001$), (2) Lequesne index: 12.3 ± 2.6 versus 4.0 ± 4.0 at the follow-up, ($P < 0.001$), (3) Harris Hip Score: 50.5 ± 8 versus 87.9 ± 15.5 at the follow-up, ($P < 0.001$). There were 11 failures (16%) including two repeat tears that were reoperated successfully. In the other 56 patients, the MRI showed no signs of the initial tear or bursitis. Of the four factors (age, BMI, fatty degeneration, muscle atrophy) that were potential predictors of the outcome, only muscle atrophy had a negative impact on functional outcome ($P < 0.05$).

Conclusions: Using an open double-row technique to repair gluteal tendon tears led to 85% of patients having good clinical results with significant improvement in symptoms and disappearance of abnormal findings on MRI. This technique can be used with all types of tendon tears, but should be performed before muscle atrophy sets in.

PROXIMAL FEMUR RECONSTRUCTION IN THE FIRST DECADE OF LIFE: THE CHALLENGE OF HIP RECONSTRUCTION IN A GROWING PATIENT

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Introduction: Proximal femur (PF) is a very rare location for bone sarcoma in first decade of life. On 238 children of this age group, affected by HG Bone sarcomas and surgically treated at author's Institution in the last twenty years, only 20 cases (8.4%) involved the PF. The authors reviewed the results of these cases where, a functional reconstruction of the hip joint was pursued by different implants.

Methods: From 1994 to 2013, 20 children (13 females and 7 males, age range 1-10, median 8) with a localised bone sarcoma (7 Osteosarcoma, 13 Ewing's Family Tumors) were surgically treated by intrarticular resection of the PF and by a limb-salvage procedure with reconstruction of the hip.

Two patients received a modular total femur (TF) megaprosthesis (1 mechanically expandable) with hinged knee and uncemented smooth tibial stem.

In 13 cases (since 1994) PF was reconstructed by an allograft/prosthesis composite (APC). with a small stem cemented into the massive bone allograft (MBA), then fixed to the residual femur by a plate.

According to the acetabular size, the femoral head was reconstructed by fixed heads in 3 children between 1 and 4 years of age. (22 mm in one case and 32 mm ceramic in two) and by bipolar cups (36-44 mm) in 12 cases (age 6-10).

In five small children (4 or 5 y/o) an original reconstructive technique was applied: the ipsilateral proximal fibula was autotransplanted with its vascular supply to the hip, with the fibular head inside the acetabulum, and with the diaphysis inserted inside a MBA, fixed to the distal femur by a plate.

Functional results were evaluated through MSTs functional score in all the patients available at last follow-up (F-up).

Results: At a mean F-up of 94 months (18-220) 13 patients are alive (65%) six after the skeletal maturity. In the 5 patients with biological reconstructions, only one girl maintained the original surgery and at 17 year follow-up displays a fascinating remodelling of the autotransplant with a normal gait. All the other four children are alive but showed mechanical (3 cases) or early septic failure (1 case) of the implant and were revised by an APC. All primary APC patients recovered walking autonomy in the first postoperative year.

One out of the 12 primary bipolar heads and two out of the 4 secondary ones were revised with uncemented acetabular cups at an interval from 5 to 17 years after the primary surgery.

In the 13 survivors the functional results at last F-up were scored as Excellent in 4, Good, in 5, Fair in 4.

Conclusions: Hip reconstruction in children is a challenge. In youngest children, APC with a small prosthetic stem cemented into a MBA reconstruct the bone stock and allow a early adequate function. Bipolar cups represent an effective and durable method that preserves the acetabulum during the skeletal growth but also fixed prosthetic heads may be useful in smallest patients.

LATE CORRECTION OF NECK DEFORMITY IN HEALED SLIPPED CAPITAL FEMORAL EPIPHYSIS – AN OPTION WITH ENCOURAGING CLINICAL OUTCOMES

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Introduction: Capital realignment is a promising technique for acute severe unstable Slipped Capital Femoral Epiphysis (SCFE). For delayed cases presenting with severe deformity osteoplasty or subtrochanteric osteotomy doesn't correct all the deformities resulting in suboptimal outcomes.

Objectives: We proposed subcapital neck osteotomy in healed severe SCFE as safer technique which corrects all the deformities at the site of deformity leading to complete restoration of hip function.

Materials and methods: Retrospective review of our hip database retrieved 41 patients with SCFE who underwent surgical dislocation. 18 patients with chronic moderate to severe SCFE formed the study group. 6 patients with open physis and chronic stable SCFE underwent capital realignment through the physis formed one group. 12 patients with fused physis with healed SCFE underwent surgical dislocation and neck osteotomy and realignment formed the other group.

Results: There were 12 boys and 6 girls in the study group with an average age at presentation of 14.2 years (11-20). The mean follow-up was 4.5 years (3-6 years). In both groups there was significant improvement in Antero-Posterior (AP) and lateral slip angles and alpha angles. For the capital realignment the mean pre-operative Modified Harris Hip Score (MHHS) and Non Arthritic Hip Score (NAHS) were 27.3 and 50.3 respectively and the mean follow-up MHHS and NAHS were 90 and 93.9 respectively ($p = 0.022$). In the neck osteotomy group the mean preoperative MHHS and NAHS were 23 and 34.8 respectively. The mean follow-up MHHS and NAHS were 90.06 and 92.18 respectively ($w = 0$; $p < 0.05$). There were no significant differences in the outcomes between the groups both clinically and radiologically. Complications included chondrolysis in the capital realignment group and non-union at the site of osteotomy in the neck osteotomy group.

Conclusions: We found that neck osteotomy was easier and equally efficacious as capital realignment surgery in chronic SCFE. Delaying the surgery after pinning might make this technique safer and straightforward to perform.

HIP JOINT REPLACEMENT IN CHILDREN

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Introduction: In the treatment of children with deforming coxarthrosis, a group of patients with signs of irreversible destruction of the hip joint which function is impossible to restore with any of the known organ sparing operations, was isolated.

Subjective: To study the possibility of restoring the function of the lower limb with total hip replacement in children.

Materials and methods: In the Turner Institute for Children's Orthopedics we performed 214 THR operations in 193 patients aged from 14 to 18 years old with deforming coxarthrosis of various origins.

In 211 cases (99%) we implanted Zweymüller cementless prosthesis. In 3 cases (1%) we used a hybrid method of fixation: cemented cup and cementless stem. As bearings we used plastic liner and metal heads (12%), ceramics (73%) and OXINIUM (15%).

Results: We carry out monitoring of all patients with the mandatory examination and X-ray control in 3 months after surgery, and then at least 1 time per year. The maximum follow-up period is 7 years. In 207 cases (97%) we obtained good results of treatment. In 7 patients (3%) we observed complications in the form of neurological disorders appeared in the early postoperative period.

Conclusions: A sufficiently long observation period and the lack of complications in a long-term period lead to the conclusion that total hip replacement is appropriate and modern treatment for adolescents with coxarthrosis of III-IV degree enabling to ease a child of pain for 3-6 months, to relieve the physical and social limitations.

INFECTION AND FAILURE RATES FOLLOWING THR IN SEPTIC ARTHRITIS: A CASE CONTROLLED STUDY

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Introduction: Total hip arthroplasty is performed as a single stage or 2 stage procedure in patients with a history of septic arthritis of the hip joint. The decision is based on whether the infection is active or resolved in the joint. Recurrence of the infection and failure of the total hip arthroplasty are the most serious complication.

Null Hypothesis: Incidence of failure due to infection following total hip arthroplasty for septic arthritis and primary osteoarthritis of the hip is the same.

Aim: To test this hypothesis in a controlled study and to analyse the results from both groups.

Patients and methods: Between March 2000 and Mar 2013, eighteen cases of septic arthritis of the hip treated with total hip arthroplasty [11 men and 7 women, Mean age 56.5 yrs (range: 30-83)], either as a single stage or 2-staged procedure were included.

The control cases [10 men and 8 women, Mean age 58yrs (range: 36-80)] had total hip arthroplasty for degenerative osteoarthritis as a elective procedure. Both groups were comparable with age, gender, BMI, follow-up period, type of anaesthesia, ASA score.

All patients included in the series had more than 18 year of follow-up.

Results: A 2-staged procedure was performed in 11/18 patients and the rest of the patients had single staged procedure, since they had no active infection in the joint.

The interval between the first stage of hip debridement and second stage total hip arthroplasty had a mean duration of 4 months (Range: 3-5 months). The hip was sterile in all the patients with septic arthritis at the time of implantation of the total hip joint.

There were no recorded complications of recurrence of infection or implant failure in the hip septic arthritis group and all of them were functioning as similar to the control group.

Conclusions: The protocol of 2- stage hip arthroplasty in presence of active infection and a single stage procedure in case of quiescent septic arthritis, in our case series achieved outcomes similar to the control group.

ORAL PRESENTATIONS

DUAL MOBILITY AND NEW APPROACHES

DUAL MOBILITY SOCKET IN PATIENTS WITH INCREASED RISK OF DISLOCATION

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Introduction: Dual mobility socket was developed in the 70's by G. Bousquet trying to solve recurrent dislocation after THA. Bousquet's prosthesis design combines minor dislocation risk with great range of movement through the application of two biomechanical principles: increasing jump distance and the recruitment phenomenon.

Objectives: Evaluate the effect of dual mobility socket to prevent dislocation in patients with increased risk of dislocation.

Methods: Authors present clinical, radiological and functional results of non consecutive series of 120 patients (47M-73F) with increased risk of dislocation, underwent total hip replacement using a dual mobility socket. Preoperative diagnosis was primary and post traumatic arthritis of the hip (42 cases) and femoral neck fractures (78 cases). All procedures were performed by a posterolateral approach. The series counts 80 non cemented dual mobility sockets and 40 cemented cups, the uncemented stems are 64 while cement was used in 56 patients.

Every case has been evaluated after 1, 3, 6 months and then annual control with x-ray exams and Harris Hip Score (HHS). Mean follow up is 3 years, (12 m to 6 yrs range).

Results: No no dislocation had been observed and no revision surgery due to accelerate liner consumption had been performed. We had 3 cases of aseptic loosening of the cup (2,5%), with no dislocation of the liner and the cup, 1 single acetabular fracture with no dislocation between the liner and the socket. No limb length discrepancy beyond 1 cm.

Conclusions: Factors increasing risk of dislocation are: muscular diseases, neurological diseases, ligament laxity in Ehler-Danlos disease or low rehabilitation compliance. Other factors are the female gender, age >75 years, posterolateral approach and preop diagnosis of femoral neck fracture.

Results are encouraging us to pursue the use of dual mobility cup to prevent dislocation in patients with elevated risk as a first choice to avoid the complication of dislocation.

PREVENTION OF DISLOCATION IN THA WITH DUAL MOBILITY ACETABULAR CUP. 14 YEARS FOLLOW UP WITH RIPO DATABASE IN ELDERLY PATIENTS WITH ALZHEIMER AND THE NEUROMUSCULAR SYSTEM DISEASES

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Introduction: Total hip arthroplasty (THA) is one of the most common surgical procedures in orthopaedic surgery.

The incidence of instability after THA in the primary surgery is 7% and revision surgery is 25%.

Risk factors for instability after THA are multifactorial and may be patient-specific (gender, age, abductor deficiency) or related to operative variables (surgical approach, component malposition, femoral head diameter).

Dislocation and instability after THA remains one of the major causes of revision surgery accounting for 32.4% of THA readmissions and 22.5% of all THA revisions in USA.

Modifications in surgical technique (e.g., anterior surgical approach, repair of posterior soft-tissues, increased offset and restoration of abductor tension) and the incorporation of larger femoral heads with greater inherent stability decrease the risk of instability after THA.

Dual mobility acetabular components (DM) have recently gained wider attention as an alternative option in the prevention and treatment of instability in both primary and revision THA.

The dual mobility component increases hip range of motion (ROM) until impingement occurs. In the first articulation the head is "engaged" but mo-

bile within the polyethylene (PE) liner and follows the typical mechanical behavior of a hard-on-soft bearing in a standard THA. However, if the femoral neck and the rim of the PE liner come into contact, a second articulation begins to function and consists of the back of the PE liner and the metallic acetabular shell. As the PE liner articulates, effective ROM is increased until impingement of the femoral neck against the rim of the shell ultimately occurs.

In this way, the head-liner complex theoretically functions as a large femoral head, increasing.

DM cups are a well-accepted treatment option for any patient at an elevated risk for instability after primary or revision THA and in the treatment of recurrent dislocation. Patients at higher risk of dislocation include patients with neuromuscular diseases, cognitive dysfunction and all patients older than 75 years with a history of prior hip surgery. In addition, the use of DM cups is indicated in revision THA for any cause primary THA after femoral neck fracture, and primary THA after tumor resection.

Materials and methods: We implanted 1127 THA with dual mobility acetabular cup from 1988 to 2013. We will not discuss the first 795 cases done until 1999 because we can not provide an accurate follow up of these patients.

We present the results of 332 bipolar cups applied from 2000 to 2013 followed up by RIPO DATABASE (Emilia Romagna Register).

Patients are over 65 years old with neuromuscular and cerebral disorders or with poor compliance.

203 patients (61%) were treated for neck fracture and 129 patients (39%) for arthrosis and head necrosis.

Results: We had 3,6% of revision surgery (12 cases): 1 acetabular fracture, 6 acetabular aseptic mobilisations, 4 acetabular septic mobilisations and only 1 THA instability with recurrent dislocation.

In our series we had only 0,3% of revision surgery for re-dislocation and a survival rate of 96,4% at 14 year.

Conclusions: Revision rate of these cups is 3,6%. This is certainly not a small number but in our opinion, seems quite acceptable because refers to patients with high risk of dislocation.

Dual mobility acetabular components can provide a viable alternative in preventing and treating instability. Concerns such as intra-prosthetic dislocation and accelerated wear have been emphasized, although they seem to be less significant in older, low-demand patients.

THE USE OF DUAL MOBILITY BEARINGS IN TOTAL HIP ARTHROPLASTY. A MULTICENTRE REVIEW OF 750 PATIENTS WITH MINIMUM 1-YEAR FOLLOW UP

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Introduction: The use of Dual Mobility (DM) bearings has become increasingly common in order to improve stability in primary and revision total hip arthroplasty (THA) surgery. The indications for the use of DM bearings include patients with a high risk of dislocation such as intracapsular femoral neck fracture, neurological diseases and primary THA for osteoarthritis in older patients with cognitive impairment.

Objectives: To evaluate the short and medium term outcomes of DM bearings in THA.

Methods: We reviewed all THA with DM bearings used at two tertiary referral hospitals between 2005 to 2014 with 1 year minimum follow up. We identified 750 patients in 3 categories:

- patients with intra-capsular femoral neck fractures treated with THA
- patients with high risk of dislocation e.g. due to neurological problems
- patients over 75 years old with primary osteoarthritis

We defined the end-points for failure as dislocation or revision for aseptic loosening.

Results: In our series, the dislocation rate was 0.4%, and the revision rate was 0.2%.

Conclusions: The use of DM bearings is associated with a very low risk of dislocation and revision in patients who are considered to be at a higher risk of developing these complications after THA.

EPONYMS IN ORTHOPEDIC SURGERY, APPROACHES TO THE HIP

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Introduction: After the low friction arthroplasty by John Charnley was no longer confined to specialized hospitals but commonplace in the general orthopedic practice, the issue remained how to most optimally reach the hip. Various approaches were already known and others were developed later. The names of the authors of these approaches remain in a lot of cases connected to the approach. These eponyms are commonly used without always the full knowledge of the background of the man behind the eponym and the way the technique was developed.

Methods: By evaluating the original articles in which the approaches are described we ascertain the original description and technique. By various sources, for instance relatives, colleagues or sometimes foundations raised in their honour, we obtain the (short) biography of the people whose name is connected to the approach.

Results: Our research covers the biographies of colleagues Smith-Petersen, Watson-Jones, Hardinge, Charnley, Moore and Ludloff. The eponymous approaches are shown and described after the short biography on each individual. The biography also encompasses the time and circumstances in which the approach was discovered and described.

Conclusions: This study shows that without the work of our colleagues we cannot proceed in our profession. The invaluable work of the people discussed is a substantial part of our daily practice and without it we would not be able to perform our surgery the way we do today. An understanding and knowledge of the people who dedicated themselves to developing the orthopedic surgery to the high standard it has today is the least honour we should give them.

ANTERIOR LONGITUDINAL OSTEOTOMY OF GREATER TROCHANTER AND PREVENTION OF EARLY DISLOCATION IN TOTAL HIP ARTHROPLASTY: UPDATED RESULTS

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Introduction: Early dislocation is a common complication of total hip arthroplasty (THA) through postero-lateral approach. Accurate soft tissue repair reduces early dislocation rate, but extra-articular impingement of the anterior margin of the great trochanter and the iliac bone, with or without soft tissue interposition, is a well recognized and underestimated etiopathogenetic cause of early dislocation in THA. Aim of this prospective study was to assess clinical and radiographic results at a minimum follow-up of six months and effectiveness of the anterior longitudinal osteotomy of great trochanter (ALOT) in the prevention of early dislocation in THA performed through a postero-lateral approach.

Materials and methods: From June 2011 to March 2015, 271 consecutive primary THAs were performed by a single surgeon (48.6% males and 49.4% females). A modified postero-lateral approach was used according to the soft tissue repair criteria, in all cases ALOT was performed at 90° or more to the antversion angle of the implant and aligned to the posterior edge of the femoral stem. All the patients underwent a clinical and radiological follow up at one, three, and six months.

Results: All patients showed a significant, early improvement of the average Harris Hip Score from 29.39 pts pre-op to 83.01 pts at three months, and 95.46 at six months post-op. In this series, only one patient reported a dislocation of THA, not related to impingement or implant placement causes that was treated with a retention cage because of severe muscle weakness. One patient suffered from a wound infection which was subsequently treated with antibiotics and had complete remission. After surgery and during the follow up period, no trochanteric fractures were detected.

Discussion: The correct positioning of the implant, head diameter, offset, soft tissues repair, absence of impingement, and patients' compliance are all elements that contribute to the prosthetic stability. Literature shows and incidence of dislocation in primary THA performed through a postero-lateral

approach ranging from 1.34% to 10% of which 91% occurs during the first six postoperative weeks.

The incidence of early dislocation was already reported in a preliminary report where the described osteotomy was performed on 189 patients was 0.53% (0.37% in the actual series), compared to a similar series from the same surgeon where the osteotomy was not performed and the dislocation rate was 1.1%, thus demonstrating the effectiveness of the ALOT.

Conclusions: The ALOT osteotomy is an effective, safe and fast procedure that can decrease the anterior impingement and early dislocation incidence in primary THA performed through a postero-lateral approach with clinical results comparable to the best reports in literature and no additional complications.

TRANSOSSEOUS 'OVER THE TOP' RECONSTRUCTION OF CAPSULE AND TENDONS AND THE PREVENTION OF HIP DISLOCATION

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Introduction: Dislocation after THP remains a devastating complication and a primary cause for revision arthroplasty. Historically, a posterior approach is more vulnerable. In this study, we present a highly reliable and anatomical reconstruction, based on the biomechanics findings of a previous cadaver experiment.

Objectives: To confirm the efficacy of a transosseous 'over-the top' repair in a clinical setting.

Methods: In a prospective cohort analysis from 1-1-2004 until 31-12-2013 data from 1085 THP were collected. 408 THP were performed using a posterior approach by one single surgeon (W.S.) and 677 THP via an anterolateral approach by one surgeon (A.L.). Early hip dislocation (<3 months) was considered as an end point. Significant differences between early dislocation rate in the cohorts were assessed using a Z-test.

Results: In the anterolateral approach, which was considered as the control group, 15 early dislocations occurred (2.2%). In the group performed via a posterior approach with enhanced repair, we noted 1 dislocation (0.2). The posterior approach resulted in significantly less early dislocations than the anterolateral approach ($p = 0.009$).

Conclusions: A careful reconstruction of the posterior hip structures (anatomical repair of the orbicular ligament and transosseous refixation of capsule and external rotators) dramatically improves stability after THP via a posterior approach. The surgical reconstruction, which has been further refined after the cadaver experiment, will be illustrated in detail.

MINIMALLY INVASIVE SUPERIOR CAPSULOTOMY: NEW FRONTIERS FOR TOTAL HIP ARTHROPLASTY. A PRELIMINARY EXPERIENCE

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Introduction: This study compares clinical and imaging outcomes of patients undergoing total hip arthroplasty (THA) using a postero-lateral minimally invasive approach (MIS group) and a standard posterolateral approach (standard group).

Materials and methods: This is a randomized controlled trial. The MIS group included 132 patients (69 males and 63 females), the standard group included 130 patients (67 males and 63 females). Patients were examined pre-operatively, at 3 months, 1 year and a minimum follow-up of 4 years after surgery using the Harris, Oxford and WOMAC hip scores, and at imaging (standardized radiographs). Patients were also asked for return to daily and recreational sport activities.

Results: The mean duration of surgery and hospitalization, the mean blood loss and the number of patients who needed for blood transfusions were significantly lower in the MIS group. The incision length averaged 7.1 cm in the MIS group, 10.7 cm in the standard group. After 2 weeks, patients who had undergone minimally invasive surgery were more able to independently get out of bed, climb stairs, and use the toilet independently. At 3 months and 1 year, the Harris, Oxford and WOMAC scores were significantly better in the MIS group. At the last follow-up, no significant inter-group differences were recorded. At the last follow-up, 22 (88%) of the 25 active patients in the MIS group practiced sport at the same level they practiced before the occurrence of symptoms to the hip; in the standard group, 16 of 26 (61.5%) active patients prac-

ticed sport at the same level they did before the occurrence of symptoms to the hip. One dislocation and an early infection occurred both in the standard group; 1 patient in the standard group developed venous thromboembolism (VTE).

Conclusions: In hip arthroplasty, the minimally invasive postero-lateral approach offers significant benefits in the early postoperative period compared with a standard postero-lateral approach.

HETEROTOPIC OSSIFICATIONS IN POSTEROLATERAL-APPROACH TOTAL HIP REPLACEMENT: INCIDENCE, RISK FACTORS AND CLINICAL RELEVANCE

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Introduction: Heterotopic ossifications (HO) are infrequent in total hip replacement and in a small amount of patients may cause pain and functional loss. They can be linked to individual predisposition, comorbidities, previous hip fractures and surgical access. Prevention is possible with medication or radiant therapy. Surgery is possible but there's an high relapse percentage.

Objectives: In this prospective study we evaluated incidence of HO, clinical significance, associated risk factors in an heterogeneous group of patients underwent total hip replacement.

Methods: We evaluated 350 patients underwent total hip replacement in our Department between January 2010 to December 2012. All surgery were performed with posterolateral surgical access without any pharmacological or radiant therapy. Brooker Classification was used. Patient age, sex, comorbidities and rate of revision surgery were evaluated in Brooker III and IV.

Results: HO were present in 35% of patients. Brooker III and IV were 7,18% (6,4% group III, 1,14% group IV respectively). Average follow-up was 13,4 months. Average age was 68,1 years. Comorbidities in patients with Brooker III were: 2 colon diverticulosis, 5 prostatic hypertrophy, 9 dyslipidaemias, 2 reumatoid arthritis, 1 previous tuberculosis e 1 monoclonal gammopathy. Comorbidities in group IV were 1 reumatoid arthritis and hip fracture, 1 non Hodgkin linfoma, 1 multiple sclerosis e 1 ulcerative colitis.

5 patients with Brooker III presented pain at extreme hip mobilization, while 2 with Brooker IV pain and functional limitation.

2 patients with Brooker IV underwent surgery to HO exeresis.

Conclusions: Significant HO (Brooker III and IV) in posterolateral surgical access are rare but can be related to pain and functional limitation.

When performing a total hip replacement in patients with previous hip neck fractures or chronic inflammatory diseases should be useful a pharmacological or radiant prophylaxis regardless of sex and age.

ORAL PRESENTATIONS ANTERIOR APPROACH

DISTAL EXTENSION OF THE DIRECT ANTERIOR APPROACH – A CADAVERIC FEASIBILITY STUDY

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Introduction: The direct anterior approach (DAA) is becoming more popular as the standard surgical approach for primary total hip arthroplasty. However, femoral complications of up to 4% have been reported. Therefore, it is important for surgeons to understand the periarticular neurovascular anatomy in order to safely deal with intraoperative complications.

Objectives: The aim of this study is (1) to investigate the surgical anatomy of the neurovascular structures anterior to the femur and (2) to describe the position of the neurovascular structures in relation to surgical landmarks relevant to the DAA.

Methods: Anatomic dissections were performed on 17 human cadavers. The branches of the motor nerve to the vastus lateralis muscle (MNVL) were dissected to the entry-point in the vastus lateralis muscle (VL). Anatomical landmarks easily identified through the DAA were located: anterior superior iliac spine (ASIS), the insertion of the gluteus minimus muscle on the vastus ridge (GM)

and the tip of the lesser trochanter (LT). The distances between the anatomical landmarks and the entry-point of the branches of the MNVL were measured.

Results: Two main branches of the MNVL were present in clearly distinguishable neurovascular bundles in 17/20 specimens. The average distances to the anatomical landmarks were: ASIS–1st bundle = 12.3 cm (range 9.7-14.5), GM–1st bundle = 3.2 cm (range 2.2-4), LT–1st bundle = 1.6 cm (range 0.7-2.8), 1st bundle–2nd bundle = 3.3 cm (range 1.8-6.1). A different branching pattern was found in 3 specimens: multiple branches of the MNVL in 2/20 and 1 branch in 1/20 specimens.

Conclusions: The motor nerve to the vastus lateralis muscle had a consistent branching pattern into 2 clearly distinguishable bundles in 85% of the specimens. Knowledge of the position of these neurovascular bundles in relation to the anatomical landmarks makes distal femoral extension of the DAA feasible and enables the surgeon to manage intraoperative complications in a safe way. However, in 15% of the specimens an alternative branching pattern was found compromising distal femoral exposure.

HIP ABDUCTOR MUSCLES FUNCTION: A SURFACE-ELECTROMYOGRAPHY ANALYSIS AFTER ANTERO-LATERAL VS DIRECT ANTERIOR MINIMALLY INVASIVE APPROACHES IN TOTAL HIP ARTHROPLASTY

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Introduction: Advantages of minimally invasive surgery (MIS) in total hip arthroplasty include faster recovery, shorter rehabilitation, decreased blood loss, less pain and a shorter scar; not less important should reduce soft tissue damage.

However approaches advertised as minimally invasive, like the postero-lateral, lateral, or with double incision, are associated with muscle and/or tendon injury.

The Antero-Lateral Minimal Invasive approach (ALMI) as described by Rottinger is a modification of the standard antero-lateral Watson-Jones approach and utilizes the intermuscular plane between the Tensor Fascia Lata (TFL) and the gluteus medius (GM). It is similar and shares the advantages of "Direct Anterior Approach" (DAA) of being muscle sparing by not violating the abductor muscles.

Objectives: The purpose of this study was to compare the clinical results and surface electromyography (s-EMG) data about abductor muscles after ALMI compared with DAA.

Materials and methods: S-EMG data of 22 ALMI patients were compared to a matched control 22 DAA. S-EMG activity for the gluteus GM and TFL was collected during each isometric and dynamic exercise and normalized based on a submaximal voluntary isometric contraction (SVIC).

Results: The s-EMG signal of the GM muscle activity during isometric and dynamic exercises was better in the DAA group compared to the ALMI group 10 days and 6 weeks after surgery ($p < 0.05$). At three and six month after surgery both groups showed significant improvements of isometric SEMG signals of GM and TFL muscles compared to pre-operative results ($p < 0.05$). Dynamic s-EMG signals of the TFL showed no significant differences between the two groups as well as compared to pre operative results.

Conclusions: ALMI have similar reduction in muscle damage and function after THA compared to DDA and therefore share the same functional recovery time. However ALMI, when compared to DAA, does not require specialized table, dissection is extensible in every direction and it has no femoral component design limitations.

LEARNING CURVE FOR MINI-INVASIVE ANTERIOR HIP APPROACH: MULTICENTRIC STUDY

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Introduction: Anterior hip replacement is an example of how the medical field is continually evolving and trying to improve outcomes for patients.

This approach has several advantages: less damage to the soft tissue by using

intermuscular and internervous planes, less pain and blood loss and a faster recovery but the learning curve is demanding and with some risks.

Materials and methods: 8 orthopaedic departments were involved in this multicentric study. We evaluated the results of the first 30 cases of each department in terms of:

1. incidence of complications
2. accuracy of components positioning

In our study we discuss 240 cases: 143 female and 97 male, average age 71,7 (22-100), 216 total hip arthroplasty 24 hemiarthroplasty.

Results: We had 41 complications in 40 patients (16,6%), only 12,9% of this complications were relevant.

14 cases (5,8%) increase surgical time, 18 cases (7,5%) longer recovery, 12 cases (5%) partial weightbearing, 15 cases (6,2) longer hospitalization.

No dislocation occurred, in only 10 cases (4,2%) we had a poor final outcome because of the complication.

In 60 patients we evaluated the positioning of the components: stem orientation compared to the femoral axis $0,9^\circ \pm 1,4^\circ (0^\circ-6^\circ)$, average inclination of the acetabular cup $46^\circ \pm 7^\circ (28^\circ-64^\circ)$.

3 stems (5%) with varo/valgus orientation more than 3° and 6 acetabular cup (10%) with an inclination less than 35° or more than 55° .

In this 60 patients we evaluated the Harris Hip Score: before the operation 56 ± 20 , after the operation 89 ± 13 .

Average surgical procedure duration: 100 ± 26 minutes.

Conclusions: With this paper we want to discuss the component positioning and the complications occurred during the learning curve for the minimally invasive anterior hip approach.

The majority of the complications had a minor impact on the final result and only in 4,2% of the cases the complication affected the final outcome.

The component positioning was good in the majority of the cases and non dislocation occurred.

In summary the minimally invasive anterior hip approach has the theoretical advantage of minimal soft tissue injury and it has been shown that the expectations of facilitated early rehabilitation can be fulfilled. The technique is perhaps more technically demanding than the other approaches but with a correct education program can be used routinely without major complication.

ANTERIOR MINIMALLY INVASIVE SURGERY FOR TOTAL HIP REPLACEMENT: LEARNING CURVE, EXPERIENCE AND OUTCOMES OF A DISTRICT GENERAL HOSPITAL SURGEON

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Introduction: Anterior Minimally Invasive Surgery (AMIS) for Total Hip Replacement (THR) is gaining popularity in some centres in the UK and Europe.

Objectives: We report our experience and outcomes of performing AMIS.

Methods: Training and approval was completed. Modifications to the instruments were performed over time based on feedback. An image intensifier was used intra-operatively. Patients underwent the same enhanced recovery protocol as for conventional THR.

Prospective data on demographics, length of stay, surgery time, complications and Oxford Hip Scores (OHS) pre and post operatively were collected. A subgroup comparison with a cohort of patients that had undergone a conventional THR by the same surgeon was performed.

Results: Forty-nine THRs on 46 patients were performed using AMIS between April 2013 and January 2015. All were done for osteoarthritis of the hip apart from one that was done for a fracture neck of femur. One patient sustained a peri-prosthetic fracture that was detected on the immediate post-operative x-ray and underwent subsequent fixation. In another case, the lateral femoral cortex was breached. This was detected intra-operatively and did not require fixation. The patient had an uneventful recovery.

Of 32 patients that had AMIS and 25 patients that had a posterior approach, the median length of stay was 4 days (IQR, 3-5) vs. 4 days (IQR, 3.5-6.5), median surgery time was 96.50 minutes (IQR, 87.25-106.75) vs. 97 minutes (IQR, 86-116.5), median pre-operative OHS was 15.5 (IQR, 9-21.5) vs. 11 (IQR, 8-16.5) and median OHS at 6 weeks was 42 (IQR, 37.5-46) vs. 40 (IQR, 32-45.5).

Conclusions: AMIS is associated with a learning curve as with the introduction of any new procedure. The early results are encouraging and comparable to those of conventional THR.

Long-term data is required to assess the outcomes of AMIS. In the meantime, we believe that it is a safe technique to use.

ANTERIOR MINIMALLY INVASIVE SURGERY (AMIS) - WHAT WE LEARNED IN THE PAST 7 YEARS

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Introduction: Minimally invasive operative approaches for the hip surgery gained a lot of attention in the last decade. Anterior approach is one of them.

Objectives: Since May 2007 and until March 2014 in a regional hospital two orthopedic surgeons conducted 148 primary and 1 revision AMIS surgery. The operative technique had to be learned and the learning curve is slow. Are there any differences in operative technique, early postoperative ambulation, limb lengthening after 7 years of experience with AMIS technique?

Methods: Retrospectively we analyzed all 149 patients, 47 male and 102 female. Mean age was 68; 52 years (range 45, 07-82, 96). The following parameters were analyzed: operative blood loss, drainage from operative wound, volume of blood reinfusion by OrthoPAS[®] system, volume of blood transfusion, duration of surgery, duration of hospitalization, postoperative limb length equality and intra operative and post operative complications.

Results: We had 3 major intraoperative complications in the first 2 years; 1 periprosthetic fracture of femur and 2 protrusions of acetabular cup. Low grade infection was the reason for two stage revision surgery. The data showed reduced intra operative blood loss: 736 ml/patient in 2007 compared to 307,27 ml/patient in 2014. The need for blood transfusion was significantly reduced: 365,71 ml of blood transfusion in 2007 compared to 31,5 ml of blood transfusion per patient in 2014. Duration of surgery (87,77 minutes in 2007 compared to 55,45 minutes in 2014) and duration of hospitalization (12,05 days in 2007 compared to 8,9 days in 2014) were diminished. Postoperative limb length discrepancy was 0,47 cm/patient in 2007 compared to 0,22 cm/patient in 2014.

Conclusions: After learning curve and 7 years of experience with AMIS technique our results show that the operative blood loss, need for transfusion, duration of operation and hospitalization and postoperative limb length discrepancy were significantly reduced. The main reason to continue with AMIS technique is the preservation of hip musculature and that for significant less post operative pain, earlier rehabilitation and satisfied patients.

DIRECT ANTERIOR APPROACH IN TOTAL HIP REPLACEMENT: COMPLICATIONS AND EARLY RESULTS IN A SERIES OF 209 PATIENTS

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Introduction: The direct anterior approach (DAA) in total hip replacement has gained popularity for its advantages such as less surgical trauma with a rapid postoperative recovery. High number of complications induced by the DAA technique are reported in the literature.

Objectives: The aim of this study was to examine the early results and peri-operative complications in a consecutive series of total hip arthroplasties performed by a single surgeon through a minimal invasive anterior approach with the aid of a positioning table.

Methods: From 2010 to 2014 we performed 212 total hip arthroplasties in 209 patients with a mean age of 63,3 ($\pm 12,31$) years. Three patients had a simultaneous bilateral total hip replacement. 94 were male, while the mean BMI was 26,4 ($\pm 3,9$). Operation time, intraoperative blood loss, postoperative blood transfusions, time of hospital stay were analyzed. Complications were classified with Clavien-Dindo Classification. Clinical and radiographic analysis were performed preoperatively, at 6 weeks and at 1 year postoperatively.

Results: The mean duration of surgery of 95 (± 20) minutes. The mean length of hospital stay was 9,2 (± 2) days. Five patients (2,3%) had dislocation and 4 (1,9%) required revision. The average cup inclination angle was 43° ($\pm 5^\circ$), in 6 cases we observed subsidence of the stem and one patient had peri-prosthetic lysis.

Conclusions: The use DAA in total hip replacement has been criticized for the high number of reported complications. In our experience we have observed a high rate of complications, however, most of these complications did not lead to any deviation of the normal postoperative clinical course or demanded only an additional ambulatory monitoring. The complications that required re-hospitalization or a second surgery have been very low. The excellent results and the small number of dislocation confirm the validity of minimally invasive DAA that preserving posterior hip muscles allows a rapid postoperative recovery.

DIRECT ANTERIOR APPROACH VS POSTERO-LATERAL APPROACH WITH A SAME IMPLANT IN 60 PATIENTS. CLINICAL AND RADIOLOGICAL FINDINGS AND REVIEW OF LITERATURE

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Introduction: Total Hip Arthroplasty outcome depends to many surgery-related factors and surgical approach has been discussed to be one of these.

Objectives: Aim of this randomized prospective study was to compare functional and radiological findings of two homogeneous groups of patients with the same prosthesis but with two different surgical approaches.

Material and methods: Between November 2013 and March 2015, 60 patients were randomized in two groups based on surgical approach. Group A: Direct Anterior Approach (DAA) and Group B: Postero-Lateral (PL).

Blood loss, Visual Analogue Scale (VAS), length of stay (LoS), Harris Hip Score (HHS) pre-operative and at 1, 3 and 12 months, complications and radiographic evaluations at 1, 6 and 12 months were considered.

Each patient received same antithrombotic prophylaxis, analgesic scheme and followed same rehabilitation protocol.

Results: The average age was 64,7 years (36-78) in Group A and 63,1 years (43-79) in B. The average follow up was 12 months (6-16). Surgical time was slightly higher in group A. Blood loss, VAS and LoS were not statistically different between two groups. HHS was better in group A vs B (79 vs 62) within the first month, but yet not statistically significant 6 month after (85 vs 84). In Group A were described 7 minor complications (5 local hematoma, 2 paresthesia in the territory of lateral cutaneous nerve) and 1 major (trochanteric fracture). In Group B: 1 minor complication (local hematoma) and no major. By radiographical findings any relevant differences were pointed out.

Conclusions: DAA is burdened by a longer learning curve and needs dedicated surgical instrumentation. DAA showed better functional results but not statistically significative in the first postoperative weeks and it has more complications than PL.

In conclusion, early functional outcome can be conditioned by surgical approach. Anyway, the ideal surgical approach is the one which surgeon has more confidence.

ONE-STAGE BILATERAL TOTAL HIP ARTHROPLASTY THROUGH A MINIMALLY INVASIVE ANTERIOR APPROACH: FUNCTIONAL OUTCOMES AND COMPLICATIONS IN 20 PATIENTS

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Background: One-stage bilateral total hip arthroplasty (THA) has many advantages such as a single hospital stay, a shorter rehabilitation time and decreased management costs per patient. The use of this strategy is limited however cause a possible increase in the perioperative complication rate. In this study our objectives were to evaluate functional outcomes and complications in patients managed with one-stage bilateral total hip arthroplasty performed by a minimally invasive anterior approach.

Hypothesis: The complication rate after one-stage bilateral total hip arthroplasty is not significantly different from that after unilateral THA.

Materials and methods: Two German surgical centres participated in a retrospective observation study of patients managed with one-stage bilateral minimally invasive THA performed by one surgeon. The 20 included patients (16 female, 4 male) had a mean age 56 years (range, 35-77) and a follow-up of 12 months.

Results: Mean hospital stay length were 10,4 days (range, 6-18), mean operative time was 148 minutes (range, 92-185), mean bloodloss intraoperatively was 687,5 ml, and mean haemoglobin levels were 14,3 g/dl preoperatively and 11 g/dl postoperatively. No perioperative complications or deaths were recorded. The Harris hip score (HHS) improved from 39,45 \pm 17,49 preoperatively to 98,45 \pm 2,04 at last follow-up. The High Activity Arthroplasty Score (HAAS) improved from 6,20 \pm 3,75 preoperatively to 15,20 \pm 1,47 after 12 months postoperatively. The general quality of life questionnaire (FLZ) improved from 62,25 \pm 10,14 to 71,15 \pm 7,34 and the health quality of life questionnaire (FLZ) improved from 60,90 \pm 8,87 to 73,10 \pm 5,23.

Discussion: The results of this multicentre retrospective study indicate that one-stage bilateral THA through a minimally invasive anterior approach is a valid alternative to two-stage bilateral THA in American society of anaesthe-

siologists score (ASA) 1, 2 and 3 patients with a preoperative haemoglobin level of about 14 g/dL. No complications were recorded.

BIOMECHANICAL RESTORATION OF HIP PARAMETERS IS SUCCESSFUL USING THE DIRECT ANTERIOR APPROACH WITH A TAPERED WEDGE STEM

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Introduction: The direct anterior approach to the hip (DAA) allows the implantation of total hip arthroplasty (THA) without any muscle section but reduced surgical field may result in poorly reconstructed hip biomechanics and improperly positioned components. In this setting, implant design plays an important role in order to achieve a proper restoration of the joint.

Objectives: To evaluate the degree of biomechanical restoration achieved with a tapered wedge stem optimized for DAA and characterized by a size specific medial curvature implanted using DAA.

Methods: Retrospective study on 30 consecutive THA with Accolade II (Stryker) implanted using the DAA. All implants were primary hip arthroplasty for osteoarthritis or avascular head necrosis. Radiological parameters were determined from a pre- and a postoperative pelvic overview x-rays, and analysed with the digital planning software TraumaCad.

The following parameters were determined on both sides: vertical (vFO) and horizontal femoral offset (hFO), vertical (vHCR) and horizontal hip centre of rotation (hHCR), abductor lever arm (ABD), leg length (LL), stem-shaft axis (ssAx) and cup inclination (CUP).

Results: After THA, the avg. hHCR had significantly medialized by 5.9 mm ($p < .001$) with no lateralization in any patient. PostOP avg. vHCR had significantly more proximal by 2.0 mm ($p < .01$).

PostOP avg. hFO had increased by 2.2 mm (NS), with 69% of the cases showing an increase and avg. ABD was unchanged.

Avg. calculated postOP leg length discrepancy (LLD) was -1.4 ± 5 mm with 76% of the cases showing a LLD within 5 mm. The ssAx was $0.4^\circ \pm 1.3^\circ$ in valgus and CUP was $41.9^\circ \pm 5^\circ$ (range 32° - 51°). Similar results were observed comparing postOP vs. contralateral side.

Conclusions: In our consecutive series of patients with a tapered wedge stem characterized by a size specific medial curvature implanted by DAA, restoration of biomechanical parameters of the hip joint and component positioning were excellent compared with data from literature.

ORAL PRESENTATIONS MODULARITY AND TAPER

FRETTING AND CORROSION - WHAT ARE THE INFLUENCING FACTORS?

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Introduction: Fretting and corrosion in modular hips is a hot topic since years, revision rates of 4% have been reported due to biological reaction to metal ions and particles. Especially bearing couples with large diameters experience high frictional moments, leading to increased micro movements in the interfaces.

Objectives: Goal was to determine the influence of the head material, the taper angle difference between head and stem, and the roughness of the stem taper on the corrosion behaviour.

Methods: A) To determine the influence of the head material and the taper angle difference on corrosion, matched cohorts of 50 ceramic and 50 CoCr retrievals each from the same manufacturer were measured to exclude mix-and-match influences.

B) To determine the influence of the roughness of the stem taper, 398 explanted metal heads from CoCr/PE bearing couples were examined. In 171 combinations, the stem material was Ti6Al4V, in 227 CoCr. Each 203 stem tapers without and 195 with micro structure were paired to minimize other influencing factors.

The taper surfaces were evaluated using a modified Goldberg score as well as quantitatively using a validated method.

Results: A) The corrosion scores of stems with ceramic heads were significantly lower ($p = 0,03$, Wilcoxon-Test) than with metal heads. The corrosion phenomena of the CoCr head were 5 to 10 times higher compared to those on the stem taper. The taper angle difference (same manufacturer) showed no significant influence on the corrosion behaviour in both cohorts.

B) No significant influence of the surface structure of the stem taper on the fretting-corrosion values has been found.

Discussion: The results of the fretting and corrosion investigations using retrievals show a significant decrease of the corrosion hazard when ceramic heads are used. This is mainly due to the finding that most of the fretting phenomena are observed at the trunnions of the CoCr heads. No influence of taper angle difference or stem taper roughness could be observed.

FEMORAL HEAD TAPER CORROSION ASSESSMENT OF A 19-YEAR RETRIEVAL DATABASE

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Introduction: The use of tapered junctions in THA has excellent results. Recent findings regarding corrosion artifacts have spurred growing interest.

Objectives: The purpose of this study was to assess an on-going 19-year retrieval database to determine correlations between severity of corrosion and time *in vivo*, head size, head offset, and head material.

Methods: Retrieved femoral heads revised from 1997 to 2015 were investigated. Tapers were scored independently by a panel according to Goldberg *et al* Tapers exhibiting worst case mechanically assisted crevice corrosion (MACC) features were further analyzed using microscopy, elemental composition, and surface geometry analysis tools. Taper profile mapping within the contact region quantified depth of material loss. Exclusion criteria included less than 1 week *in vivo*.

Results: There were 233 retrieved heads (170 CoCrMo, 63 OxZr) that met the inclusion criteria. Time *in vivo* ranged from 1 week to 15 years. The majority of the head tapers were 12/14. Head sizes ranged from 22-56 mm diameter. Corrosion scores neither correlated to time *in-vivo* ($R^2 = 0.08$) nor to the head size ($R^2 = 0.23$, $p > 0.05$). Corrosion scores showed a parabolic relationship to the head offset ($R^2 = 0.86$) with lower scores for neutral offsets. OxZr heads had lower scores as compared to CoCrMo (1.9 ± 0.7 vs 2.5 ± 1.0 , $p < 0.001$). CoCr (16) heads showed measureable material loss (range 1-103 μ m) due to MACC features such as discoloration, fretting, stem imprinting, and chromium-rich debris. The apparent material loss on 2 OxZr heads was due to blunt damage and was not due to MACC.

Conclusions: CoCrMo tapers have years of clinical success but are still associated with MACC and quantifiable material loss. Though many confounding variables may contribute to taper corrosion, no correlation was observed for head size or time *in vivo* and corrosion score. OxZr heads and more neutral offsets are associated with decreased corrosion susceptibility.

TAPER AND BEARING SURFACE ANALYSES OF CoCrMo AND OXIDIZED Zr-2.5Nb HEADS AFTER LONG-TERM HIP SIMULATOR TESTING

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Introduction: A hip simulator test was performed for 45 million cycles (Mc) to compare the long-term performance of 10 Mrad crosslinked polyethylene (XLPE) acetabular liners against 36 mm CoCrMo and oxidized Zr-2.5Nb (OxZr) femoral heads. The purpose of this study was to evaluate the tapers and bearing surfaces of the long-term simulator tested femoral heads.

Methods: CoCrMo and OxZr heads (36 mm, $n = 4$ each), assembled onto 12/14 Ti6Al4V stem trunnions, were tested in diluted calf-serum against 10 Mrad crosslinked UHMWPE on an AMTI hip simulator for 45 million cycles at 1.15 Hz using a protocol based on ISO-Bergmann profiles. Along with visual and SEM examination, tapers of the simulator tested heads were measured on a Taylor-Hobson roundness machine using the straightness function. Bearing surfaces of the heads were analysed using a RedLux 3D surface profiling technique.

Results: Fretting and corrosion were observed on the tapers of all simulator tested CoCrMo heads. The maximum depth of materials loss from the ta-

pers ranged from 5.8 μ m to 35.8 μ m. Multiple scratches and grooves were observed on the bearing surfaces of the CoCrMo heads, with maximum depth ranging from 11 to 28 μ m. The scratches and grooves on the articulating surface of the CoCrMo heads could have resulted in an increased wear for the XLPE acetabular liners, and corrosion at the head taper could have contributed to the overall material loss from the CoCrMo/XLPE bearings. In comparison, bearing surfaces of the OxZr heads appeared to be intact, and tapers showed minimal signs of fretting and corrosion with no measurable depth of material loss after simulator test for 45 Mc. This could be attribute to the ceramic oxide on the surfaces of the ceramicised metal (OxZr).

Conclusions: This long-term simulator test demonstrated that using OxZr femoral head may provide potential benefits in reducing taper corrosion as well as bearing wear associated failure in total hip arthroplasty.

ADVERSE REACTION TO METAL DEBRIS IN UNCEMENTED METAL ON POLYETHYLENE ACCOLADE-TRIDENT TOTAL HIP REPLACEMENT. A CASE SERIES AND LITERATURE REVIEW

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Introduction: Adverse reaction to metal debris (ARMD) is well recognised as a complication of large head metal on metal total hip replacement (THR) leading to pain, bone and tissue loss and the need for revision surgery. An emerging problem of trunnionosis in metal on polyethylene total hip replacements leading to ARMD has been reported in a few cases. Increased metal ion levels have been reported in THR's with a titanium stem and a cobalt chrome head such as the Accolade-Trident THR.

Objectives/methods: We present 3 cases of ARMD with Accolade-Trident THR's with 36 mm cobalt chrome head and a polyethylene liner.

Results: Metal ion levels were elevated in all three patients (cobalt 10.3-161 nmol/l). Intraoperative tissue samples were negative for infection and inflammatory markers were normal. Abnormal fluid collections were seen in all three cases and bone loss was severe in one patient leading to a proximal femoral replacement. Histology demonstrated either a non-specific inflammatory reaction in a case which presented early or a granulomatous reaction in a more advanced case suggesting a local foreign body reaction. All patients had improved symptoms post-operatively. 1 patient who had stage bilateral Accolade-Trident THR's is awaiting revision for the other side which has an MRI proven fluid collection and is symptomatic.

Conclusions: ARMD in metal on polyethylene THR's with a titanium stem represents a potential emerging problem. Further studies are required to assess whether these occurrences are rare or represent the tip of an iceberg.

STEM-NECK MODULAR TOTAL HIP ARTHROPLASTY: POSSIBLE MECHANICAL EFFECTS!

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Introduction: Recently modular neck femoral components has been considered at risk for Fretting at the stem-neck interface. Normally total joint replacement are not monitored for COCr levels in the various casities are not yet really known.

Aim: Serum, urinary levels and radiographic evaluation in patients with Modular stem first implant recalled from one company.

Matherial and methods: Analysis of 22 patients with ABG II Modular Neck From Stryker with a minium 1 year Follow up that has been checked wit serum, urinary CoCr evaluation and clinical and radiographic control.

Results: Mean serum Cr 0,63 μ g/L-1 (range 0,1-2,15 μ g/L-1), Mean serum Co μ g/L-1 (range 0,62-7,78 μ g/L-1), Mean urinary Cr 1,24 μ g/L-1 (range 0,48-2,21 μ g/L-1) and mean urinary Co 14,22 μ g/L-1 (range 3,3-31,2 μ g/L-1).

Conclusions: Nobody of the patients presente any symptoms or signs that can be attributed to the implant. In addition the offset recovery and the age seems to be correlated with high levels but this data it's quite weak and needs more follow up an patient to be confirmed. A control group is in progress at the moment of this writing.

RECALL ABGII MODULAR SYSTEM: KAPLAN MEYER AT MAXIMUM OF 6 YEARS IN A SERIES OF 170 CONSECUTIVE PATIENTS: CLINICAL RESULTS, MRI STUDY, METAL IONS AND PATIENT-ORIENTED RESULTS

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Introduction: In regard of the significant revision rate of ABG II Modular system, 3.9% at one year and 10.3% in three years, highlighted by Australian (Orthopaedic Association National Joint Replacement) Registry Annual Report, it was decided to perform a retrospective analysis of patients who has undergone total hip arthroplasty with ABG II Modular hip system.

Objectives: The aim of this research was to investigate the survival rate of ABGII modular system at maximum of 6 years.

Materials e methods: We evaluated 151 consecutive patients who underwent 163 primary total hip arthroplasty (12 bilateral). The survey consisted of 83 females and 68 males with an average age of 72.7 years, an average BMI of 31.12. These patients underwent a clinical examination, standing anteroposterior (AP) and lateral radiographs of the pelvis (to detect any signs of osteolysis), resonance imaging (MRI) with metal artifact reduction techniques, serum chromium and cobalt levels and questionnaires patient-oriented.

Results: The mean follow-up was 4.99 years. The mean value of serum cobalt, 4.92 µg/L, is higher than the normal range (0-1 µg/L), while the average value of chromium, 1.45 µg/L, is within the normal range (0-9 µg/L). The Kaplan Meier highlights a revision rate to 7 years 11.39% and a survival rate of 88.61%, whereas 11 patients died, 47 patients were lost to follow-up and 4 patients underwent to revision surgery for painful with the presence of a periprosthetic fluid collection. We also identified 4 patients at risk, with cobalt levels >10 µg/L, symptoms and fluid collections.

Conclusions: The long term clinical effects of such modular designs are unknown and these patients need to be followed for the development of symptom and with radiographs, MRI, serum metal measurement and clinical examination.

PRIMARY TOTAL HIP ARTHROPLASTY WITH MODULAR NECK STEMS. OUR EXPERIENCE AT 8-YEAR FOLLOW-UP

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Introduction: Modular hip replacements are becoming popular. Theoretical advantages of this design include optimization of femoral anteversion, limb length, and offset of the femoral component. However, modularity also increases the number of mechanical junctions that may lead to fretting, corrosion and fracture.

Objectives: To evaluate benefits and complications in modular-neck prostheses.

Methods: Patients were evaluated retrospectively at a minimum of 1 year postoperatively. From January 2007 to December 2013, 525 total hip arthroplasties (THA) were performed with a modular neck stem in our center. Stems used were Profemur Z and Profemur Xm, from Wright Medical Implant (Wright Medical Technology, Inc, Arlington, TN, USA).

Results: Four patients (4 THA) had died and 26 (29 THA) had been lost to follow-up. Latest evaluations were performed at a mean of 66 months (range, 39-92) after THA. A short-neck component was used in 201 hips, and a long-neck component in 324. A straight neck was used in 273 hips (52%), Ante-Retro 8° neck in 194 (37%), Ante-Retro 15° neck in 26 (5%) and Varus-Valgus neck in 32 (6%). Complication rate was 4% (21 cases). 1 of the 525 prostheses implanted needed revision for neck failure. There were 7 dislocations (1 reoperated), 4 deep infections (all revised), 6 cases of stem subsidence (1 reoperated), 2 intraoperative femur fracture (1 reoperated), and 1 nerve palsy (femoral). Kaplan-Meier survivorship analysis based on 525 hips at risk, with any implant revision for any reason as end point, revealed a cumulative survival rate of 97.8% at 8 years.

Conclusions: In our experience, modular neck stems are useful even for simple and difficult hips. Benefits of modularity allow for intraoperative adjustments to promote optimal positioning of the prosthesis. This should improve stability, decrease the dislocation rate, and assist in equalization of leg length.

EARLY TO MID-TERM RESULTS OF AN UNCEMENTED, MODULAR, METAL-ON-METAL TOTAL HIP ARTHROPLASTY

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Introduction: Recent controversy over the use of metal-on-metal bearings, and modular stems in total hip arthroplasty (THA) have led many surgeons to abandon these technologies. Theoretical advantages of these implants include; more accurate recreation of patient's offset and leg-length, reduced dislocation rates, and negligible wear rates. We believe that there remains a role for these technologies in carefully selected patients.

Objectives: We aim to demonstrate the early to mid-term results of an uncemented, modular, metal-on-metal hip replacement, in a consecutive series of patients.

Methods: 94 THAs were performed in 87 patients using an ACOR modular stem (Amplitude, Valence, France), coupled with a Cormet cup (Corin, Cirencester, UK). This represents a continuous series of patients under the age of 75 performed by a single surgeon. The bearing choice in each of these was a large head metal-on metal (head size 40-52). Patients were followed up clinically and radiologically to 5.3 years. Mean age at operation was 59.8, and mean BMI was 30.6.

Results: 1 patient was lost to follow up. 3 patients died during follow up. 3 patients underwent revision procedures; 1 for stem subsidence immediately post-operatively, 1 for stem fracture, and 1 for presumed ARMD. Survivorship for aseptic loosening was 100% at 5.3 years, survivorship for any cause of revision was 96.8%.

All hips were fully osseointegrated on plain x-ray.

Mean Harris hip scores improved from 44.2 pre-operatively to 94.2 at latest follow up. 19.1% experienced a squeak, all of which resolved spontaneously. Mean serum cobalt and chrome levels were 103.7 nmol/L and 73.7 nmol/L respectively at latest follow up.

Conclusions: This series demonstrates satisfactory early to mid-term results using the Acor modular stem, coupled with a Cormet uncemented cup, and a large head metal-on-metal bearing. Despite concerns about the use of modular femoral stems, and metal-on-metal articulations, we believe that these technologies still have a role to play, especially in younger high demand patients. We suggest that this implant/bearing choice should be avoided in females of child-bearing age, and in patients over 130 Kg.

ORAL PRESENTATIONS METAL ON METAL

DIFFERENCES IN THE MANAGEMENT OF METAL ON METAL HIPs: INTERNATIONAL MULTI-DISCIPLINARY TEAMS

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There are many guidelines that guide the management of patients with MOM hips. We looked to compare the differences in management of patients with MOM hips from around the world.

Six international tertiary referral orthopaedic centres were invited to participate by organising a multi-disciplinary panel consisting of 2 or more hip surgeons and a musculoskeletal radiologist. A full clinical dataset including history, blood tests and imaging for 10 patients was sent to each unit, hence all 6 units discussed the same 10 cases. Differences in the interpretation of findings, management decision and rationale for decisions were compared using quantitative and qualitative methods.

Overall agreement between orthopaedic centres recommending treatment on the management of patients with MOM hip implants was moderate (kappa = 0.6). Full agreement was seen in a third of cases, however split decisions were also seen in a third of cases. Units differed in their interpretation

of investigation findings, and put varying emphasis on serial changes in the presence of symptoms.

In conclusion, the management of raised or rising blood metal ions, cystic pseudotumours and peri-acetabular osteolysis led to inconsistent agreement between centres. Coordinated international guidance and MDT panel discussions are recommended to improve consensus in decision-making.

HOW SHOULD WE FOLLOW-UP ASYMPTOMATIC METAL-ON-METAL HIP RESURFACING PATIENTS? A PROSPECTIVE LONGITUDINAL COHORT STUDY

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Introduction: European guidance recommends annual follow-up for asymptomatic metal-on-metal hip resurfacing (MoMHR) patients, whilst the MHRA review as per local protocol.

Objectives: To determine changes that occur in MoMHRs with repeat ultrasound, and to identify factors associated with progression of ultrasound findings.

Methods: A prospective longitudinal study of 152 asymptomatic MoMHRs (122 patients) was performed. All patients were investigated in 2008 (Oxford Hip Score (OHS), radiographs, blood metal ions, ultrasound), and underwent repeat ultrasound and OHS 3-5 years later. One radiologist graded all scans (1 = normal; 2 = psoas/trochanteric bursa; 3 = pathological effusion; 4 = pseudotumour) and measured lesion volumes. Factors associated with progression between scans (increase in grade, increase in volume but same grade, change from cystic to solid pseudotumour, and need for revision) were analysed.

Results: There were 25 (17%) hips with grade increases between scans, 122 (80%) with no grade change, and 5 (3%) with grade decreases. Significant increases in grade ($p = 0.00018$) and volume ($p = 0.0058$) occurred between repeat scans. There were 29 hips (19%) with any progression between scans. Factors significantly associated with progression on ultrasound were high blood cobalt ($p = 0.00013$) and chromium levels ($p = 0.00065$), decrease in OHS, ($p = 0.043$), and high initial ultrasound grade ($p = 0.003$) and volume ($p = 0.036$). Fifty asymptomatic MoMHRs had low initial blood cobalt and chromium levels ($<2 \mu\text{g/l}$) and normal initial ultrasound scans. The diagnostic test characteristics for having no evidence of progression of ultrasound findings on repeat examination for this subgroup were: sensitivity 40%, specificity 97%, positive predictive value 98%, negative predictive value 27%.

Conclusions: Asymptomatic MoMHR patients with normal blood metal ions and ultrasound imaging do not require repeat follow-up within 5 years. Annual European follow-up of asymptomatic MoMHRs is costly and unnecessary.

CONDITIONS INFLUENCING COBALT AND CHROMIUM CIRCULATING IONS LEVEL IN METAL-ON-METAL PATIENTS

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Among the factors accounted as responsible for the high failure rates of big head metal-on-metal hip implants there are the release and accumulation of metal ions.

The conditions leading to cobalt and chromium ions increase in MoM patients could be related to three different aspects:

1. Prosthesis properties (head diameter, cup model, trunion)
2. Surgeon ability/choice (position of the cup)
3. Patient features (sex, specific and non specific response, transport system, renal function, hepatic detoxification)

Several of our studies were addressed to some of those aspects.

One of these, on 95 retrieved devices, showed how trunion presence could affect the production of debris in metal-on-metal vs ceramic-on-ceramic patients. These data together with other our results showing that type and quantity of metal debris in synovial fluid and blood cobalt levels are correlated, demonstrate the important role of trunion in the production of metal ions.

Another study on 12 subjects was designed to observe the patient specific capability to eliminate metal ions after revision surgery. While for cobalt all the patients were able to completely excrete cobalt ions within 5-7 months after MoM bearing removal, for chromium ions it didn't happen.

Other two different approaches were performed to better understand the subject specific capability to transport metal ions (albumin study) and to manage the response to them (heme-oxygenase-1 study):

- a mutational screening of *ALBUMIN* gene was conducted in 30 MoM prosthetic patients resulting in the absence of nucleotide changes compared with the *ALB* reference sequence. To this study was also added the analysis of expression of modified albumin protein;
- a gene and protein expression study on 44 patients of heme-oxygenase-1, that is one of the most important antioxidant enzyme induced by metallic ions, was performed. This study resulted in no statistically significant differences in the expression of the gene and protein heme-oxygenase-1 between prosthetic and non prosthetic patients, as well as between patients with high and low ions levels.

Our results show that, while trunion is a prosthesis-related condition influencing the level of metal ions, the protein studied (albumin and heme-oxygenase-1) seem to be not involved in determining chromium and cobalt ions level. On the other hand chromium and cobalt elimination rates are different, but similar in all patients analyzed, suggesting that this process could be not patient-related.

We support the importance of researching more about ions transport within the organism once released by hip prosthesis, about the chemical species involved, the districts where they are contained and the mechanisms of elimination, not excluding the existence of a subjective susceptibility to these metals ions.

THE PROBLEM OF METAL ON METAL, OUR EXPERIENCE IN 59 CASES

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Objectives: Recently, concerns have arisen about metal-on-metal (MoM) total hip arthroplasty (THA) due to their potential responsibility in systemic and local adverse reaction to metal debris (ARMD). Purposes of this study were to identify abnormal wear, observe the role of ions alarm levels in the diagnosis of ARMD and describe histopathology of soft tissues surrounding MoM-THAs failed.

Methods: 59 primary MoM-THAs had follow-up consisting in periodical orthopedic controls using Oxford Hip Score (OHS), radiographs and testing whole blood cobalt and chromium ions. A Metal artifact reduction sequence (MARS) MRI and an eventual revision surgery was proposed to patients with anomalies in previous exams. During the surgery were collected material to exam. The prosthesis articular surface was analyzed by a contact-scanner, blood samples using Inductively coupled plasma mass spectrometry (ICP-MS), while tissue morphology was graded in light microscopy.

Results: 8 prosthesis need a revision. The mean linear wear was $2.42 \mu\text{m}/\text{year}$ (range 0,41-16,54) for the femoral head and $1.27 \mu\text{m}/\text{year}$ (range 0,10-2,98) for the liner. Light microscopy revealed significant signs of corrosion at the interface head-neck in 7 of these implants. Only in 3 MoM-THA revisioned, whole blood ions levels were higher than $7 \mu\text{g/l}$ actually indicated as alarm: mean chromium $5.35 \mu\text{g/l}$ (range 0,16-11,95); mean cobalt $4.37 \mu\text{g/l}$ (range 0,35-18,7).

Histology of soft tissue revealed a mixed inflammatory cell infiltrate and extensive superficial necrosis. Inflammatory cells pattern was different in each case.

Conclusions: ARMD occurs also around MoM with low wear of bearing surfaces. Hypothesizing multiple sites of releasing metal particles, it could not be excluded ARMD also in others material matchings. Metal ions measurements can be used as diagnostic index of wear, but should be integrated with clinical and radiological aspects in a multilayer follow-up. The pathogenesis of ARMD is still unknown.

557 METAL-ON-METAL CORAIL-PINNACLE TOTAL HIP REPLACEMENTS WITH 36 MM HEADS. A 5 YEAR FOLLOW UP: LEVELS OF ARMD REMAIN LOW DESPITE A COMPREHENSIVE SCREENING PROGRAM

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Introduction/objectives: We conducted a retrospective study to assess the prevalence of adverse reactions to metal debris (ARMD) and the clinical significance after implantation of the 36 mm Corail/Pinnacle Metal on Metal (MoM) total hip replacement (THR) (DePuy Orthopaedics, Johnson and Johnson, Warsaw, Indiana).

Methods: Between 2006 and 2011, 557 sequential 36 mm MoM THRs were performed in 525 patients (355 females; 170 males) with a mean age of 76 and a median follow up of 5.6 years (range 3.4 to 9) were followed according to the UK Medicines and Healthcare Products Regulatory Agency (MHRA) guidelines. This included measurement with blood Cobalt and Chromium levels, Oxford Hip Scores (OHS), plain radiographs and subsequent ultrasound/revision in symptomatic patients.

Results: At 62 months following the start of the MoM follow up program, 12 cases have been revised for reasons of ARMD (2.2%) and 20 non-ARMD associated revisions (3.5%). The mean survivorship was 92.8% (Range - 91.6-94% 95% CI).

92% of patients were asymptomatic. Of the 476 patients that had blood tests, elevated levels of either Cobalt and/or Chromium were found in 85 patients (17.8%) above MHRA guidelines. Chromium was never independently elevated (without Cobalt) but Cobalt was elevated independent of Chromium levels in 75% of cases. Metal ion levels had no correlation with cup inclination angle (mean inclination angle 42°). There was no significant link between metal ion levels and symptoms or OHS. The mean OHS was 38/48. A low OHS was the sole predictive factor in assessing those patients that are symptomatic or not. 12 hips were revised for Adverse Reaction to Metal Debris ARMD. The dislocation rate was 0.69%.

Conclusions: While survivorship and function of the 36 mm MoM head is better than that of the larger metal MoM head sizes and other 36 mm studies, it remains unacceptably high. The presence of independently elevated Cobalt levels may indicate that wear is corrosion at the head-neck taper junction rather than the bearing surface.

The MHRA guidelines offer an excellent framework for follow-up however the management of the pain-free hip with abnormal bloods and normal imaging and the symptomatic hip with normal imaging and bloods remains difficult. Metal ions and imaging act only as an aide for management.

The significance of the larger (and stiffer) implants causing less Cobalt release is interesting and may be because of less head-neck taper corrosion as shown by other studies.

MID TERMS RESULTS OF 486 CONSERVE PLUS® HIP RESURFACINGS. MEDIUM FOLLOW UP AT 7.2 YEARS

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Introduction: Hip resurfacing has been considered a viable alternative in young and active patients. The theoretical advantages such as the ability to restore the anatomy, preserve bone stock, and offer excellent functional results in the medium term have been called into question by the recent controversy about the metal on metal bearings and its possible disastrous consequences.

Objectives: The study presents the results of 486 implants at medium follow up obtained in a hip surgery based department.

Methods: A series of 486 hip resurfacing arthroplasties Conserve Plus® Wright - Microport, carried out between July 2003 and September 2008. The follow-up was 7.2 years (4 to 9.4). Patients were evaluated clinically with Merle d'Aubigné-Postel, Harris and WOMAC scores. The implants were evaluated radiographically. Were recorded the surgical times, the bleeding, the size of the components, as well as the complications.

Result: The mean inclination of the acetabular component was 43.4° (35°-58°), the mean CCD femoral angle was 137.9° (127°-150°). Hospital stay was longer in cases operated by posterolateral approach, as well as the global bleeding. We observed at mean follow-up a marked improvement in all clinical and func-

tional scores. Revision cases were 10, one of which due to infection. We observed revision case for persistent posterolateral bursitis due to metal debris, finally diagnosed as a case of delayed metal hypersensitivity. At medium follow up of 7.2 years the survivorship of our resurfacing series in 486 cases was 97.9% with a failure rate of 2.1%.

Conclusions: We still consider that hip resurfacing is a minimally invasive procedure, in terms of saving bone, bleeding and hospitalization, when compared to a traditional system. The survival rate observed encourages us to maintain this indication, but with restriction in the indication to young osteoarthritic adult male patients.

HIP ARTHROPLASTY WITH METAL-ON-METAL TRIBOLOGY: 10-YEAR FOLLOW-UP AND IONIC RELEASE TREND IN 36 MM HEAD IMPLANTS

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Introduction: Metal-on-metal (MoM) bearings have been used as alternative to polyethylene. Concerns about systemic metal ion release and reports of adverse local soft tissue reactions have reduced the use. Today information regarding prevalence and risk factors for adverse reactions are scarce and there is no agreement about the management of patients with MoM.

Objectives: Purpose of this study was to report the 10-year outcome of a population composed of young people, with high functional requests and 36 mm prosthetic heads. Moreover we want to assess the incidence of adverse reactions to metal debris (ARMD) and trends of ionic release.

Methods: We conducted a prospective study on 54 patients with 36 mm MoM heads (Pinnacle acetabular shell), mean age of 57 years and a mean follow-up of 10.1 years. Clinical scores and plain radiographs were collected at time 0, 6, 12, 24, 60 and 120 months for all patients. From time 0 to 60 months, 34 patients were randomized for blood ions measurements. At 120 months ions concentration was examined in all 32 patients remained. Ultrasounds and resonance for high risk patients.

Results: Four hips were revised: survivorship was 91.1% and 93.2% when excluding revised for reasons not hip-related. Outcome was good in 93.5%. Median blood cobalt levels rose until 12 (p: 0.0001), then we saw a stabilization, followed by a new increase from 60 to 120: 2.20 µg/L (p: 0.002). Median chromium levels rose from 0 to 12 (p: 0.0001) and then remained constants: 0.70 µg/L. The incidence of ARMD was from 8.6 to 14.2%. There is no correlation between ions concentration and ARMD.

Conclusions: This study indicates that the clinical and radiological results following MoM are satisfactory with low revision rates at ten year. We have described a second run-in phase: the consequences have to be evaluated. Incidence of ARMD is low but is not correlated with ions concentration and so it doesn't seem to have a good predictive value for the screening.

MEDIAL CALCAR EROSION IS ASSOCIATED WITH SYNOVIAL THICKNESS IN PATIENTS WITH ASR XL TOTAL HIP ARTHROPLASTY

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Introduction: Medial calcar erosion is a late finding in patients with severe adverse local tissue reactions (ALTR) following total hip arthroplasty (THA) with dual modular neck stems.

Objectives: To evaluate if medial calcar erosion is also present in patients with standard stems in metal-on-metal (MoM) THA.

Methods: 96 patients (108 hips) with MoM THA had radiographs and an MRI of the hip performed at a mean time of 5.7 years after surgery. The mean age of the patients at the time of MRI was 72 years (range 42-99) and 44% (42 patients) were women. Medial calcar erosion was assessed from radiographs. Atypical medial calcar erosion was defined as 1) any radiolucency or endosteal scalloping emerging from the cranial edge of the medial femoral stem-calcar interface (denoted "stem-interface erosion"), or 2) any "bite type" sign of endo- or periosteal scalloping in the remainder of the medial calcar above the lesser trochanter (denoted "cranial-medial erosion"). The diameter, volume, synovial thickness and Anderson grade of ALTRs were assessed from MR images.

Results: Calcar erosion was present in 50% (n = 54) of hips. Stem-interface erosion was present in 16% (n = 17) of the hips while 11% (n = 12) had erosion in the cranial-medial part of the calcar. In 23% (n = 25) of the hips, erosion was present at both locations simultaneously. Calcar erosion was associated with synovial thickness, but not with maximal diameter, volume, or Anderson grade of ALTR. The relative risk of having a synovial thickness >3 mm increased by a factor of 3.0 (95% CI 1.3-6.5) if medial calcar erosion was observed.

Conclusions: Synovial thickness may be more relevant than ALTR size in the determination of severity and subsequent collateral tissue damage. When assessing radiographs of MoM THA patients, special attention should be paid to the medial calcar as subtle erosions may be an early sign of ALTR.

METASUL 28 MM MOM TOTAL HIP REPLACEMENTS; ADVERSE REACTION TO METAL DEBRIS INCIDENCE AND OUTCOME AT 10 YEARS

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Introduction: Ever since the adverse reactions to metal debris (ARMD) from metal on metal bearings came to light, their use has fallen dramatically since 2009. Although the ARMD was seen predominantly with large diameter metal heads and some resurfacings, there have been a few cases published in literature of ARMD in patients who received Metasul® 28 mm MoM articulating hip replacements. Current MHRA guidance for hips with less than 36 mm heads recommends metal ion blood levels and MRI in symptomatic cases only. This could potentially miss out some cases.

Objectives: To review our cohort of patients who had Metasul® MoM bearing total hip replacement to determine the incidence of ARMD for this particular implant. Secondary objective was to assess survival of implant, complications and revision causes and rates.

Methods: We performed a prospective study of a single surgeon case series. MoM clinics were set up. Data was collected from patient case notes and clinical assessment of patients. Cobalt and chromium blood ion levels were tested in all patients captured in follow-up clinics. Metal suppressed magnetic resonance imaging was performed on those with high/rising metal ion levels or if symptomatic.

Results: 75 hips were implanted in 70 patients. Mean follow-up was 10 years. Mean age was 69 years. There were 44 female patients. Acetabular components were Allofit uncemented cups whilst femoral components were a mixture of cemented (MS30/CPT = 45) and uncemented (CLS/Wagner = 30) implants. All had Metasul® 28 mm MoM bearing. ARMD did not develop in any patient during this follow-up. 3 patients suffered dislocations with one early. Polywear osteolysis seen in 2 patients and 1 developed a deep vein thrombosis.

Conclusions: Our study demonstrates that total hip replacement with Metasul® MoM 28 mm articulation in our cohort had a good success rate with no adverse reaction to metal debris.

ORAL PRESENTATIONS THA IN DDH

CEMENTLESS THREADED CUPS IN COMBINATION WITH/WITHOUT COTYLOPASTY FOR THE TREATMENT OF HIP DYSPLASIA- 12-22 YEAR FOLLOW UP. AN INDEPENDENT STUDY

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AIM: To assess the survivorship of a Cementless threaded cup in combination with Cotyloplasty for patients with Hip Dysplasia.

Methods: This was a retrospective study of 114 patients with 126 hips operated during the period of 1992-2000. Sixty-five hips had dysplasia, 51 hips

had low dislocation and 10 patients had high dislocation. Forty-four patients (35%) had a previous operation, either an isolated acetabular/femoral or combination of the two osteotomies. All patients had a Cementless Total Hip Arthroplasty (THA). The acetabular component was placed in the anatomic centre either with or without a Cotyloplasty. Patients with Dysplasia did not have cotyloplasty while the rest had a cotyloplasty. The acetabular component was the "Alloclassic CSF Cup". The Femoral component was "Alloclassic uncemented stem." The bearing couples varied. All patients were followed up with an examination and a Radiograph. The radiographs were assessed for Cotyloplasty complications, component position, evidence of loosening, lysis and heterotopic ossification. Notes were reviewed for complications.

Results: The mean age was 48 years (range 25-84). The mean Follow up was 15.4 years (range 12-22). Seventy-one patients (57%) had a metal on metal articulation and the rest had a hard on soft bearing. There were 8 early complications. (6.3%) Two patients underwent a late revision for aseptic loosening at a mean of 11 years. These patients had a hard on soft articulation. The survivorship of the Acetabular components was 98.4% at a mean of 15.4 years. All the femoral components survived (100%).

Conclusions: The success rate of patients undergoing Cementless Arthroplasty using the Threaded cups is high especially using a hard on hard bearing. The complication rate is however larger than in the normal population.

CEMENTLESS ACETABULAR RECONSTRUCTION IN DYSPLASTIC HIP: FIVE YEAR RESULTS OF TOTAL HIP ARTHROPLASTY USING THE 15 DEGREES FACE CHANGING CUP

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Introduction: Total hip arthroplasty (THA) for secondary OA due to developmental dysplasia remains a surgical challenge. Methods of reconstructing acetabular deficiencies are associated with high failure rates. The best results have been reported when the cup is placed in the true acetabulum.

We report the medium term outcome of using a 15 degrees face-changing (150 F-C) cup to achieve the principles in THA, secondary to acetabular dysplasia.

Patients and methods: 29 hips in 27 patients with secondary OA due to acetabular dysplasia underwent THA using the 15 degrees Face Changing cup between May 2007 and June 2010. There were 20 females and 9 males with a mean age of 52 years (range 32-68). Preoperative radiographs showed a mean Centre Edge angle of 20 degrees (9-40 degrees), Sharp's angle of 46 degrees (8-50 degrees) and femoral head extrusion of 31% (8-50%). Average pre-op Harris Hip Score (HHS) was 42 (13-58) and Oxford Hip Score (OHS) was 42 (23-53).

Procedure: A posterior approach was used in all cases. The shell can be placed at an abduction angle of 60 degrees so that the porous coated surface is fully covered by the host bone. This aligns the ceramic liner in the optimal position of 45 degrees of abduction. An uncemented, or a cemented stem, with a 28 or 32 mm delta ceramic head articulating with the cup was used in all cases. No patient received any form of bone graft. All patients began full weight bearing the next day.

Results: Average clinical and radiological follow up was 60 months (36-76 months). The mean HHS improved to 93 and the mean OHS improved to 17. There were no infections or dislocations in the series. There was 100% survivorship of the hip joint in both components. Post-operative radiographs revealed good integration of the cup. The mean covered acetabular lip inclination angle was 51 degrees (range 41-61 degrees) and the true inclination angle of the bearing was 46 degrees (26-46 degrees).

CUSTOM MADE 3 D PRINTED ACETABULAR AUGMENTS FOR PRIMARY THA IN SEVERE HIP DYSPLASIA

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Background: Total hip arthroplasty in developmental dysplasia of the hip remains challenging. Complex reconstructive procedures are described in cases of severe acetabular deficiency of the hip. Mostly, autologous femoral head grafts are the technique of choice to restore acetabular anatomy and to obtain optimal coverage of the acetabular cup. Long-term benefits of this technique remains controversial with studies reporting high rates of graft resorption, collapse and non-union. In some cases, highly dysplastic hips

require an alternative technique, because of the inability to use femoral head autografts. A custom-made acetabular augment in order to restore this acetabular anatomy could be solving these complex acetabular reconstructions.

Methods: We present 8 cases of primary total hip arthroplasty in a severe dysplastic hip (Crowe type IV), using a custom-made acetabular augment. This augment is a metal implant with a trabecular surface to restore the acetabular anatomy and to achieve excellent coverage of the acetabular cup. A custom-made drilling jig is used for optimal cup reaming and screw positioning. Follow-up was clinical and radiological and mean follow-up time was 2 years.

Results: 3 D printing of the pelvis facilitates the preoperative planning and improves the intraoperative accuracy in severe hip dysplasia. We found good clinical and radiological short-term results with restoring of full weight bearing and good range of motion. Radiological follow-up showed good augment, screw and cup positioning. No short-term complications are reported.

Conclusions: The use of custom-made acetabular drill guides, printed pelvis and augments in total hip arthroplasties in highly dysplastic hips is a promising technique.

MODULUS STEM FOR DEVELOPMENTAL HIP DYSPLASIA: LONG-TERM FOLLOW-UP

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Introduction: Developmental dysplasia of the hip (DDH) is the most common underlying condition, resulting in secondary hip osteoarthritis. Joint deformities, such as variations of the femoral neck version, excessive cervico-diaphyseal angle, reduced medullary canal size and a shallow and roofless acetabulum, contribute to making primary hip replacement in DDH patients technically demanding.

Objectives: The purpose of this prospective study was to assess the long-term clinical and radiographic outcomes of the MODULUS system in restoring joint biomechanics in DDH patients after total joint replacement.

Methods: Between October 2001 and December 2010, 143 patients with developmental dysplasia underwent hip replacement surgery using a conical stem with modular necks (MODULUS system, Lima Corporate, Villanova di San Daniele del Friuli, Italy). Thirty (21.0%) patients had both hips replaced, for a total of 173 implants. Dysplasia evaluation was based on the Crowe classification (6): 66 (38.1%) hips were classified as Crowe I, 50 (28.9%) hips as Crowe II, 33 (19.1%) hips as Crowe III and 24 (13.9%) hips as Crowe IV. The mean age at the time of surgery was 55 years (range: 22-81 years). The mean follow-up was 87 months (range: 36-146 months).

Results: Average Harris Hip Score increased from 42 (range: 23-65) preoperatively to 92 (range: 76-100) at the last follow-up. Stem revision was required in two cases. There was one case of stem subsidence. The physiological biomechanical parameters were restored. The mean postoperative femoral offset was 38 mm (range: 27-48 mm). The MODULUS stem showed good long-term clinical and radiographic results, with a Kaplan-Meier survivorship of 97.6% (95% CI: 94.8%-100.0%) at 8 years.

Conclusions: The clinical and radiographic outcomes of the MODULUS system in DDH patients are promising. The MODULUS performance is comparable with the results reported in the literature on other implants in the treatment of developmental dysplasia of the hip.

CEMENTLESS CONE STEM AND METAL-ON-METAL ARTICULATING SURFACE FOR THE TREATMENT OF ARTHRITIS FOLLOWING CONGENITAL HIP DISEASE

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In recent years cementless cone tapered stems reached a large success in Hip revision surgery, literally revolutioning the prognosis of many cases of dramatic bone stock loss.

Nevertheless, little experience exists in the Literature about their use in primary arthroplasties. The Cone Stem was designed in the 80's by Prof. Wagner. The stem is made of a rough blasted Titanium Alloy with a cone angle of 5° and 8 sharp longitudinal "ribs" that cut into the inner cortex, providing excellent rotational stability: The ribs depth of penetration ranges between 0.1 and 0.5 mm and is also very important to achieve osteo-integration. The CCD angle is 135°. The stem is straight and can be implanted indifferently in

any degree of ante- or retro-version thus being indicated in dysplastic arthritis where we need to correct anteversion.

Between 1993 and 1998 the Author (RB) has implanted 106 consecutive cone stems in 100 patients with dysplastic arthritis. The acetabular component was always cementless and in Titanium. The articulating surface was Metal-on-Metal (Metasul).

The average follow-up was 18.7 years.

According to the Hartofilakidis classification we had 71 patients of type A, 29 of type B and 6 of type C.

Clinically we had 88.7% of Satisfactory results in Group A, 81% in Group B and 67% in Group C no cases of anterior thigh pain.

No patient required revision of the stem, while we revised 5 cups.

Radiographically, 17% of patients showed some resorption in femoral zone 1 and 7. In 12 cases it was a narrow fissure due to the oscillations of proximal stem under load. This lesion was never progressive. In the same zones we observed 4 cases of real osteolysis. No radiolucent line was observed in other femoral zones. In the acetabular side we had 13 cases (14%) of radiolucency. In no case we had a clear ARMD (Adverse Reaction to Metal Debris).

Cone stem gave excellent long-term clinico-radiographical results in dysplastic arthritis.

TOTAL HIP ARTHROPLASTY WITH SHORTENING OSTEOTOMY IN CROWE TYPE III-IV DEVELOPMENTAL DYSPLASIA

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The Developmental Dysplasia of the Hip (DDH) is the main cause of osteoarthritis in young patients. In the most serious cases of the disease (Type 4 according to the classification of Crowe) total hip arthroplasty (THA) seems to be the necessary solution and most reliable way to restore the correct biomechanics of the joint and to eliminate the pain. There are many difficulties in the implant of a hip prosthesis in a patient with DDH: the young age of the patients, the anatomy of the femur extremely altered and a high failure rate. In the literature so much techniques described how to recreate the proximal part of a dysplastic femur and to avoid the palsy or the paralysis of the sciatic nerve: the use of external fixators, osteotomies of shortening. We report our experience of 15 patients operated with shortening osteotomy (8 transversal osteotomies and 7 z-shape osteotomies) all with excellent clinical and radiological results.

LONG TERM RESULTS OF THE CHARNLEY LOW-FRICTION ARTHROPLASTY WITH BULK AUTOGRAFT OF THE FEMORAL HEAD FOR DEVELOPMENTAL DYSPLASIA OF THE HIP

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Developmental dysplasia of the hip can present a significant technical challenge to the arthroplasty surgeon. Addressing the insufficient acetabular bone stock can be particularly difficult and a number of methods have been described including supplementing the lateral wall with cement, acetabular osteotomy and the use of extra small sockets with variable results.

Between 1983 and 1988 we carried out 45 Charnley low-friction arthroplasties (LFA) combined with bulk autografts of the femoral head in 41 patients with severe developmental dysplasia of the hip.

Seven patients were male and 34 were female. There were 4 bilateral cases within the group. The average age at the time of surgery was 46.17 years (range 24-77). The preoperative radiographs were assessed for the severity of DDH according to the classifications of Crowe et al, Hartofilakidis et al and Sharp.

After a mean follow up of 18 years there had been 13 deaths unrelated to the surgery and 13 revisions in total. Socket loosening was the most common reason for revision (10/13) followed by loose stem (2/13) and infection (1/13). 20 hips (17 patients) remain in follow up and were included in the most recent clinical and radiological analysis.

Post-operative and follow-up radiographs were analysed for coverage of the socket by the graft, for loosening and for the graft incorporation. The auto-

graft of the femoral head covered a mean 26% (range 16-35) of the acetabular component. All grafts united. In the majority of patients, graft resorption was found to be moderate and patients remained clinically satisfied at latest follow-up.

Our findings indicate that the Charnley LFA with an autograft of the femoral head for DDH remains successful at a follow-up of up to 28 years.

CLINICAL OUTCOME OF TOTAL HIP ARTHROPLASTY (THA) AFTER ILIOFEMORAL DISTRACTION IN HIP DISLOCATIONS

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Background: THA following iliofemoral distraction as a treatment option for hip dislocation is technically challenging.

Aim: To retrospectively evaluate the clinical outcome of THA following iliofemoral distraction in hip dislocations.

Material and methods: 10 patients (10 hips) with hip dislocations were studied. Average age was 36.4 (22-56) years, 2 males and 8 females. 5 patients had unilateral Crowe type IV dislocation, 2 patients had pseudoarthrosis of the femoral neck with high dislocation (>6 cm) of the proximal femur; 2 patients had acetabular fracture with migration of the femoral head into the pelvis; and 1 patient had post traumatic ankylosis at the false acetabulum. Iliofermal distraction using monolateral and bilateral external fixator was used in all cases for an average duration of 10 (8-12) weeks. The average length gained was 5.9 (2.6-9.7) cm. Two cemented and seven uncemented, and one reverse hybrid THA with acetabular reconstruction using autografts in 7 cases was done.

Results: The average duration of follow up was 5.4 (3-11) years. The Harris Hip Score improved from 32 to 80 ($p < 0.01$). Postoperative pain free walking distance improved significantly. There were two cases of pin tract infection and one case of pin breakage during distraction. There were no instances of component migration or dislocation. There were two cases of deep infection with implant revision.

Conclusions: Two staged procedure following iliofemoral distraction before THA is a viable treatment option for hip dislocation especially Crowe Type IV with severe limb length discrepancy. Iliofermal distraction is indicated to restore limb length without nerve palsy and to reduce the technical difficulties associated with intraoperative adhesions and scarring.

ORAL PRESENTATIONS PRIMARY THA (PART 1)

THE INFLUENCE OF OBESITY IN CUP POSITIONING DURING TOTAL HIP REPLACEMENT

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Introduction: Total hip arthroplasty (THA) is a successful surgical procedure in which the correct component positioning influences the long-term survivorship of the prosthesis and the restoration of normal biomechanics. Malpositioning of the acetabular cup is frequently associated with dislocation, implant failure, impingement, volumetric wear and others problems. Considering the currently increase in demand for THA, it's important to identify the most significant factors that influence cup placement. Among those factors the obesity could influence negatively the surgical procedure.

Objectives: In this study we intended to determine how BMI (Body Mass Index), obesity in detail, could influence cup positioning and successive clinical outcomes.

Methods: We evaluated three groups of patients, obtained from a retrospective review of 115 THA performed from January 2013 to March 2015 in our institution, divided for surgical approaches (direct lateral, antero-lateral and DAA – direct anterior approach) and analyzed for gender, age, diagnoses and BMI (non obese BMI < 25, obese BMI ≥ 25). Then we measured abduction and version angles of the acetabular component on post-op x-ray.

Results: We observed an important difference in the mean abduction angle and a little difference in the mean anteversion angle between obese and non obese patients. The average age of the population was 68.3 years, 26,1% patients had a normal BMI, 73,9% were obese. There were 42% males and 58% females. Lateral approach was used in 45%, ante-lateral in 37% and DAA in 18% of patients.

Conclusions: Our study found a correlation between obese patients and acetabular cup position. It showed how the incorrect positioning of the pelvis, the difficulty to identify bony landmarks and the soft tissue obstruction may determine less accurate cup placement regardless of surgical approaches. We think that the current methods used to position acetabular component are inaccurate in obese patients.

AN ANATOMICAL STUDY SUPPORTING POSTERO-INFERIOR PLACEMENT OF ELEVATED LINERS FOR HIP REPLACEMENT

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Introduction: The typical uncemented acetabular component for hip replacement has a flat face or an elevated lipped liner placed postero-superiorly. Conversely, the typical position that a cemented cup might have an elevation is a "Long Posterior Wall". As most dislocations occur posteroinferiorly in flexion and internal rotation, perhaps there is an advantage with postero-inferior liner placement?

Objectives: We intend to demonstrate that with a cup positioned at 45 degree inclination & 20 degree anteversion, the postero-inferior aspect of the acetabulum is unprotected, increasing risk of dislocation in flexion, adduction, and internal rotation. This paper considers the native bony acetabular shape, and how in prosthetic replacement, we can best replicate it.

Methods: An anatomical study was carried out on forty eight dry bone human pelvises. Each hemipelvis was orientated in a jig so the horizontal plane replicated the face of a cup placed at 45 degree inclination & 20 degree anteversion. Spheres with a handle were available in 1 mm increments and selected for best fit within the acetabulum. In 10 degree increments around the face of the acetabulum, the point at which the handle contacted the bony rim was measured on each pelvis. This was then mapped using polar geometry giving visual representation of the data. Subsequent intra-operative observations were made to consider risk of impingement.

Results: The native acetabulum is not a simple hemisphere. The bony rim contour fluctuates 25 degrees between its highest and lowest point. This highest point is postero-inferior, providing an additional 25 degrees of bony stability compared with postero-superiorly.

Conclusions: This is evidence that with an acetabular cup placed in the 45 & 20 degree position, an elevated liner placed posteroinferiorly best replicates the native bony anatomy, and should provide greatest protection against dislocation without risk of impingement on the neck or trochanter. Our study also considers alternate liner placement if the cup is positioned differently for better bone apposition.

DARE YOU STILL USE SCREWS? PROSPECTIVE DENSITOMETRIC STUDY ON TRABECULAR TITANIUM TM WITH SCREW FIXATION PERIACETABULAR OSTEOINTEGRATION: OUTCOMES AT 1-YEARS FOLLOW-UP

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Introduction: Trabecular Titanium is characterized by a high open porosity that imitates the morphology of trabecular bone. The surface roughness of the component is considerably greater than that of earlier designs, which theoretically may contribute to more stable initial fixation. Meanwhile, we are generally tend to rely on adjuvant fixation like screws to reduce the risk of the dislocation of a press-fit shell. The components with high friction coefficient may bring us the possibility that we have to use screws in less cases than ever before. Considering disadvantages of screws, the surgeon should have a high threshold for using screws if component stability is enough.

Objectives: The primary objective of this study is to evaluate the BMD around a cement-less acetabular cup with 2 screws made from Trabecular Titanium in primary total hip arthroplasty by means of DEXA.

Methods: 28 hips underwent primary THA by one surgeon with cement-less highly porous cups made from Trabecular Titanium. There were 4 men and 24 women, with a median age and BMI of 67.2 years and 23.3 Kg/m². Diagnosis were primary OA in 7(25%) cases, RA in 1(3.6%) case, SLE in 1 (3.6%) case, DDH in 19 (67.9%) cases. BMD was determined by DEXA according to DeLee and Charnley 3 ROIs at 2 weeks, 6,12 months. Statistical analysis was carried out using non-parametric tests (Mann-Whitney) and a P<0.05 as threshold for statistical significance.

Results: BMD values initially decline from baseline at 2 weeks to 6 months (median ROI1:88.7%; ROI2:94.2%; ROI3:95.3%) and to 12 months (median ROI1:84.6%; ROI2:93.6%; ROI3:94.5%). There are a statistical significant decrease in ROI1 from baseline to 6 months (P = 0.024).

Conclusions: Evaluations of BMD confirmed the insufficient periacetabular osseointegration in ROI1. In previous reports (with no adjuvant fixation) there were tendencies that BMD were increasing or relatively maintained in ROI1. The outcomes of our study indicates possibility that the screws cause the decreasing of BMD.

MODULAR TRABECULAR TITANIUM CUPS IN COMPLEX PRIMARY CASES

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Introduction: Cementless acetabular cups in primary total hip replacement (THR) are used for over three decades. Their use is limited in some complex cases. The use of trabecular titanium (TT) cups with internal modularity in these cases shows advantageous intraoperative performance.

Objectives: The aim of this study was to evaluate early results of primary TT modular cup implants in complex primary cases due to secondary osteoarthritis (OA).

Methods: Between April 2010 and December 2014 a modular TT acetabular cup was used in 112 patients for complex secondary OA. Mean follow up was 28,6 months (range 3-60). 75 patients were operated for postdysplastic OA, 8 for posttraumatic OA, 3 for OA associated with meningocele, 11 for OA with marked protrusion, 3 for OA due to TB arthritis, 8 for necrosis affecting acetabular integrity and 1 for OA with large cyst in iliac bone. Bone autograft was used in 15 patients, allografts in 8.

Internal modularity - augmentation of the TT cup coverage by an insert - was used in 56 of 112 patients. Outcomes evaluated were implant survivorship, dislocation, complications. X-rays were evaluated for cup migration, radiolucencies at the bone/implant interface.

Results: At final follow-up there were no revisions neither due to cup failure, nor to stem insufficiency. No specific problems due to cup modularity were noted. One infraction of the proximal femur was noted on postoperative X-ray. There was one early revision for acute periprosthetic fracture. 1 dislocation treated with closed reduction at 6 weeks postoperative did occur. No radiolucent lines or changes in cup position were noted at control visits on radiograms.

Conclusions: Modular acetabular TT cups designed for revision and complex primary cases show promising results in short term follow-up. Design of TT cups for dysplastic condition—part of a hemisphere—and internal modularity of implant lead to excellent implant stability in conditions of complex primary THR.

OUR EXPERIENCE IN PRIMARY THA USING DELTA CUP TT

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Introduction: Delta TT cup is an acetabular cup with a high grip and wide-open porosity structure. Trabecular titanium thanks to its particular alveolar porosity structure helps osteoconductivity other than representing a structure with elevated mechanical resistance and having characteristics of elasticity very close to cancellous bone.

Material and methods: Since 2005 to 2014 we have implanted in 623 patients 693 Delta TT cups for primary THA - 158 males and 465 females - with average age of 59 yrs old (min 17 yrs old - max 88 yrs old).

Primary osteoarthritis: 590

Congenital hip dysplasia secondary osteoarthritis: 48

Femoral head idiopathic osteonecrosis: 27

Post-trauma osteoarthritis: 19

Femoral pathological fractures: 5

Rheumatoid arthritis: 4

In most of the cases we used a CER-CER coupling.

Results: Results have been particularly satisfying with an optimal HHS and an important returning to sports activity mainly on young patients. COMPLICATIONS 6 cases of dislocation (all happened within 5 months after surgery), 5 of them needed the replacement of the acetabular cup as well as an aseptic mobilization happened 4 yrs after surgery. No infections.

Conclusions: Delta TT primary cup is a reliable material and a good option in hip primary prosthetic replacement. We have noticed a great patients compliance starting from the beginning of rehabilitation thanks to the ideal osteoconductive characteristics of the TT. A further advantage is made from the possibility of using large diameter head in short metal-back (inclination for females subjects).

Good clinical results seen in mid-term follow-up encourage us in implanting this cup.

MINIMUM THREE-YEARS CLINICAL AND RADIOGRAPHIC RESULTS OF A NOVEL, POROUS-COATED PRESS-FIT, TAPERED TITANIUM HIP STEM

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Introduction: There is continued effort for advanced implants and bearing surfaces in total hip replacement, especially for the younger patient with a longer life expectancy and increased needs.

Objectives: This prospective case-series study aims to present the preliminary, minimum three-years, results of a novel uncemented stem. It is a titanium, tapered stem with porous-coating and anti-rotational ribs in the metaphyseal region for initial stability and a grit blasted diaphyseal region. The distal tip is polished and shortened to minimize thigh pain.

Methods: Between June 2010 and May 2012 we operated on 20 males and 29 female patients (53 THRs, mean age 66 ± 13 years). The diagnosis was osteoarthritis in 39 patients (41 THRs), developmental dysplasia in six patients (eight THRs), avascular necrosis in two patients (two THRs) and chondrolysis in two patients (two THRs). The bearing surface was ceramic on ceramic in six patients (eight THRs), metal on polyethylene in 22 patients (22 THRs) and ceramic on polyethylene in 21 patients (23 THRs). Patients' demographic data, Harris Hip Scores (HHS) and Oxford Hip Scores (OHS) were collected prospectively, preoperatively, postoperatively, and at six months intervals thereafter. Radiographic evaluation was performed on standard anteroposterior and lateral X-rays at the same time intervals.

Results: At last follow-up, mean 50 months after surgery, no revision for any reason has been reported. Six patients were lost to follow-up and one deceased three years post-operatively from an unrelated reason with a stable and untroubled prosthesis. There was one periprosthetic fracture two years after the initial operation but with a stable prosthesis, which was treated with open reduction – internal fixation. Three patients had complained of thigh pain, which had resolved at last follow up. At the most recent follow-up, the average HHS improved from 33.9 ± 13.6 preoperatively to 89.35 ± 12.72 and OHS from 12.7 ± 5.6 to 41.6 ± 7.2. No radiolucent lines in any of the Gruen zones and no stem subsidence were observed at any time interval, while cortical hypertrophy was observed at the diaphyseal zone in two patients.

Conclusions: This study showed that this new press-fit stem design had excellent short-term clinical and radiological results in all followed-up patients. Longer follow-up is needed to evaluate its long-term survival and effectiveness.

SECOND GENERATION TAPERED FEMORAL CEMENTLESS STEM IN TOTAL HIP ARTHROPLASTY: A MINIMUM 15-YEAR FOLLOW-UP STUDY

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Background: The Synergy femoral component was introduced in 1996 as a second generation titanium proximally porous-coated tapered stem. The purpose of this study was to evaluate the outcome of the authors' experience using this stem at minimum 15 years of follow-up.

Material and methods: We retrospectively reviewed a consecutive series of 102 patients (112 hips) who underwent surgery between November 1996 and October 1998 for primary THA using cementless Synergy stem with a minimum 15-years follow-up. The mean age at the time of surgery was 61 years, and the mean duration of follow-up was 16.3 years. Seventeen patients were lost at FU. Ninety-four hips in 85 patients were available for clinical and radiologic analysis. Clinical results were assessed using validate tools (SF12, WOMAC and HHS). Thigh pain frequency and intensity were also recorded.

Results: All clinical evaluation tools showed a statistically significant improvement compared to the preoperative scores. We observed a not constant thigh pain in 5 hips. Nine stems were revised due to polyethylene wear (3 cases), late periprosthetic fracture (2 cases), infection (2 cases), subsidence (1 case) and instability (1 case). Stem related revision was a case of subsidence, related to occult intraoperative calcar crack and early revised (within 1 year); cumulative stem-related survival rate at 15 years was 99%. Radiolucent lines were uncommon, non progressive, less than 2 mm, in Gruen zones 2 and 6. Stress-shielding was present as cortical reaction in 5 femurs in Gruen zones 3 and 5. Fifteen cases of HTO (grade I and II in 12 case and grade III in 3 cases) were observed.

Conclusions: The Synergy stem demonstrated excellent clinical and radiographic results at 15 ± 17 years FU in 85 patients. Survivorship (with stem revision as end point) was 99% at 15 years. Thigh pain was uncommon and the level of activity and autonomy is excellent. Radiolucent lines were benign with no aseptic loosening.

EXCELLENT MID-TERM RESULTS OF THE POROUS AND HYDROXYAPATITE COATED BI-METRIC FEMORAL STEM

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Introduction: This study assessed the mid-term survivorship of the tapered porous and hydroxyapatite coated Bi-Metric femoral stem in a single centre. Many of the stems were inserted as part of a metal on metal (MoM) total hip replacement system. Thus stem survivorship in the metal on metal setting is also assessed.

Methods: A retrospective review was performed of all patients undergoing a THR with a Bi-Metric femoral stem between 2003-2010. Stem failure was considered if revision occurred for a stem related complication. Three modalities were assessed: Stem failure rate, overall stem revision rate and stem revision rate in the MoM setting.

Results: 1,508 stems were implanted in 1,341 patients (167 bilateral). 1,468 stems were used in the primary and 40 in the revision setting. The acetabulum was uncemented in 1,487 and cemented in 21 cases. Bearing surfaces were ceramic on ceramic in 43 cases, ceramic on poly in 57 and MoM in 1408. Average follow up was 6.9 years (2 years-11 years). 8 hips were lost to follow up. 3 stems had been classified as having failed (2 for fracture of the stem neck below the trunion and 1 for stem tip pain). Assuming stem failure as the end point, Kaplan Meier survivorship analysis demonstrates a 99.8% (CI 99.6%-100%) survivorship of the Bi-Metric femoral stem at 11 years. Considering stem removal for any cause as the end point, Kaplan Meier survivorship analysis demonstrates a 98.3% (CI 97.5%-99.1%) stem survivorship at 11 years. 141 THRs (9.4%) underwent revision of bearing surfaces for adverse reactions to metal debris, retaining the well fixed stem in most cases. The overall survivorship of the Bi-Metric stem in the MoM bearing group was 99.8%.

Conclusions: These findings demonstrate excellent mid-term survivorship of the tapered porous coated Bi-Metric femoral stem. Even in the presence of a high revision rate in the MoM subgroup, the stem survivorship is excellent.

10-YEAR CLINICAL OUTCOMES FOLLOWING THR WITH THE MÜLLER LOW PROFILE CUP

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Aim: To present the 10 year clinical outcomes of the Müller Low Profile Cup.

Methods: 106 primary total hip arthroplasties in 87 patients were performed in our institution by the senior author. All patients received the Morscher-Sportorno (MS-30) cemented femoral stem with ceramic head and a cemented UHMWPE Müller Low Profile Acetabular Cup.

Follow up was recorded at the most recent clinical review where radiographs and Oxford hip scores were obtained. Minimal linear acetabular wear was observed at latest AP radiographs, with no gross loosening of cup. Acetabular inclination was measured using method described by Lewinnek.

Results: The mean age of the patients was 60 (50-69). 11 patients had died (10%) and 17 patients were lost to follow up therefore clinical outcomes were obtained for 78 hips (74%). Mean Oxford Hip score at 13 years (10-20 years) was 46.2. Acetabular inclination was measured at an average of 39° (range 23°-54°) at the same time. No patients had required revision surgery at the time of last follow up.

Conclusions: Our data showed excellent results for survival, clinical performance and radiological outcomes of the Müller Low Profile Cup at a mean age of 13 years from primary procedure. Intraoperative bony landmark recognition for placement of the acetabular component aids in correct placement and we believe influences subsequent longevity of the prosthesis. The use of a cemented UHMWPE Low Profile Acetabular Cup can prove cost effective in comparison to other regularly used acetabular components.

ORAL PRESENTATIONS SHORT STEMS

A NEW SHORT STEM FOR TOTAL HIP ARTHROPLASTY IN COMBINATION WITH THE DIRECT ANTERIOR APPROACH: PRELIMINARY 2 YEAR RESULTS OF A PROSPECTIVE STUDY IN A SINGLE INSTITUTION

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Introduction: Patients with osteoarthritis of the hip are getting younger and therefore have a higher risk for secondary revision. Short stems claim to be as reliable a standard stems but with the advantage of being bone sparing. The direct anterior approach (DAA) is potentially less invasive than standard approaches. However no study has investigated in the reliability of the combination of these two procedures.

Objectives: The aim of this study was to the investigate the radiological and clinical 2 year results of a newly introduced short stem implanted by the direct anterior approach in a single institution.

Methods: Prospective clinical and radiological study with 85 patients operated in one single hospital with implantation of the new short stem in combination with a vitamin E enriched cup (Optimys/Vitamys, Mathys Medical, Bettlach, Switzerland). Radiological parameters assessed were: Bone resorption or hypothyroidism, heterotopic ossification, osteolysis, stem migration and radiolucency. Clinical parameters: VAS under rest load and satisfaction, Harris Hip Scores. Adverse events were also recorded.

Results: 85 patients operated between 03.11 and 08.12 mean follow-up 25.5 mts (SD 5.5). 4 patients were lost to f-up; 3 dead, 1 refusal. Of these all prosthesis were in situ. Bone resorption: 0/81, Hypertrophy of femoral bone 1/81, heterotopic ossification 6/81, 5 with Brooker I, 1 Brooker II, Proximal osteolysis 8/81, calcar resorption 0/81, stem migration: 0/81, Interface radiolucent lines 0/74. VAS at rest: Mean 0.1 (SD 0.5), VAS under load: Mean 0.2 (SD 0.7) VAS satisfaction: 9.7 (SD 0.8), HHS score: Preop 61.1 (SD 14) post-op 98.2 (SD 4.4). Adverse events: 4, 1 cup dislocation, acetabular perforation, 1 aseptic loosening, 1 periprosthetic fracture.

Conclusions: Early results of this new short stem in combination with the direct anterior approach are promising. Recorded complications on the femoral side are comparable to standard uncemented stems. Clinical results show a significant improvement of the HHS score with no dislocation while using the DAA.

DIRECT ANTERIOR APPROACH AND SHORT FEMORAL STEM FOR PRIMARY TOTAL HIP ARTHROPLASTY. MID-TERM OUTCOME IN 500 CASES

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The goal of this report is to evaluate the results of a direct anterior approach with cementless anatomical short stem in young, active patients. Midterm

results of 500 consecutive reconstructions performed between 2008 and 2011 are reviewed in a follow up of at least five years. The mean age at the time of the operation was 53 years (from 26 to 65 years). In 441 of the patients the diagnosis was arthritis of the hip joint or aseptic necrosis in 56 and in three of the others – fracture of the femoral neck. In 86 of the cases both hips were operated simultaneously at the same time with one anesthesia. Cement free monoblock anatomical femoral stem ABG II Hip System was used exclusively.

449 patients were reexamined at least 60 months after the reconstruction, mean follow up 78 months. One patient died of a pulmonary carcinoma. Other 50 cases were lost for follow up. Operative time, transfusion requirements, narcotic usage, length of hospital stay, achievement of rehabilitation milestones, cane usage, and complications are examined at the last follow up. Harris Hip score was altered to values of ≥ 90 points in $92.2\% \pm 6.48$ in comparison with the initial values before the operation of $30.01 \text{ DS} \pm 13.25$. At the control radiographic examination the stem position was good in the neutral position or slight valgus ($<5^\circ$ of varus) except in 5 cases in a varus position, with most frequent reason being the implanting of a lesser than the necessary size of femoral stem. At the last follow up there are not cases with periprosthetic joint ossification. Complications included fracture of the lateral femoral cortex (intra op) in 2 patients, malposition of the stem (undersizing and subsidence) in two cases, varus position of the stem in 5 cases, postoperative dislocation – two patients with a long-standing traumatic origin of the arthritis. Two cases presented with late infection 2 years after the operation. 24% of the patients reported for a certain extent of hipoaesthesia.

The short anatomical ABG II HA stem for cementless fixation has shown encouraging results with primary and mid-term stability. Restoration of leg-length equality is not difficult with a direct anterior single-incision mini-approach. The less surgical dissection and reduced blood loss make possible to replace both hips simultaneously as a single procedure with one anesthesia.

INDICATIONS AND EARLY FUNCTIONAL OUTCOMES OF A METAPHYSEAL SHORT STEM

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Introduction: The Minima short stem was designed according to bone preserving principles to achieve extended metaphyseal fitting with physiological proximal loading.

Purpose: This prospective study aimed to assess patient functional recovery after total hip arthroplasty (THA) with this short stem.

Materials and methods: Between September 2013 and February 2015, 76 consecutive patients (80 hips) underwent THA with Minima S (Lima Corporate). There were 22 (28%) women and 58 (72%) men, with mean age of 54 ± 10 years. Primary diagnosis was mostly primary coxarthrosis (81%). A posterolateral approach was used in 79 cases, and anterior in 1. Radiographic, clinical (HHS, TUG), PROMs (VAS, HOOS, UCLA) assessments were performed preoperatively (T_0), at 6 weeks (T_1), 6 (T_2) and 12 (T_3) months.

Results: Significant early functional recovery was observed, with mean HOOS function ADL (T_0 : 41 ± 17 ; T_1 : 78 ± 17 ; T_2 : 92 ± 9), HOOS function SR (T_0 : 22 ± 17 ; T_1 : 59 ± 22 ; T_2 : 78 ± 14), UCLA activity (T_0 : 5 ± 2 ; T_1 : 7 ± 2 ; T_2 : 9 ± 1) doubling by T_1/T_2 . TUG (T_0 : 16 ± 6 ; T_1 : 13 ± 2 ; T_2 : 11 ± 2) and flexion data (T_0 : $90^\circ \pm 10^\circ$; T_1 : $105^\circ \pm 9^\circ$; T_2 : $118^\circ \pm 5^\circ$) corroborated these outcomes. Mean HHS (T_0 : 49 ± 13 ; T_1 : 84 ± 13 ; T_2 : 96 ± 5) also doubled by T_2 . Mean VAS (T_0 : 8 ± 1 ; T_1 : 2 ± 2 ; T_2 : 1 ± 1), HHS pain (T_0 : 13 ± 7 ; T_1 : 39 ± 7 ; T_2 : 43 ± 2), UCLA pain (T_0 : 3 ± 1 ; T_1 : 8 ± 2 ; T_2 : 9 ± 1) and HOOS pain (T_0 : 39 ± 17 ; T_1 : 82 ± 15 ; T_2 : 92 ± 9) demonstrated significant early pain relief already at T_1 . X-rays showed good implant stability, without loosening, subsidence, radiolucent lines or osteolysis. No signs of metaphyseal stress-shielding, pedestal formation, cortical hyperostosis or calcar resorption were observed in the short term follow-up, demonstrating effective physiological load transfer. No revision or implant failure occurred till now.

Conclusions: Clinical results and PROMs indicated significant early functional recovery. Preliminary radiographic analysis confirmed good implant stability with firm stem proximal fixation. Proper indication and precise surgical technique are mandatory.

THE SILENT™ HIP, NECK ONLY PROSTHESIS IN PRIMARY HIP ARTHROPLASTY: A PROSPECTIVE STUDY- MINIMUM 2 YEAR FOLLOW UP

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Aim: To assess the survivorship of the Silent™ (Depuy Synthes) neck only prosthesis in primary hip arthroplasty performed by a single surgeon with a minimum 2 year follow up.

Methods: Ethical approval was obtained. This prospective study was performed between October 2010 and March 2013. The Silent™ hip was implanted into 29 hips (28 patients). The Acetabular component was the GRIPTION™ (Depuy Synthes). The bearing surface was ceramic against ceramic in all patients. All patients were followed up for a minimum of 2 years. Follow-up intervals were 6 weeks, 3, 6, 12 and 24 months. Oxford Hip Scores and EuroQol 5D were used as patient reported outcome measures and were collected prospectively. Radiographs were assessed at similar intervals for loosening, subsidence, migration and presence of radiolucent lines.

Results: 24 males and 4 females made up the study population. The mean age was 44.3 years (36-52 years). One male underwent bilateral replacements. The mean pre-operative Oxford hip score was 46.1 (38-49) reduced to 14.1 (12-17) post-operatively ($p < 0.01$). The EQ 5D improved from a mean of 0.05 pre-operatively to 1 post-operatively ($p < 0.01$). There was no radiographic evidence of loosening, subsidence, migration or radiolucency. There were no cases of revision. One patient (7%) developed a post-operative deep venous thrombosis, who was commenced on treatment doses of low molecular weight heparin for DVT and subsequently developed a hematoma. This required a wound washout and settled.

Conclusions: Our findings suggest that the use of the Silent™ neck only prosthesis offers excellent patient reported outcomes and confers the benefits of conservation of proximal bone stock. This is especially useful in patients requiring primary arthroplasty a young age and those with proximal subtrochanteric deformities. The study adds to a growing body of evidence supporting the use of short stem prostheses.

A PROSPECTIVE STUDY OF A NOVEL NECK PRESERVING STEM: EARLY CLINICAL RESULTS

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Introduction: X-Fit is a novel uncemented neck-preserving stem designed to maximize the bone preservation through a grooved cross-section, minimize the metaphyseal invasiveness and be implanted following a mid-to-total femoral neck preservation. It also offers high torsional stability thanks to an innovative X-shaped transverse section (+30% vs equivalent rounded design from bovine bone testing).

Objectives: The purpose of this study is to present the early clinical results of a running prospective multicentric study, approved by Ethics Committees, aiming at evaluating the radiological and functional performances of the X-Fit stem on a 100 cases cohort at minimum 1 year follow-up.

Methods: Since 2012, 63 patients (65 hips), undergoing primary THA with X-Fit stem, have been enrolled in 4 Italian centers, including 24 left hips, 37 right hips, and 2 bilateral hips. The average patient age is 54.7 years, recorded diagnoses were osteoarthritis (59 cases), avascular necrosis of femoral head (5 cases), post-traumatic osteoarthritis (1 case). The Harris Hip Score (HHS) was measured pre-operatively and at three different post-operative follow-up (1 month, 6 and 12 months). X-ray images were taken at the same time-points.

Results: The 63 patients have an average of 16 months (range 1-29 months). No infection, hip dislocation, nerve injury, or deep vein thrombosis occurred. Six neck cortical cracks (9.8%) treated with cabling occurred intra-operatively. One patient showed bone resorption at 7 months follow-up, and 2 ectopic ossification Brooker III at 7 and 12 months follow-up. The survival rates of the cups and stems were 100% at the last follow-up. At 1 year follow-up the average HHS was 98.5 starting from a pre-op HHS of 47.2.

Conclusions: The X-Fit neck-preserving stem, having achieved 100% excellent rate results at 1 year, looks clinically promising in the short-term; a longer follow-up and a larger study cohort are required to support its mid-term performances.

BONE REMODELLING AROUND SHORT METAPHYSEAL IMPLANT IN TOTAL HIP ARTHROPLASTY: A DEXA STUDY WITH 3 YEARS OF FOLLOW UP

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Introduction: Cementless short stems in Total Hip Arthroplasty (THA) had been introduced to preserve femoral bone stock reducing soft tissue damage. The insertion of a metallic implant changes bone loading conditions resulting in a remodelling of femoral bone. To quantify changes in bone mass after short stems THA, dual-energy X-ray absorptiometry (DEXA) was used.

Objectives: The aim of this study was to evaluate the Bone Mineral Density (BMD), measured by DEXA as well as clinical and radiographical outcome in a series of 134 short metaphyseal stem in THA at a mean follow-up (FU) of 3 years.

Methods: Between 2006 and 2013, we performed 289 THA using the same short metaphyseal implant. All operations were performed by the same senior surgeon, in the same lateral approach. The first 141 implants with a minimum 3 years FU were selected for this study. Harris Hip Score (HHS) and standard radiographs were made preoperatively and postoperatively and at 3, 6 and 12 months and annually then.

At 3 years postoperatively in 46 patients, of a mean age 74, BMD of the operated hip was evaluated comparing with the contralateral unoperated hip using DEXA analysis through a specifically developed protocol of analysis with 5 periprosthetic Regions Of Interest (ROIs) described by Gruen.

Results: At the FU the HHS has improved from preoperative to postoperative (p value 0,0001). No patient showed thigh pain or thigh discomfort. X-ray showed no evidence of periprosthetic osteolysis or subsidence. One revision was performed for aseptic loosening. DEXA analysis showed an increased BMD in all ROIs. In ROIs 1, 2, 3 the increase resulted as statistically significant.

Conclusions: In our study at 3 years of FU, BMD was increased in all periprosthetic ROIs as a sign of integration between the bone and the implant even in an older patient population of a mean age of 74.

The results of this study suggest that short metaphyseal stem leads to an encouraging clinical and radiographical mid term outcomes.

MID-TERM CLINICAL AND RADIOGRAPHIC OUTCOMES WITH A NECK-PRESERVING FEMORAL STEM

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Introduction: Preserving the femoral neck may offer biomechanical advantages as well as greater bone stock conservation, which are especially important in young and active patients.

Objectives: This prospective study was performed to assess clinical and radiographic outcomes after THA using the COLLO-MIS short stem, which aims to preserve the femoral neck and lateral cancellous bone stock while minimising impact on adjacent soft-tissues.

Methods: Between November 2008 and April 2011, 70 patients (71 hips) underwent cementless THA with the COLLO-MIS short stem via a posterolateral tissue-sparing approach. There were 29 (41%) women and 42 (59%) men. Mean age and BMI were 62 ± 13 (27-82) years and 27 ± 4 (20-42) kg/m². Patients were affected mainly by primary coxarthrosis (86%). Clinical evaluation (Harris Hip Score, HHS) and independent radiographic assessment were carried out preoperatively, and postoperatively at 1, 6, 12, 24 and 60 months.

Results: Mean HHS increased from 52 ± 14 (16-84) preoperatively to 99 ± 2 (92-100) at 24 months and 99.5 ± 1 (95-100) at 60 months. 99% of patients reported satisfactory results and 97% recorded significant pain relief already at 12 months. ROM improved in all terms within 6 months, indicating an early functional recovery as a result of the minimally invasive surgical procedure. 99% of stems showed effective osseointegration,

stability and optimal positioning, without stress shielding or radiolucent lines. The presence of evident re-oriented trabeculae, especially in the metaphysis, and the reduced patterns of trabeculae in the great trochanter demonstrated physiological load transfer. No sclerosis or diaphyseal hypertrophy were reported, in accordance with the complete absence of thigh pain at any follow-up. 1 (1.4%) revision occurred due to a post-traumatic fracture. Neither loosening, mechanical failures nor dislocations were reported.

Conclusions: All patients presented early functional recovery and very good clinical results at 2-year and 5-year follow-up, with overall firm bone in-growth and optimal stem positioning in the neck and proximal femur. Good primary stability thanks to optimal neck fixation and proximal femur physiological loading demonstrated to be fundamental to ensure a stable secondary fixation.

MINIHIP ARTHROPLASTY: REVIEW OF CLINICAL OUTCOMES AT A UK CENTRE

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Introduction: Short stem hip implants have been introduced as a bone preserving alternative to conventional stems, however there is uncertainty about long-term clinical outcome, implant survival and complication rates.

Objectives: To assess clinical outcome of MiniHip arthroplasty using both patient reported measures such as the Oxford hip score as well as adverse events such as dislocation and all-cause revision.

Methods: Retrospective review of consecutive total hip replacements using the Corin MiniHip between July 2009 and July 2012. Cases were performed by hip arthroplasty consultant surgeons at a UK specialist centre. Data were collected on patient demographics, dislocations and implant survival at mean 22.5 months follow up (range 11.5-62.1 months). Oxford hip scores were assessed at mean 13.9 months follow up (range 8.2-62.1 months).

Results: There were 115 MiniHips implanted in 109 patients during the study period. 29 MiniHips were lost to follow up, resulting in 86 cases with complete patient reported outcome data. Mean age was 52.9 years (range 22-72 years) and 74% were female (n = 64).

Indications for surgery included osteoarthritis (n = 66; 79%), rheumatoid arthritis (n = 2; 2%), osteonecrosis (n = 7; 8%), hip dysplasia (n = 2; 2%) and revision of resurfacing arthroplasty (n = 8; 9%).

At 22.5 months follow up, there was one dislocation (1.1%) and four revision procedures (4.6%). Revisions were performed for infection, a mal-aligned stem, a broken prosthesis stem, and aseptic loosening.

The mean Oxford hip score preoperatively was 17.2 (range 2-36) and improved postoperatively to 38.9 (range 11-48) at 13.9 months mean follow up.

Conclusions: We experienced a higher than expected complication rate at relatively short-term follow up. This was perhaps partly due to a steep learning curve in what is quite a small cohort of patients. Lessons regarding patient selection can also be inferred from our use of the MiniHip stem as a revision prosthesis following hip resurfacing.

ORAL PRESENTATIONS SHORT STEMS AND TECHNIQUES

DIFFERENCES IN INTRAMEDULLARY FITTING PATTERN BETWEEN FIT-AND-FILL TYPE SHORT STEM AND TAPERED SHORT STEM

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Introduction: Short stems could preserve proximal bone stock and achieve physiological proximal loading. Several reports suggested good clinical short-term outcomes of short stems. However, it is unclear how fitting patterns of short stem are achieved intramedullary and influent primary fixation and bone reactions such as bone ingrowth or stress shielding.

Objectives: The objective was to evaluate differences in intramedullary fitting pattern between fit-and-fill type short stem (MiniHip; Corin, UK) and tapered short stem (Optimys; Mathys, Switzerland).

Methods: Fifty patients who were underwent THA with MiniHip (Group M) and fifty patients with Optimys (Group O) were enrolled between 2013 and 2014. Intramedullary fitting patterns were analyzed by 3D templating software (ZedHip; LEXI, Tokyo). After the location and alignment of stem were extracted from postoperative computed tomography (CT), we reproduce the location and alignment in preoperative CT by computer-aided design (CAD) stem model. The area with CT value over 600 HU on the CAD stem surface was defined as contact with femoral cortical bone. We calculated the contact area of CAD stem surface with cortical bone. We divided CAD stem surface into 7 parts according to modified Gruen's zone classification. The frequency of contact and contact area in each zone were compared between the 2 groups.

Results: The frequency of contact in Zone 1 to 7 (Group M/O) was 68/30, 20/28, 62/94, 94/96, 60/72, 98/96, 100/100% and there were significant differences between 2 groups in Zone 1 and 3. The contact area was 0.04/0.01, 0.02/0.01, 0.08/0.39, 0.55/0.56, 0.06/0.10, 0.60/0.42, 1.14/0.61 cm² and there were significant differences between 2 groups in Zone 1, 3 and 7.

Conclusions: Fitting pattern of MiniHip was contact at medial- and lateral-proximal and distal portion and that of Optimys was contact at medial and lateral-distal portion. The further study is necessary to reveal the relation between fitting pattern and bone reactions.

BIOMECHANICAL CONSIDERATIONS IN A MALPOSITIONED SHORT STEM HIP IMPLANT: 5 YEARS MID-TERM RESULTS

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Introduction: Short stem implants are widely used in hip replacement surgery. These implants work according to different biomechanical rules.

Short stem prosthesis have been made to obtain a physiological strength distribution on proximal femur, to preserve metaphyseal bone stock and soft tissues.

Objectives: The aim of this report is to point out that some "surgical mistakes" may not necessarily lead to failure and the use of implants capable of bearing mechanical stresses can assure a good functional result.

Methods: Authors submitted a case series of 74 implants in 67 patients, implanted from June 2006 to December 2010 with an average follow-up of 60 months (range 36-106 months) and focused their studies on a patient with a bad positioned short stem hip prosthesis (the stem is out the posterior cortex of femur).

Results: Finite element analysis (two numerical models: the first one analyzes the stress and strain distributions in the healthy femur (without prosthesis) and the second one analyzes the same boneimplant biomechanical system of the clinical case but assuming the prosthesis in the proper position) demonstrates that "circumferential metaphyseal support" can guarantee excellent clinical results, also with wrongly positioned implant, due to biological changes in bone morphology, around the stem, that can help successful functioning.

The patient has still not been subject to revision 60 months after surgery.

Conclusions: An orthopaedic surgeon must always implant the prosthesis in the right way. Nevertheless, our experience shows that some mechanical and biological pitfalls are well tolerated by some short stem hip prosthesis.

DOES THE SURGICAL APPROACH INFLUENCE DIGITAL TEMPLATING ACCURACY IN THA USING A SHORT MODULAR STEM?

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Introduction: Aim of this study is to assess any differences in digital templating accuracy of a modular short femoral stems implanted with 2 different approaches (direct anterior and posterolateral).

Material and methods: From December 2012 to January 2014 100 patient undergoing to a THA using the same implant with a short femoral modular stem were prospectively included in the study and divided in 2 groups according to the surgical approach. All the patients underwent to the same

preoperative radiological protocol and the digital templating. The digital templating results were compared with the truly inserted implant size and a statistical analysis was carried on.

Results: For the cup the mean percentage of agreement (\pm size) was 90.0% in Anterior approach-group and 89.6% in the posterolateral approach group. For the femoral stem the mean percentage of agreement (\pm size) was 88.0% in and 89.1% respectively. Likewise there was a statistical significant better accuracy in the modular femoral neck accuracy in the anterior approach (\pm size) and a statistical significant higher percentage of modular femoral neck with an increased antversion in the posterolateral approach.

Discussion: In our experience digital templating in short modular femoral stem seems to be less accurate for the posterior-lateral approach in term of both femoral neck length and antversion. A possible explanation may be not a technical error but just a surgeon behavior to overcorrect the templating to prevent dislocation potentially more common using a postero-lateral approach.

FITMORE® HIP STEM: OUR EXPERIENCE - X-RAY, CLINICAL AND FUNCTIONAL RESULTS

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Background: Hip arthroplasty is a surgical procedure commonly performed to manage a wide group of pathological conditions. Although it produces great satisfaction in patients, there are a lot of works concerning the need of a revision surgery for implant loosening. For this reason bone preserving and soft tissue sparing are to be into consideration particularly in treatment of young patients. Short and curved stems became more popular for the potential bone preserving, with neck retention, maintenance of middle greater trochanter and stress transfer to the proximal femur.

Objectives: The aims of our work are: 1) evaluation of functional results in patient undergo total hip arthroplasty with a fitmore stem at a mid-term follow up of 4 years, 2) radiological analysis of bone integration; 3) evaluation of patient's satisfaction.

Methods: It is a case series of 118 patients (60 male and 58 female; mean age 53,4 years) operated with a THA from January 2008 to June 2014, retrospectively observed with a maximum 6 years follow-up (mean 4,2 years). There are 80 cases of osteoarthritis, 38 cases of osteonecrosis. All operations are performed by the same surgeon. For all patients ROM, Harris Hip score and plane radiographs are obtained before the surgical procedure and at the planned follow-up. All patients express their satisfaction about surgery.

Results: No cases of infection are registered. Two patients was re-operated for aseptic loosening, with removal of acetabular component and femoral head. ROM improves in all the domains ($p < 0.001$); Harris Hip score results excellent in 98 patients, good in 12 patients, fair in 6 patients and poor in two cases. The 97% of our patients are satisfied for the surgical procedure.

Conclusions: Fitmore® hip STEM total hip can be considered a good device to ensure recovery of ROM and functionality in patient observed after a mid term follow-up of four years. Patients can start the postoperative treatment in a brief time due to the preservation of the anatomical hip conformation of each patient. This advantage contributes to create a high rate of satisfaction in patients. Longer follow-up and a wider population can be useful, but these data can help surgeon in implant choose.

FOURTH GENERATION CEMENTING TECHNIQUE WITH A NOVEL SHORT-STEM IN PRIMARY TOTAL HIP ARTHROPLASTY

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Introduction: The Friendly Short stem is less invasive and more bone conservative due to its shortened height and innovative cementing technique. Its instrument set allows to optimize the cement mantle thickness via an improved pressurization and stem centralization system.

Objectives: Aim of this prospective study was to evaluate functional recovery and implant stability after total hip arthroplasty (THA) with this cemented short-stem.

Methods: Between June 2011 and October 2012, 96 consecutive patients (100 hips) underwent THA with the Friendly Short stem (Lima Corporate).

A minimally invasive postero-lateral approach was used in all cases. There were 60 women and 36 men, with a mean age of 72.6 ± 6.2 (59-85) years. Underlying pathology was mostly primary coxarthrosis (94%). Radiographic and clinical evaluation (Harris Hip Score HHS, Oxford Hip Score OHS) were performed preoperatively, at 45 days, 6, 12, and 24 months.

Results: Mean HHS and OHS improved from 36.0 ± 11.3 and 10.9 ± 4.9 preoperatively, to 96.4 ± 6.1 and 46.5 ± 3.1 at 2 years, with the most significant recovery recorded 45 days after surgery (HHS: 78.6 ± 9.9 ; OHS: 34.0 ± 7.4). All patients reported remarkable early improvements, especially in terms of joint functionality (Flexion: preop. 77.7 ± 11.1 , 101.7 ± 8.9 at 45 days) and pain relief (HHS pain domain: preop. 9.6 ± 4.2 , 41.4 ± 3.6 at 45 days). X-rays demonstrated good implant stability thanks to optimal cement fixation; there was only 1 case of non-progressive 1-mm radiolucent lines, but no osteolytic areas, subsidence or loosening were observed. Absence of fatigue fractures in the cement mantle proved that there was good stress distribution. No revision or implant failure occurred.

Conclusions: Clinical and patient-subjective outcomes were very satisfactory, indicating significant early functional recovery. Although longer follow-up is required, radiographic assessment demonstrated good implant stability at 2 years as result of this innovative cementing technique.

MID TERM RESULTS OF A SHORT CEMENTED FEMORAL COMPONENT

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Introduction: Short stem cementless total hip replacement has gained an increased interest in the last 10-15 year. Following the same philosophy of minimal bony invasiveness, in 2004 a shortened version of the cemented Friendly stem (Lima LTO, San Daniele Friuli-Italy) was developed. The shortened version of this polished double tapered stem was studied to be implanted with a high neck cut and a fourth generation cementing technique. The tip of the device extends only 2 cm below the lesser trochanter.

Objectives: The aim of the study was the evaluation of a new short cemented femoral stem in total hip arthroplasty.

Methods: From January 2005 to January 2008 we performed 43 total hip replacement using the Friendly short stem. The instrument set allows perfect cement pressurization and both proximal and distal stem centralization. In 40 cases a cementless acetabular cup was used, in 3 cases a cemented cup. Mean age at the time of surgery was 79 years (71 to 86). Mean follow-up is 7.9 years. Patients were evaluated pre and postoperatively with the HHS. On x-rays we observed and classified the quality of the cement mantle according to Barrak, stem alignment, subsidence, radiolucent lines, cortical hypertrophy and calcar resorption.

Results: Ten patients died for causes unrelated to THR. Thirty-three were available for follow up. HHS improved from a mean value of 45 (8 to 66) to 93 (86 to 100). One patient had a traumatic femoral fracture without stem mobilization 4 years after primary THR (Vancouver B2). Because of the quality of the cement mantle and the stability of the stem, this patient was initially treated with ORIF but 1 year later required revision with a standard cemented stem. Of the remaining 32 implants, survival rate was 100%. In all cases we saw a Barrak class A cement mantle and in 14 cases a physiologic stem subsidence on less than 2 mm within the cement mantle was observed. No bone-cement radiolucent lines, cortical hypertrophy and calcar resorption were detected. No patients complained of tight pain.

Conclusions: Cemented femoral components remain the gold standard for THR in old patients with porotic bone. In this small series of 32 THR, at an average of 8 yrs FU, we obtained excellent results with an ultra short cemented polished stem. Short stemmed cemented hip replacement is an interesting innovation with the great advantage of easing a possible future revision.

ROBOTIC SURGERY APPLIED TO TOTAL HIP ARTHROPLASTY: PRELIMINARY RESULTS AND TECHNICAL NOTES

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Introduction: The advantage of Orthopedic Surgery Robotic Assisted (CORA) is the precise placement of the prosthetic implant, reaching levels of pre-

cision of 1 mm and 1° in space. The attainable accuracy with the proper restoration of anthropometric values represents the theoretical benefit of increased survival.

Objectives: From 07/11/14 to 02/28/15, we performed 32 THA with Robotic technique. The average age was 54 aa (aa 40-84), including 18 men and 14 women. The average robotic time was 64 min. Verification of the results was made by comparing the length, combined offset, inclination and Acetabular Cup version, Combined Anteversion, version of the stem.

Methods: All patients were operated by posterolateral approach. The technique involves the implantation of the femur computer assisted, the cup with a robotic arm and checks combined.

Results: We obtained the following anthropometric data expressed with average values:

Operated hip length expressed in mm compared to the opposite hip to 2.1 mm, compared to the pre-operative increased by 2.7 mm; combined offset than the opposite hip increased by 3.4 mm, compared to pre-operative increased by 2.0 mm; acetabular cup tilt of 41.6° with respect to the actual planned 40.7°; The actual acetabular cup version of 22.2° with respect to the planned 22.6°; The effective combined anteversion of 35.5° with respect to the planned 34.2°; The actual stem version of 13.2° to 11.5° planned.

Conclusions: The factors to consider are the cost-benefit ratio, which are the largest in the immediate management costs and the prosthesis.

The anthropometric correct results, (offset and leg length discrepancy), achieving the best possible result in terms of coverage of the acetabular anteversion and combined, will have a positive impact on the increased survival of implants by reducing subclinical instability, impingement and edge loading.

DYSMETRY AFTER HIP ARTHROPLASTY

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Introduction: The dysmetry of lower limbs after a total hip arthroplasty is still today one of the most common complications. The use of new prosthetic designs and the versatility of the current surgical techniques offer the possibility to reproduce today, in a prosthesis hip the same characteristics of the physiologic one preventing dysmetry.

Methods: It was conducted a multicentric study involving Garibaldi Catania Hospital and S. Giovanni Calibita Hospital - Fatebenefratelli in Rome. The Criteria for inclusion In the study was to select patients affected by arthritis; patients with contralateral prosthesis, dysplastic, rheumatologic or traumatic hips were excluded. The study involved 77 patients aged between 65 and 80 years (mean age 70 years), 32 men and 45 women. Dysmetry cases greater than 1 cm were 12. Clinical and radiographic check-up were performed (AP load x-rays) at 3-6-12-18 months post-op.

Results: Analysis of radiological parameters mentioned above showed that among 77 patients, 12 had a hypermetria of the operated extremity, with values between 10 and 13 mm (11.8 mm average value).

Discussion: An appropriate preoperative planning in total hip prosthesis significantly reduces the risk of complications and allows the orthopaedic surgeon to plan the correct choice of prosthetic elements, so to obtain appropriate femoral and acetabular offset, improvement of lever arm of abductor muscles and therefore limb eumetria. Despite having clear this purpose, the need for intra-operative stability can lead to a variation of these anatomical parameters.

Conclusions: Our study pointed out that, despite an appropriate pre-operative planning finalized to faithfully reproduce the anatomy and morphometric parameters, intra-operative joint stability during surgery can lead to their modification, without involving a serious impact on the function.

BILATERAL TOTAL HIP ARTHROPLASTY: ONE-STAGE VERSUS TWO-STAGE PROCEDURE

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Introduction: Despite several studies, controversies prevailed about the rate of complications following one-stage and two-stage bilateral total hip arthroplasty (THA).

Purpose: In current prospective study, we compared the complications and functional outcomes of one-stage and two-stage procedures.

Methods: One hundred and eighty patients (ASA class I or II) with bilateral hip osteoarthritis were assigned randomly to two equal groups. Two groups were matched in term of age and sex. All of the surgeries were performed through the Harding approach using uncemented implants. In two-stage procedures, surgeries were performed with 6 months to one year interval. All patients were evaluated one year postoperatively.

Results: The Harris hip score averaged 84.1 ± 12.6 and 82.6 ± 15.3 in one-stage and two-stage groups, respectively ($p = 0.528$). The hospital stay was significantly longer in two-stage group (9.8 ± 1.1 versus 4.9 ± 0.8 days). The cumulative hemoglobin drop and number of transfused blood units were the same. One patient in each group developed symptomatic deep venous thrombosis and managed successfully. There was no patient with perioperative death, pulmonary embolism, infection, dislocation, periprosthetic fracture or heterotrophic ossification. No patient required reoperation. Two patients in one-stage group developed unilateral temporary peroneal nerve palsy resolved after 3 and 4 months.

Conclusions: The current study showed that one-stage bilateral THA can be used successfully for patients who require bilateral hip arthroplasty without increased rate of complications. The functional and clinical outcomes are comparable and hospital stay is significantly shorter. However, the authors recommend to perform one-stage bilateral THA for healthy patients with ASA class I or II.

ORAL PRESENTATIONS TRIBOLOGY

DOES THE USE OF A CERAMIC HEAD ELIMINATE THE RISK OF TRUNNIONOSIS?

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Introduction: The use of ceramic heads over metal heads in total hip replacements has increased with the expectation of reduced corrosion at the head-stem taper junction. It is known that the metal alloy used for the stem component affects the likelihood of corrosion at the taper junction but it is currently unknown whether the adoption of ceramic heads eliminates the risk of trunnionosis.

Objectives: The purpose of this retrieval study was to determine whether the use of ceramic femoral heads reduces fretting-corrosion damage at the taper junction compared to metal heads.

Methods: 29 ceramic-on-polyethylene hips (COP), 5 metal-on-polyethylene hips (MOP) and 5 large diameter metal-on-metal (MOM) hips were selected from our retrieval collection; all had been paired with CoCr alloy stems. All head tapers and stem trunnions were: 1) assessed for fretting and corrosion using a semi-quantitative grading method and a subsection of 5 COP, 5 MOP and 5 MOM hips was 2) measured for the volume loss at the head-stem junction using a roundness-measuring machine.

Results: Visual assessment of the junctions revealed the highest median scores for fretting and corrosion at the head taper in the MOM heads and the lowest median values in the COP heads; the highest trunnion score was found in the cohort of ceramic hips. We found that the greatest material loss at the head-stem junction occurred in the MOM heads. Volume of material loss at the head taper was 0.61, 0.19, 0.03 mm³/year for MOM, MOP and COP respectively whilst at the trunnion it was 0.14, 0.06 and 0.09 mm³/year.

Conclusions: We found evidence of corrosion of the inner head taper of ceramic heads however, this was reduced compared to metal heads. The use of ceramic heads does not completely eliminate trunnionosis and may lead to greater material loss at the stem trunnion possibly as a result of the harder ceramic wearing the softer metal.

IMPLANT WEAR IN TOTAL HIP ARTHROPLASTY: A SYSTEMATIC REVIEW AND META-ANALYSIS OF METAL ON POLYETHYLENE VERSUS CERAMIC ON POLYETHYLENE COMPONENTS

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The pursuit for the ideal bearing in Total Hip Arthroplasty (THA) remains the goal of hip surgeons and tribologists. While Metal heads against a Polyethylene (MoP) liner remain the most popularly used coupling, there has been increased use of ceramic heads with a polyethylene liner (CoP). The reasons are twofold; a perceived better wear profile and less corrosion at the head/neck interface with CoP THA. The National Joint Registry of England and Wales highlights survivorship of CoP as being significantly better at 7 and 10 years than that of MoP.

It has been postulated that this better survivorship is due to the lower polyethylene wear rates with a ceramic head.

In this systematic review and meta-analysis we reviewed all English literature on MEDLINE, EMBASE, CINAHL, the Cochrane Database for Systematic Reviews, and the Compendex of Engineering from inception to July 2014 for comparative or randomized studies in this topic. Seven Randomised Control Trials met the criteria for this study with a total of 720 patients (894 hips).

There were no differences in the amount of linear or volumetric wear between the CoP or MoP. There was a confirmation of other studies that there was a higher rate (but non-significant) of linear and volumetric wear using a smaller head irrespective of the tribology. Joint Registry data confirms that the revision rates of CoP are lower than MoP THAs (despite a younger average patient cohort). The reason for that is unknown, but this meta-analysis suggests that polyethylene particulate wear and associated osteolysis may not be the most important cause.

Further investigation is necessary to explain the differences between these two bearing surfaces to aid surgeon choice of bearing materials.

WEAR IN TOTAL HIP ARTHROPLASTY USING CERAMIC HEAD: 10 YEARS MAXIMUM FU

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Introduction: The number of total hip arthroplasties in young patients is continuously increasing. Nowadays, the study of the materials wear, with the goal of improving the survivorship of implants, represents a fundamental subject in this kind of surgery. The role of ceramic materials in the valuation of types of wear is particularly known.

Materials and methods: We have selected 834 patients, underwent total hip arthroplasty, in which a ceramic head was implanted with a maximum follow up of ten years. 367 patients were males and 467 were females, operated by 14 surgeons of the same equipe of Orthopaedic and Traumatology Department. A postero-lateral approach, according to Gibson Moore, and an extrarotator tendons transosseal repair was performed.

Results: 446 ceramic liners, 354 polyethylene liners and 34 metallic liners were used. 18 types of stems, 5 of which stemless, were implanted. The mean survivorship at 10 years was 92%. No ceramic heads and liners breakage occurred. In particular, of 69 total hip arthroplasties, implanted in 2005, only 3 were revised.

Discussion: In our cohort review no major failures of ceramic components were observed. These data suggested the importance of design and up grading of new materials, in order to achieve better long term results. Therefore, the ceramic components represent the gold standard, specifically in young active patients with good long term results regarding functional outcomes and wear of implants.

Conclusions: The use of ceramic head, assembled with ceramic or polyethylene liners, demonstrated good results at 10 years follow up. Ceramic-on-polyethylene is a valid alternative to ceramic-on-ceramic in consideration of the lower cost and theoretical lower risk of breakage.

THE MAXERA CUP LARGE DIAMETER HEADS CERAMIC - CERAMIC

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Introduction: The authors report the short term results of their experience with a new ceramic-ceramic coupling system with large diameter heads (Maxera Cup-Zimmer, Warsaw, Indiana, USA) in total hip arthroplasty. This system incorporates ceramic Biolox® delta, which is characterized by low wear, high fracture strength and excellent biocompatibility, which make this system an appropriate choice for the treatment of younger and more active patients.

Objectives: The study aim was to evaluate: intraoperative and early postoperative complications, prosthetic components placement, early clinical and radiological results and finally the surgeon's learning curve.

Methods: In our unit, from April 2011 to October 2014, 110 cups were implanted with mono block ceramic insert Maxera Cup. In all cases we used a stem Fitmore. Sixty patients were male and 50 were women, and their average age was 59 years (range 30-65 years). The preoperative diagnosis was osteoarthritis in 75 cases and vascular aseptic necrosis in 35 cases. In all patients we performed a mini posterolateral access. The clinical evaluation pre-and postoperative was performed using the Harris Hip Scores (HHS). Radiographic analysis postoperative was performed to assess the correct positioning of the components.

Results: After a follow-up period of 32 months (range 48 to 6 months), clinical and radiographic results were good and satisfactory in all patients. We found an increase R.O.M. compared to the previous standard plants. The HHS is increased from a preoperative value of 48 (range 35-60) to a postoperative value of 95 (range 75-100). We observed no cases of dislocation, infection and early aseptic loosening. We observed 2 cases of transient squeaking. We have obtained excellent results in all post-operative radiographic cases.

Conclusions: The large diameter heads have a high degree of stability and allow a greater range of motion respecting conventional articulation. The coupling ceramic-ceramic is also characterized by low wear, so this system is particularly suitable for young and active patients and it is an appropriate alternative to metal-metal articulation. In our brief experience, the total hip prosthesis heads of large diameter ceramic-ceramic is a very reliable choice in young patients and a safe procedure with acceptable learning curve of the surgeon.

COMPARATIVE EFFECTIVENESS OF THE MOST COMMONLY USED TOTAL HIP REPLACEMENT COMPONENTS IN THE U.S.: COMPARISON OF METAL AND CERAMIC HEADS WITH METAL ON HIGHLY CROSSLINKED POLYETHYLENE LINERS

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Background: The most common bearing surface utilized among primary total hip replacements worldwide is a hard surfaced femoral head that articulates against a soft ultra-high molecular weight polyethylene (UHMWPE) acetabular liner. The purpose of the study was to evaluate metal vs. ceramic femoral heads when used with a UHMWPE liner as well as the effect of using larger sized femoral heads within each of these groups.

Methods: Data were prospectively collected from a U.S. total joint replacement registry. The material of the femoral head (metal, ceramic) was crossed with head size (<32, 32, 36, >36) yielding eight device groupings. The primary outcome was all-cause revision and secondary outcomes included dislocation and infection within one year.

Results: For all-cause revision and dislocation the results suggest use of head sizes <32 mm (relative to 36 mm) led to greater risk of revision for both metal and ceramic heads. For infection there was some indication that metal heads <32 mm heads were protective relative to 36 mm, but a similar effect was not observed for ceramic heads. When comparing metal and ceramic heads there was some suggestive evidence that ceramic heads were protective with respect to all-cause revision, particularly at larger head sizes (36 mm),

however this failed to exceed the threshold of statistical significance.

Conclusions: Use of head sizes <32 mm should be discontinued in favor of larger heads, in particular 36 mm, with a more tenuous recommendation for use of ceramic heads.

FUNCTIONAL AND CLINICAL OUTCOME OF THA USING 4TH GENERATION LARGE DIAMETER CERAMIC COUPLES – IS THERE AN ECONOMICAL JUSTIFICATION?

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Introduction: Bigger bearing couples are in vogue for the added advantage of improved function. The alternative 'Big Balls' to metal on metal bearing remains the ceramic couple. However the associated economical burden remains to be justified. This study reports the clinical, functional and economical analysis of primary hip arthroplasties using large diameter (36 mm and above) 4th generation ceramic bearing couples.

Methods: We prospectively reviewed 1219 consecutive primary THA in 1012 patients, with minimum follow-up of 60 months. A Biolox-Delta ceramic liner with an 18 deg taper and Biolox-Delta ceramic head (36 mm and 40 mm) were used in all cases. Detailed economic analysis was performed. Radiographs were systematically analysed.

Results: Mean age was 64.9 yrs (11-82 years). There were no dislocations. 50-62 mm acetabular shells were used. 36 mm head was used in 92% of cases. No acetabular revisions were performed for aseptic loosening. Other re operations were for infection (1), peri-prosthetic fractures (4) and one ceramic liner fracture. The mean Harris and Oxford scores were 95 (88-97) and 14.1 (12-33) respectively. Mean time to return to recreational sports was 4.2 months. No acetabular liner wear was demonstrated in CT Scans. Mean inclination was 47.4 deg (37-65). With an end point of definite or probable loosening, the probability of survival was 99.3%. Overall survival was 98.1%. Detailed economical analysis revealed a marginal increase in operating costs, which were offset by the reduced risk of infection, aseptic, loosening and improved function.

Discussion and conclusions: The results of this study show an excellent clinical and functional outcome and support the use of a fully coated prosthesis with ceramic bearing couples. Ceramic fracture is technique dependent and the economic implications are minimal to what has been perceived.

MIS-SEATING OF TRIDENT CERAMIC ACETABULAR LINERS: A 6-YEAR AUDIT OF INCIDENCE AND REVISION RATE IN SOUTH DEVON, UK

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Introduction: The Trident uncemented acetabular implant (Stryker, Kalamazoo, Michigan USA) comprises a hydroxyapatite-coated metal shell and a metal-backed ceramic liner. These are assembled intra-operatively, connected by taper press fit. Correct alignment is required for secure mounting.

Objectives: Recently reported liner mis-seating prompted an audit of procedures to discover whether mis-seating led to revision surgery and compare local results with reported rates of misalignment.

Methods: We retrospectively reviewed post-operative and follow-up radiographs of all patients receiving Tridents at Torbay and Mount Stuart hospitals from 2008 to 2014. Data from 5 surgeons was obtained through searching coding records by implant type. We defined mis-seating as the presence of a gap between liner and shell, or liner misalignment relative to the shell of more than 1 degree, on AP or lateral radiographs. All authors were involved in reviewing radiographs.

Results: 108 patients received 118 hips, with an age range of 30-77 (average 57). Of these 16 (13.5%) showed mis-seating. Three of the misplaced liners were correctly positioned on follow up radiographs. This rate is similar to other studies. One hip dislocated soon post-operatively and one required revision for painful psoas tendon impingement; both were in the correctly seated group.

Conclusions: Despite intraoperative checks mis-seating still occurs, possibly due to deformation of the relatively thin shell, and misalignment of the taper as this may jam in an eccentric position. None of the mis-seated liners required revision during the study course, a maximum follow up period of 6 years. Future research is indicated to discover the biomechanical aetiology and long term significance of Trident liner misalignment, especially considering their use in younger patients and subsequent long required implant service life.

IS WEAR OF DUAL MOBILITY CUP LOWER OR HIGHER THAN CONVENTIONAL CUP? RESULTS ANALYSIS OF AN *IN VITRO* STANDARD TEST

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Introduction: Polyethylene (PE) wear is clearly linked to total hip arthroplasty (THA) failure, leading to osteolysis and decreasing survivorship rates. Dual mobility cups (DMC) are widely used to prevent THA instability. However some studies have pointed PE wear risk as a “dual wear” risk. Hip wear simulation is usually used to understand factors influencing wear and to differentiate design, PE and materials performances. To date, few works have been published studying dual mobility insert wear.

Objectives: Our objective was to evaluate wear of DMC compared with a fixed single articulating hip design and to measure wear under same conditions (loading cycle, temperature, sterilization, material and surface roughness).

Methods: The test bench includes one station for a control sample and one for dynamic test. Those are driven independently one from the other. Two electrical actuators applied the forces and two forces sensors putted on the fixing plate of the acetabular part gave the corresponding values. On the dynamic station, the angular movements are generated by an electric motor. Sleeves are installed on the bowls containing the testing liquid and on the supports of acetabular parts, in order to get a tight volume that excludes contaminant particles. Wear is measured by a gravimetric method. The simulator is stopped and implants have been removed from the simulators in order to achieve weighting and observations at 0.5, 1, 2, 3, 4 and 5 millions cycles. At the end, the sample PE insert and the control one are removed from their cup in the aim to measure the mass loss.

Results: Under same conditions gravimetric wear and linear penetration of the head are perfectly comparable between a conventional and a dual mobility cup.

Conclusions: *In vitro*, DMC wear is equal or less important than a standard single fixed cup and volumetric wear is lower than published data. Wear of the two joints of a DMC is not increased thanks to the recruitment phenomenon and the freedom induced by the concept.

of the implanted femur, particularly investigating the effect of stem design on the risk of periprosthetic femoral fractures.

Objectives: The aim of the present study is to investigate the influence of the hip implant design (straight vs. anatomical) on the stress distribution on the surrounding bone in different sideways fall configurations.

Methods: The finite element model of an intact femur was built and validated against experimental data from literature. The model was then modified to simulate the introduction of a straight stem design and an anatomical one. A simple standing and three sideways fall conditions with impact on the great trochanter combining different degrees of adduction (0°, 30°) and internal rotation (0°, 30°) were considered. The influence of the stem design on the stress/strain arising on the surrounding bony structures was analysed and discussed against clinical data.

Results: In standing, the straight stem design demonstrates a more distal load transfer to the bone, while the anatomical one design leads to a more proximal load transfer: these results correlate well with densitometry measurements describing bone resorption/apposition with different stem types. In sideways fall, the straight design leads to significant stress intensifications on the bone at the stem corners and on the tip. Conversely, the anatomical implant leads to high loads on the trochanteric region, where the residual bone thickness is lower than for the straight one, and on the proximal diaphyseal ones, in correspondence of the smooth stem cue.

Conclusions: Our study contributes explaining the rationale behind the higher incidence of distal fractures observed for straight stem designs (85% type B), and the higher incidence of trochanteric and proximal diaphyseal fractures (type B: 61%, AL: 31%, AG: 7.7%) found for anatomical designs.

REVIEW OF PERIPROSTHETIC FRACTURES IN HIP RESURFACING

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Introduction: The incidence of periprosthetic fractures of hip resurfacings has been reported between 0.4 to 4.0%. The standard management is revision to a stemmed femoral prosthesis. However, there have been case reports and series, with the successful management with retention of prosthesis following a traumatic fracture. This would be advantageous for preservation of bone stock and for reduced surgical morbidities associated with revision surgery.

Objectives: To review the current evidence regarding the management of retaining the prosthesis in the presence of a traumatic periprosthetic fracture, in a previously well-fixed hip resurfacing.

Methods: A systematic review was performed using the MeSH Terms ‘Periprosthetic Fracture’ AND ‘Hip Resurfacing’, ‘Intracapsular Fracture’ AND ‘Hip Resurfacing’ and ‘Intertrochanteric Fracture’ AND ‘Hip Resurfacing’. The MeSH Terms were linked with the Boolean operator ‘AND’. Studies were only included if they were published in English language. Studies were excluded if they did not consider the management of periprosthetic fractures of hip resurfacings.

Results: Twenty-one studies were identified. Twelve considered the management of intertrochanteric fractures. Intracapsular fractures were reviewed in six studies and two studies considered basicervical fractures. One study considered a femoral shaft fracture. Two failures were reported in association with intracapsular fractures.

Conclusions: The management of traumatic periprosthetic fractures of hip resurfacings may be managed with retention of the prosthesis. Intracapsular fractures and fractures managed non-operatively, should be closely observed. If there is any concern regarding the stability of the original prosthesis or component malpositioning, revision to a stemmed femoral component is advocated.

ORAL PRESENTATIONS

PERIPROSTHETIC FRACTURES, MEGAPROSTHESIS AND TUMOURS

PERIPROSTHETIC FEMORAL FRACTURE DUE TO SIDEWAYS FALL: A COMPARATIVE ANALYSIS ON THE EFFECT OF STEM DESIGN

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Introduction: Despite previous studies have focused on the failure process leading to hip fractures in sideways falls, no authors dedicated to the study

LATE PERIPROSTHETIC FRACTURES OF THE FEMUR AFTER TOTAL HIP REPLACEMENT

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The management of periprosthetic fractures is an issue of increasing importance for orthopaedic surgeons. Because of the expanding indications for total joint arthroplasty (TJA) and an aging population with increasingly active

lifestyles, the incidence of primary and revision TJA is increasing, and there is a corresponding increase in the prevalence of periprosthetic fractures about a TJA. The management of these fractures is often complex because of issues with obtaining fixation around implants, dealing with osteopenic bone or compromised bone stock, and the potential need for revising loose TJA components.

In addition, these injuries frequently occur in frail, elderly patients, and the literature has demonstrated that both morbidity and mortality in these patients is similar to that of the geriatric hip fracture population. As such, the early restoration of function and ambulation is critical in patients with these injuries, and effective surgical strategies to achieve these goals are essential. The goal of treatment should be to heal the rift in the best anatomical axis as possible, to obtain a stable prosthetic implant, to be able to ensure patient's return to the conditions of the previous features fracture and premature patient mobilization. To achieve these objectives the choice of treatment should take into account the level of the fracture, bone quality, implant stability and quality of life patient.

The aim of our study is to analyze the results of the treatment of a ongoing series of cases of periprosthetic fracture undergoing surgery from 2005 to 2015 at the Department of Orthopedics in S. Orsola Malpighi of Bologna. It is 56 patients, 39 females and 18 males aged between 46 and 93 years (mean 76.3). 32 cases were subjected to osteosynthesis: 4 cerclage isolated, 28 plate osteosynthesis, 25 to reimplantation of the stem and one total replanting. One case had bilateral periprosthetic fracture and one case refracture after osteosynthesis.

Results: The average follow-up was 40.10 months (1 to 126). All fractures have been selected according to the classification of Vancouver: type A: 1, B1: 22, B2: 25, B3: 9, C: 1. The fracture type A has been subjected to revision of the stem for loosening. Type B1 fractures were treated with osteosynthesis in 19 cases, in 2 and was revisited the stem, in a case of non recent fracture, the stem was stable and the fracture was not treated. The type B2 fractures were treated with revision of the stem in 20 cases, and with osteosynthesis in 5. In fractures type B3: in 3 cases was performed revision of the stem; in 6 osteosynthesis. The fracture type C has undergone osteosynthesis. At the time of follow up, 3 patients died of causes unrelated to the intervention. 1 case (B3) was explanted for refracture after osteosynthesis. 4 cases (B2) have had dislocation after revision of the stem due to instability. 2 resolved spontaneously and 2 resolved after stem revision. 1 case of nonunion after osteosynthesis treated with autologous bone grafts. 1 case of deep infection early resolved with debridement and antibiotic therapy. 1 case of consolidation in varus with dislocation of the plaque and reoperated plaque removal. General complications: 3 TVP, 2 myocardial infarction. The authors' conclusion is that the treatment of a fracture around a femoral stem successfully restores function for most patients. The greatest long-term problems are: instability after revision of total hip arthroplasty and fracture nonunion after osteosynthesis. The authors believe that much attention should be paid to the overall condition of the fractured and the quality of life report. Better results is seen in B1 fractures with stabilization of the fracture rather than after replacement of the stem. In these cases it is necessary to obtain the approximation of the fragments to the stem to reduce the risks of instability. B3 fractures should be treated again with revision of the stem, but the focus should be given to the possibility of functional recovery. In large elderly with little chance of functional recovery, conservative treatment should be considered.

MODULAR FEMORAL TAPERED REVISION STEMS IN TREATMENT OF PERIPROSTHETIC HIP FRACTURES

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Introduction: The incidence of periprosthetic hip fracture is almost 1-6% of all primary total hip arthroplasties. In case on stem mobilization a revision surgery is required.

Objectives: To evaluate the clinical and radiographic results of a Modular Femoral Tapered Revision Stems in periprosthetic fractures at mid-term follow-up.

Methods: We retrospectively evaluated 18 patients (14 female and 4 male) with periprosthetic hip fracture. The mean age was 71 years (range: 48-87). According to the Vancouver classification 14 patients were B2 type and 4 pa-

tients were B3 type. In 67% of cases we perform a CT study to better evaluate the mobilization of the stem. In one case also a cup revision was performed. The patients were evaluated with HHS and with a pelvic and hip X-rays at a medium follow up of 50 months (range 36-84).

Results: At the latest follow-up all the fractures were healed. The mean HHS score was 84 points, 73% of patients were pain free and the remaining 27% had slight pain (NRS 1-3). The 50% of patients walks without aid, the 39% of patients use a cane only for long distances and the 11% use cane or crutches all the time. As complications we registered a superficial infection treated successfully with debridement and with antibiotic drugs, and one dislocation treated with an acetabular revision.

Conclusions: This type of stem is useful to treat periprosthetic fractures because the load is transmitted in the diaphyseal region by-passing the fracture site. Our clinical results are in line with those reported in literature for periprosthetic fractures, that are in general inferior to those of primary total hip replacement.

THE OUTCOME OF THE USE OF DISTALLY LOCKED UNCEMENTED FEMORAL STEM (CANNULOK) IN VANCOUVER B2, B3 PERIPROSTHETIC PROXIMAL FEMORAL FRACTURE IN ELDERLY POPULATION

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Introduction: Periprosthetic proximal femoral (PPF) fracture is a serious complication following Total hip arthroplasty (THA)/hemi arthroplasty. These are technically demanding fractures to manage in a high risk group of patients. From the UK National joint registry (NJR) database, PPF fractures are the 3rd most common reason for THA reoperation. The numbers of PPF fractures are expected to increase with time because of the increase in the number of THR performed yearly, the increase in the number of Hemi arthroplasty for hip fractures and the prevalence of osteoporosis in the elderly. The complication and re-operation rate of the PPF fracture is high, reported as up to 48% in some studies.

Objectives: The aim of this study was to assess the clinical and radiological outcome of the use of distal locking femoral stems (Cannulok Plus, Orthodynamics, England) for the treatment of PPF fractures at our institution.

Patients and methods: This was a retrospective study. It has included all patients in the period between 01/01/2007 and 31/03/2014 who have presented to our institution with the following inclusion criteria:

1. Patient with PPF fractures on the top of either one of the following:
 - Ipsilateral primary THR,
 - Revision THR
 - Hip hemiarthroplasty.
2. The femoral stem was considered loose (preoperatively or intra-operatively).
3. The patient has had a revision of the stem using Cannulok stem with or without a combined internal fixation.
4. Patient had at least one year of follow up after their revision surgery.
5. Patients were 75 y old or above at the time of surgery.

We have evaluated the clinical outcome of the patients using the Oxford hip score and assessment of the associated complications. The radiological outcomes have been through reviewing patients' postoperative plain radiographs to assess the fracture union.

Results: 28 patients have met our inclusion criteria with a mean age at surgery of 82.6 (75-92) years. According to Vancouver classification of PPF fractures, 20 patients had Vancouver B2 and 8 had Vancouver B3 PPF fractures. Four patients have early death within 3 months postoperatively. All fractures have united except one which has been managed with plate augmentation and bone graft. With the stem revision for any reason was the end point; the stem survivorship was 100% at mean follow up 44.5 months (24-96). The rate of associated complications was 28%.

Conclusions: The management of these PPF fractures in elderly population poses considerable clinical challenge with high morbidity and mortality as expected in this age group of patients. The distal locking stem achieves strong initial fixation required for bone ingrowth even in cases of severe bone loss with a low risk of revision surgery.

THE ROLE OF MEGAPROSTHESIS IN THE TREATMENT OF SEPTIC NON UNIONS AND CRITICAL SIZE BONE DEFECTS

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Introduction: Recently the evolution of prosthesis technology allows the surgeon to replace entire limbs. These special prostheses or megaprotheses were born for the treatment of severe oncological bone loss. Recently, however, the indications and applications of these devices are expanding to other orthopaedic and trauma situations. Since some years we are implanting megaprotheses in non-oncological conditions such as septic post-traumatic failures represented by complex non-unions and critical size bone defects.

Objectives: The purpose of this study is to retrospectively evaluate the clinical outcome of this treatment and register all the complications and infection recurrence.

Methods: Between January 2008 and January 2014 we have treated 20 patients with septic post-traumatic bone defects. In 15/20 cases we perform a 2 steps procedure: 1° step: resection, debridement, devices removal and antibiotic spacer implantation; 2° step: spacer removal and megaprosthesis implantation. In 5/20 patients in whom all the femur was infected, we performed a one step procedure by the complete removal of the femur and a megaprosthesis (Total Femur) implantation.

Results: We obtained good results from a clinical, laboratory and radiological point of view with restoration of the function of the affected limb. Only in 2/20 cases the infection recurred. All the Total Femur megaprosthesis implanted in a one step procedure healed without recurrence of infection.

Conclusions: Megaprosthesis in severe septic bone loss can be considered, in extreme cases appropriately selected, as an available solution for the orthopedic surgeon. The two steps procedure gives the best results with safety and lower infection recurrence creating a membrane (Chamber Induction Technique) that can protect the prosthesis in a safe environment. We can perform a one step procedure only when all the infected segment is entirely removed. This type of complex surgery must be performed in specialized centers where knowledge and technologies are present.

SILVER-COATED HIP PROSTHESIS REDUCE THE INFECTION RATE IN ONCOLOGICAL LIMB SALVAGE SURGERY

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Background: Silver coatings, used in many surgical devices, have demonstrated good antimicrobial activity and low toxicity. Oncological musculoskeletal surgery have an high risk of infection, so in the last decades, silver-coated mega-protheses have been introduced and are becoming increasingly widespread.

Material and methods: We performed a retrospective analysis of 68 cases of primary or metastatic proximal femur bone tumor, operated between 2003-2015 with wide margins resection and reconstruction with hip tumoral prosthesis. The average age was 61 years (range 41-78 years), all patients were treated by the same surgeon, with antibiotic prophylaxis according to a standard protocol. Silver-coated prosthesis were implanted in 56.8% of patients, standard tumoral prosthesis were implanted in the remaining part. Patients were examined annually and complications were recorded, with particular attention to infectious diseases.

Results: The mean follow-up was 46.5 months. 19.4% of patients died at a median time of 34.9 months after surgery. 18.8% developed complications that required surgery, 8.6% had infectious complication. 2.2% of patients treated with silver-coated implants developed early infection versus 10.7% treated with standard tumoral prosthesis. This difference among the two groups was statistically significant, while the percentage of late infections, occurred from 6 months after surgery, was similar between the two groups. Assuming a reduction of antimicrobial silver-activity in the time, a microscopic analyses of two silver-coated prosthesis, explanted respectively 82 months and 27 months after surgery, was carried out. An important degradation of the coating surface with almost complete absence of silver was observed. Silver blood level have been taken in a sample of patients, at different time

after surgery, and they always showed values significantly below the threshold of toxicity. No patient has shown any sign of local or general toxicity secondary to silver.

Discussion: Our study demonstrates that hip silver-coated prosthesis have a rate of early infection significantly lower than traditional implants, while there were no differences in the rate of late infections, as described also in the literature. This is likely related to wear of the silver-coating, which occurs on average 2 years after implantation.

Conclusions: We recommend the use of hip silver-coated prosthesis as primary implants for limb salvage surgery, in primary or metastatic proximal femur bone tumors, considering the absence of signs of toxicity and the lower rate of early infection.

THE USE OF RAPID PROTOTYPING PELVIC CUSTOM MADE PROSTHESIS ASSOCIATED TO BONE CUTTING JIGS IN PELVIC TUMOR RESECTION

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Introduction: The reconstruction of large pelvic bone defect after sarcoma resection, including the hip joint, is a difficult procedure associated to long operation time and high numbers of complications whatever the reconstruction method.

Rapid prototyping technology allows to make and accurate planning of the resection and anatomical reconstruction. Moreover with the same technique it is possible to perform bone cutting jigs and custom made prosthesis (trabecular titanium).

Objectives: To report our experience about the use on bone cutting jigs and trabecular titanium custom prosthesis in large pelvic bone defect.

Methods: From August 2013 to April 2015, we treated 4 patients for bone pelvic sarcoma. Histology was Ewing sarcoma in 3 cases and chondrosarcoma in 1. Mean age was 27 years (range 18-35). Resection type (acc. with Enneking and Dunham classification) were II and III in 3 cases, while type II and partial III in 1. From high definition CT series of the pelvis a 3D model is obtained and used to define osteotomy lines place and the type of fixation. Custom-made osteotomy jigs (Nylon) and custom-made trabecular titanium prosthesis have been produced through rapid prototyping technology. Osteotomy jigs are placed onto the pelvis during surgery to guide the bone cuts. Custom prostheses is fit in the bone gap and fixed by plug and screws previously planned. Post-operative CT scan was performed to evaluate the matching. The patients were evaluated clinically and radiographically (X-ray and CT scan) every 3 months. Functional evaluation was performed by MSTs score.

Results: Wide margins were obtained in all cases and no local recurrences were evident. Time of surgery was about 4 h (from 200 to 250 minutes). Full weight bearing was allowed at mean time of 6 months.

No postoperative complications. In one case mobilization of a screw without affecting implant stability.

After a mean follow up time of 14 months the first 3 patients could obtain a satisfactory functional result (mean 24/30). No patient use supports and walk with evident limping.

Postoperative CT scan showed good matching, however, signs of bone ingrowth was present only partially in the first patient performed.

The mean follow up was 14 months (range 6-21).

Conclusions: Rapid prototyping is a promising technique able to perform high-precision 3D physical structures. Moreover, short surgical time, adequate margins, low rate of complications and good functional results can be obtained. More cases and longer follow up is need to establish this technique as the future standard in reconstruction after pelvic resection as well as in revision THA surgery.

MULTICENTRE CLINICAL STUDY FOR EVALUATION OF A COLLAGEN-HYDROXYAPATITE COMPOSITE SCAFFOLD IN REVISION HIP SURGERY

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Background: To overcome the limitations of bone grafts in revision surgery, hydroxyapatite-based scaffolds were developed. Regenoss, a three-dimensional composite biomimetic scaffold made of hydroxyapatite nanocrystals

nucleated into type I collagen fibers, represents an innovative solution for bone regeneration. We evaluate the clinical and radiological results of the use of RegenOss in hip revision surgery.

Methods: 127 patients undergoing hip revision were enrolled. Acetabular defects were: IIA in 7 patients, IIB in 65, IIC in 9, IIIA in 9, IIIB in 7. Regenoss scaffold, mixed with blood, was used in all acetabular defects - both contained and medial wall defects. No auto or allograft was used in any patients. The acetabulum was reconstructed using an uncemented hemispherical shell and augmented with screws/augments. Functional recovery was assessed according to Harris Hip score at pre-op., 6 months, 1 and 2 years follow-up. Radiological evaluation of the scaffold was performed with X-rays and CT scan at 6 weeks post surgery, 1 and 2 years.

Results: We report the clinical and radiological results of the patients at a minimum of 18 months follow-up. 79% of the patients reported a complete recovery and/or marked improvement in functional outcome assessed by subjective scoring system (EQ 5D). Complications include dislocation (2%), infection (1.4%) and re revision (3.2%), all of which are unrelated to the Regenoss scaffold. Radiological assessment revealed excellent integration of the bone substitute within the host bone in 94% of the patients. There was evidence of defect filling with regenerate bone in 82% of the cases.

Conclusions: Radiological data demonstrates good scaffold integration despite challenging host bone conditions. The osteoconductive properties are evidenced by new bone formation. Overall data confirms the biomimetic properties, suggesting it is a valid and safe alternative to restore acetabular bone stock in revision hip arthroplasty.

ORAL PRESENTATIONS PRACTICE AND OUTCOMES

A NEW METHOD TO ASSESS AND QUANTIFY LEARNING CURVE IN HIP ARTHROPLASTY

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Introduction: Hip resurfacing arthroplasty is a new procedure and recent studies show a higher complication rate attributed to a learning curve. Implant position and post-op complications have been used to assess this learning curve. A new method using hip scores to assess and quantify this learning curve is presented.

Materials and methods: 2803 patients operated by 27 surgeons were selected from an international hip resurfacing register. Multilevel modeling was used to analyze the effect of serial procedures on year one hip scores. Scores were considered as level one and the surgeon was considered as level two. The first model (simple regression) looked at the effect of individual procedure on first year scores. The second, a random intercept model, took into account the nesting of scores within individual surgeons but assumed that the change in score per procedure for each surgeon would be identical. The final model, a random slope model, assumed that scores for each surgeon could vary over time. Individual coefficients were tested for significance using the Wald test, and the three models compared using the likelihood ratio test. MLWin v2.02 software was used for analysis.

Results: Year one post-op score was 90.8, which improved significantly by 0.011 for each extra procedure performed by the surgeons ($p < 0.05$). In the random intercept model, there was a significant variation between surgeons. The average increase in score after each consecutive procedure was 0.010 ($p < 0.05$). In random slope model, the change in hip score per additional resurfacing procedure was allowed to vary between individual surgeons and there was a significant variation in increase per additional procedure between the surgeons. The surgeons who achieved higher scores in their first procedure had a smaller increase in score per additional procedure than those surgeons who achieved lower scores for their first procedure.

Conclusions: The above results demonstrate a learning effect in surgeons undertaking hip resurfacing arthroplasty and post op hip scores can be a helpful tool for assessment of surgical performance. It can be used to assess and compare trainee performance for other surgical procedures using outcome scores. This method can be used to compare hospitals and regions and help with policy framework.

BEST PRACTICE IN TOTAL HIP ARTHROPLASTY: REVIEW OF SURGICAL PRACTICE BASED ON THE BRITISH NATIONAL JOINT REGISTRY STANDARDISED REVISION RATIO

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The National Joint Registry of England and Wales (NJR) now contains over 11 years of data with over 650000 primary total hip arthroplasties (THA). In addition to providing valuable information on implant survivorship and revision, it is also possible to evaluate the performance of individual hospitals and surgeons. The success of primary THA is dependent on the optimum combination of surgeon, implant, patient and hospital support team. Represented by a standardized revision ratio (SRR) in the form of a funnel plot, this tool can facilitate performance assessment in relation to one's peers. By forensic analysis of the best and worst SRR performers we hope to elucidate factors which may favour 'best practice' and thus guide surgeons towards improved SRR and thus reduced early revision rates.

Analysis of NJR funnel plot SRR was utilized to identify two surgeon groups. SRR results above the upper confidence limit reflect special-cause variation and are termed 'outliers' (SRR > 3 Standard deviations (SD) from norm). Similarly those surgeons with an SRR significantly lower than expected (SRR < 3 SD from norm) are termed 'underliers'. Data for these surgeon groups underwent comparisons for patient demographic, implant choice (cement, non-cement, bearing, head size) and surgeon factors (surgeon level, case load, surgical approach).

Surgeons identified as underliers compared to outliers had higher proportions of cemented implants (42 vs 14%), very low usage of stemmed metal on metal implants (2 vs 20%) but the same numbers of resurfacing replacements (10%). Underliers used less femoral brands (9 vs 16), less acetabular brands (12 vs 16) in fewer combinations (22 vs 40) per surgeon than Outliers. The mean age of patients and proportion operated upon by the consultant were the same. Underliers with the greatest numbers of cases and the lowest revision rates could be considered examples of best practice and to ascertain a lower than average SRR their model of practice could be assimilated.

SURVEY OF UK CONSULTANT ORTHOPAEDIC SURGEONS ON SURGEON SPECIFIC DATA IN ORTHOPAEDIC SURGERY: A PILOT STUDY

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Introduction: The publication of surgeon specific data (SSD) in the UK is presented with mortality as a key indicator. Mortality is rare but there are other measures that would be more informative such as revision and infection rates. Publication of individual surgeon data has potentially significant implications on service provision, innovation and training. Our questionnaire aims to explore the opinions on the current format of data publications and related concerns.

Methods: A questionnaire was adapted from one used recently in a survey of UK cardiothoracic surgeons. The questionnaire explored topics that had been defined previously in cardiothoracic literature. There is very little literature that discusses public reporting of orthopaedic outcomes. In this pilot study a selection of 25 orthopaedic surgeons were invited to complete a modified questionnaire of whom 11 were lower hip/knee arthroplasty surgeons. The questionnaire was online and fully anonymised utilising questions with Likert Scale answers and free comments.

Results: A selection of the responses are summarised as follows.

- 40% of respondents favoured the publications of SSD but 40% were opposed
- 72% favoured the publication of unit specific data

- Respondants felt that data was subject to misinterpretation by patients (84%) and colleagues (80%)
- 72% felt that innovation will be stifled
- 76% felt that there will be adverse affect on training of juniors
- 63% felt that there was more risk-averse behavior in patient selection 84% of respondents felt that their unit was not adequately resourced to collect the preferred outcomes of Patient Reported Outcomes (PROMS), infection and revision rate

Conclusions: From this pilot we conclude that the current reporting of data lacks accuracy and relevance, and has made many practitioners risk-averse. The impact on morale, inter-personal relationships, innovation and training need to be explored and acknowledged. We are developing our questionnaire for national release.

TECHNOLOGY OPTIMISED ENHANCED RECOVERY SOLUTIONS IMPROVE OUTCOMES IN TOTAL HIP (THA)

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Introduction: A multi-modal, technology-enabled program based on existing ER protocols was developed in THA aimed at optimising patient experience and delivering streamlined care with improved consistency and continuity. The program integrates modified health-service components (joint school, novel outreach support team) with interactive multi-media components (paper-based patient packs, DVDs, web-based patient and staff portals).

Objectives: Primary: Impact on length of stay (LOS) and 30-day readmission rates. Secondary: Impact on complication, re-operation, re-attendance rates, Oxford Hip Score (OHS), general health numerical rating scale (NRS) and patient experience ratings.

Methods: 1040 consecutive patients from January 2012 to December 2014 were divided into pre- (n = 519) and post-implementation groups (n = 521). The latter was subdivided into those specifically eligible for outreach support (OS) (n = 180) and those ineligible for this service (NOS) (n = 341). A smaller cohort (n = 132) of pre- (n = 62) versus post-implementation (n = 70) patients completed OHS, NRS and the satisfaction survey at 6-month follow-up.

Results: Comparable patient cohorts (age, mean 58.0-58.9; gender, 61.8-62.8% female; ASA grade 3+ 24.2-25.0%; Charlson index, mean 3.0-3.2) demonstrated reduction in mean (geometric) LOS (4.8d to 3.9d combined, 3.4d (OS), 4.2d (NOS), p<0.001) without an increase in 30d readmissions. No negative impact was observed in 6-month readmission, complication, reoperation and re-attendance rates (general complications (OS) p = 0.0148; 6 month readmissions (NOS) p = 0.0362). OHS was improved in (OS) patients (health gain 24.231, p<0.001) and NRS in all patients (health gain 1.7-2.3, p<0.002). Higher ratings were observed in education, confidence, expectation management, recommendation of service and overall satisfaction (p<0.001 to p = 0.003).

Conclusions: Patient-centred technology-enhanced programs built on established ER clinical protocols may drive efficiencies in THA surgery, leading to consistent reductions in LOS without any negative clinical impact. Positive patient-focused outcomes and experience ratings may reflect improved expectation management and patient activation.

THE RELATIONSHIP BETWEEN PATIENT EDUCATIONAL ATTAINMENT AND THA OUTCOMES: A COHORT STUDY

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Introduction: The Oxford Hip Score (OHS) is a patient reported outcome measure (PROM) used to assess hip arthroplasty outcomes. Increasing patient deprivation (measured by the Index of Multiple Deprivation) is associated with poor total hip replacement (THR) outcome. Education, skills and training (EST) is a significant component of the Index of Multiple Deprivation (IMD).

Objectives: The aim of this study was to explore whether EST is associated with hip arthroplasty outcome, as measured by Oxford Hip Score.

Methods: Patient data was collected from the Advancing Quality initiative, comprising knee and hip arthroplasty operations performed between 2010 and 2014 in the Northwest of England. Patients were ranked according to EST score and assigned to tertiles to represent three groups of relative educational attainment (high, moderate, low). Patients completed Oxford scores pre-operatively and 6 months post-arthroplasty. An improvement in OHS was defined as ≥ 5 points (a minimal clinically important difference). Association between EST category and arthroplasty outcome was assessed with multivariate logistic regression, adjusting for age, sex, pre-op OHS and statistically significant patient-reported comorbidity. Results were reported as adjusted odds ratios (OR_{adj}) with 95% confidence intervals.

Results: 8,251 patients had complete data. Mean age was 69 (SD 9.9) and 43% of patients were male. Compared to high EST: moderate and low EST were inversely associated with improvement after hip arthroplasty [OR_{adj} 0.76 (0.61-0.95)] and [OR_{adj} 0.56 (0.45-0.69)] respectively. In addition, patients with low EST were more likely to report a decrease in Oxford score post-operatively than those with high EST [OR_{adj} 1.63 (1.17-2.27)].

Conclusions: Lower educational attainment appears to be a poor prognostic marker for patient-reported improvement after THR surgery.

There is an indication that we should improve identification of individuals with a poorer educational background in order to trial programmes that prevent inequality of outcomes between differing levels of educational attainment.

YOUTUBE AS A SOURCE OF PATIENT INFORMATION FOR TOTAL HIP REPLACEMENT SURGERY

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Introduction: We assessed a selection of video content currently on YouTube relating to Total Hip Replacement (THR). The internet provides immediate access to medical resources that can be accessed by patients and YouTube itself has over one billion unique monthly users and is likely to be accessed by patients for further self-education regarding THR.

Methods: The top 50 videos using the search term "total hip replacement" were identified on a single date using default search criteria. These were reviewed by a specialist orthopaedic resident and content graded for accuracy based on 4 criteria: The procedure demonstrated, understandability of information, patient expectations and risk/benefit information.

Basic video metrics such as length, video quality were noted, as were the video sources in terms of production and geographical location.

Results: In total we identified 76,600 videos using the search term above. Forty-six out of 50 videos reviewed contained information relevant to THR in humans and half of these were either live or computer simulated demonstrations of surgery. Most contained information relevant to patients although a number appeared to favour surgical practitioners as the target audience. The mean video length was 9 minutes, 39 seconds. Most videos (28/50) were not presented in a high-quality video format. Twenty-nine videos were graded as "highly accurate" overall and 14 as "mostly accurate." The significant majority of videos originated from the USA.

Discussion: Video information has been demonstrated to have a beneficial effect on physiological stress of patients undergoing surgery, as well as on patient decision-making with regards to surgical intervention.

Our study has identified the clear interest in video content regarding THR online and that current media is accurate. If an institution were to consider producing patient video information then we would recommend this be concise, patient-focused and of high audiovisual quality.

ASSESSING HOSPITAL COST OF JOINT ARTHROPLASTY

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Arthroplasties for hip and knee arthritis are a highly successful procedure and hospital reimbursements for joint arthroplasty represent one of the largest payment by Health Services. Direct and indirect costs rely on patients, physicians, hospital, health service and stakeholder as a whole. Hypothesis for this study was that reimbursement from the public Regional Health Service (RHS) can cover the entire service in a district Italian hospital.

Gross costs for total joint arthroplasty (TJA) has been analyzed for patient procedure track (PPT): pre admission clinic, surgical procedure, in-patient and out-patient stages. Personnel, tools, operating theatre, implant, financial costs have been measured on yearly activity. Hospital financial department have measured medical staff, nurses and administration costs. Direct and indirect costs supply has been related to TJA procedure. The orthopedic department prospectively measured costs and surgical activity for TJA during a 3 months period. Reimbursement by the RHS for the code number 544, primary hip and knee joints replacement, during the analyzed period was 8861,77 euro for each procedure.

Costs for drugs and disposables has relied on 86 primary procedures, 40 hips and 46 knees. Pre admission have been evaluated in 115 euro for each patient. Gross costs for the surgical procedure stage has been measured in 3798 euro for each patient. Surgery has been performed by experienced surgeon and it took an average time of 75 minutes. The prostheses prize has been an average of 2001 euro for each implant. The TJA procedure cost has been esteemed in 6952 euro in front of 8861,77 euro of reimbursement. Among stages of the PPT the surgical procedure relies for more than 55% of the all costs. Gears and instruments rely for 2650 euro and prosthesis is 2/3 of the costs. Staff organization and personnel fee is 4297 euro. Staff's cost for IP stage cover the 60%.

Inpatient resource are the most important fee for a TJA, representing nearly the 60% of all reimbursement. The price of the implant has to consider the value of the procedure and volume of the hospital. To cut costs Regional Health Service has to consider network rather than individual specialists and purchases. High-quality prospective data are essential to drive resource allocation and robust methodologies should be used to pave the way of the patient performance track.

HOW GRANULAR SHOULD YOUR JOINT REGISTRY BE?

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Introduction: Joint registries are set up for various reasons including recall, surgeon performance and implant performance. Implant performance can be judged grossly or down to fine detail and there is a wide variation in the degree of "granularity" to which various joint registries aspire. In the past there has been a view that registries should not be very granular but this has led to poorly performing subgroups of implants, within a large otherwise successful family being "missed".

The NJR database had become out of date and we have been consulting with many of our partners in ISAR to produce a more sophisticated system.

Objectives:

- To develop a component library of attributes that embraces all the differences between every type of hip replacement that is available so as to be able to compare performance and identify outliers.
- To make it possible for manufacturers to upload their data to match the attribute list in one international system for the benefit of any registry who would like to use it.

Methods: We have compared the NJR architecture with the ICOR and EPRD (German National Registry) systems and produced a very granular list of attributes that we would like to share with the meeting.

Results: Over the past 10 years there have been at least 5 occasions when NJR has failed to identify outlier implants, the most noteworthy being stemmed metal on metal.

With EPRD and ICOR we have now designed a very granular system that should identify outliers more efficiently and allow comparisons to be made between the attributes associated with a hip replacement.

Conclusions: Over the past 10 years the options in total hip and total knee replacement have increased enormously and they have not always been to our patient's advantage.

The statistical power that can be achieved by linking registry data, when numbers can be small in individual registries, will give enormous value to patients, surgeons and manufacturers.

ORAL PRESENTATIONS

BLOOD LOSS, DVT PROPHYLAXIS AND PERIOP MANAGEMENT

THE EFFECT OF TRANEXAMIC ACID ON TRANSFUSION RATES, LENGTH OF HOSPITAL STAY IN TOTAL JOINT ARTHROPLASTY

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Introduction: This paper reports the results of a universal protocol for administration of tranexamic acid to all patients undergoing elective joint replacement surgery in our hospital.

Objectives: To determine whether a program of universal tranexamic acid use would bring about a quality improvement as measured by post-operative transfusion rates, hospital length of stay and complication rates.

Methods: With institutional ethics approval we retrospectively assessed the impact of a quality initiative to use a protocol for pre-operative TXA administration in patients undergoing total hip and knee arthroplasty between January 1, 2012 and April 30, 2014. Patients with known risk factors for thrombosis or seizure were excluded.

Results: We assessed a total of 2,173 patients and observed an overall increase in TXA utilization from 37% to 95%. This resulted in an overall reduction in RBC transfusion rate from 9% to 5% for all procedures ($p < 0.05$). This effect was most significant in unilateral primary total hip replacement. Universal TXA therapy resulted in an increase in postoperative Hb and a decrease in LOS. No increase in adverse thrombotic complications was observed. The treatment was cost effective. This approach was perceived by patients as providing an increase in quality of care as documented by a survey 6 weeks postoperatively. This program resulted in a cost saving estimated at over \$200,000.00 (Canadian) over the course of a year.

Conclusions: Preoperative administration of TXA (20 mg/kg) undergoing total hip and knee arthroplasty resulted in a reduction in RBC transfusion, an increase in postoperative Hb and a reduced length of hospital stay. This was associated with substantial costs savings without evidence on an increase in adverse clinical outcomes. The impact was most pronounced for primary total hip arthroplasty.

LOCAL USE OF TRANEXAMIC ACID IN PATIENTS UNDERGOING HIP OR KNEE ARTHROPLASTY TO MINIMIZE THE BLOOD LOSS

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Introduction: Arthroplasty is one of the major operations where the patient is subjected to blood loss and usually needs blood transfusion either intraoperatively or/and postoperatively, recently many authors started to use the tranexamic acid in such patients to allow for control of blood loss.

Objectives: To investigate the efficacy and safety of local tranexamic acid in patients receiving either total knee or total hip arthroplasty.

Methods: From March 2013 till now, clinical data of 116 patients who received either primary total knee or total hip arthroplasty or revision hip arthroplasty were analyzed prospectively, with mean age of 63 years. These patients received local tranexamic acid after implantation of the prosthesis and left there for 3 minutes before closure in anatomical layers and suction drain insertion. The amounts of postoperative visible blood loss, the hidden blood loss, and blood transfusion, the number of patients needing blood transfusion were recorded.

Results: There was a significant decrease in blood loss postoperatively which indeed decreased the need for blood transfusion after the operation and allowed for a better general condition immediate postoperative.

Conclusions: The local application of tranexamic acid intraoperatively in hip or knee patients could significantly reduce the amounts of postoperative blood loss and blood transfusion to avoid TKA patients' perioperative anemia-related complications. It is also safe, economic and easy to use during surgery.

TOPICAL USE OF TRANEXAMIC ACID IN TOTAL HIP ARTHROPLASTY. A PROSPECTIVE RANDOMIZED CONTROLLED TRIAL

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Introduction: Postoperative blood loss remains an important factor in orthopaedic surgery. Alloisogenic blood transfusions are associated with increased morbidity, mortality and increased costs (1, 2). The intravenous use of tranexamic acid (TA) is widespread in orthopaedic surgery, with use in both total knee arthroplasty and total hip arthroplasty. It has been shown to reduce blood loss and transfusion requirements; in addition, it also reduces financial costs (2). Topical application has the advantage of directly target the bleeding sites while systemic uptake is limited. It theoretically reduces the risk of thromboembolic complications (3-5).

Consent: Written consent was obtained from all participants in this study.

Objectives: The aim of this study is to investigate the efficacy of the topical use of tranexamic acid to decrease postoperative blood loss in comparison with a control group.

Materials and methods: This is a prospective randomized controlled trial in elective total hip arthroplasty.

We enrolled 63 patients, 25 in our study group and 38 in our control group, randomly assigned.

Pre-operatively we recorded; Haemoglobin level (Hb, g/dl), Haematocrit value (Hct, %), platelet count, INR, and partial thromboplastine time. Postoperative values were measured on day one and on day five, postoperatively, or earlier when indicated. Postoperative blood loss was recorded on a standard protocol. The transfusion rate, if necessary, was equally recorded.

Exclusion criteria: known allergy to tranexamic acid, clotting disorders, a history of vascular disease.

Results: Only preliminary results are available for now, but postoperative blood loss on day 0 already differs statistically significant ($p = 0.030756$), (mean TA group 87,083, mean placebo group 139,17).

Transfusion rate when comparing both groups is not statistically significant ($p = 0.145$), but the tendency is to be statistically significant; 0/25 transfusions in the TA group, 4/34 in the control group. A larger study with more included patients is necessary.

No adverse events were recorded considering the topical application of TA.

Conclusions: Topical application of tranexamic acid is a feasible and safe way to decrease postoperative blood loss and possibly transfusion rate in total hip arthroplasty.

Only preliminary results are known, results will be definitely known in the near future.

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A NOVEL APPROACH TO CONTROL PAIN FOLLOWING TOTAL HIP REPLACEMENT

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Background: Hip arthroplasties are associated with high postoperative pain scores. In some reports, moderate to severe pain was 58% on the first day postoperatively in total hip replacements (THRs) (Wylde 2011, Beswick AD 2012). Several techniques are currently used at our institution to tackle acute pain following THRs. These include: 1) Spinal anaesthetic (SA) with Diamorphine only; 2) General anaesthetic (GA) only; 3) SA with local infiltration anaesthetic mixture 1 (LIA1). Mixture 1 consisted of ropivacaine, adrenaline, and ketorolac; 4) SA with LIA mixture 2 (LIA2). Mixture 2 consisted of bupivacaine and adrenaline; 5) SA with LIA1 and PainKwell pump system. In this study we report on the techniques of acute pain control following THR at our regional centre for elective primary THRs.

Methods: Between June 2011 and July 2014, 173 consecutive patients undergoing primary THR using the posterior approach were prospectively followed up.

Group 1. GA only. 31 patients,

Group 2. SA only. 37 patients,

Group 3. SA plus LIA₁ only. 38 patients,

Group 4. SA plus LIA₂ only. 34 patients,

Group 5. SA plus LIA₁ plus PainKwell Pump System for 48 hours. 33 patients.

Results: Fewer patients required opiate analgesia when LIA plus PainKwell pump system was used compared to the other groups. The highest significance was at 0-12 hrs for patients requiring up to 20 mg morphine usage ($\chi^2(2) = 46.713$, $p = 0.000$); and 0-12hrs for patients requiring 30 mg morphine usage ($\chi^2(2) = 46.310$, $p = 0.000$). There were no infections, DVTs or PEs in any group. One patient in group 3 suffered a stroke (ASA 4). A Kruskal-Wallis H test also showed that there was a statistically significant difference in morphine usage across groups 1, 2, 3, 4, and 5.

Conclusions: We recommend the use of LIA with PainKwell pump system continuous infusion as an efficacious method to control pain following THR.

THE DIAGNOSIS OF PULMONARY EMBOLISM IN ORTHOPAEDIC PATIENTS AT THE PAH

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Pulmonary embolism (PE) is the commonest cause of preventable death following knee and hip arthroplasty. The National Health Service has introduced guidelines for its diagnosis.

A retrospective audit was performed to study whether these guidelines are adhered to in orthopaedic patients. We hypothesised guidelines were not adhered to and computed tomography pulmonary angiography (CTPA) was performed when not indicated resulting in the overdiagnosis of PE. Standards measured included whether patients had a chest x-ray (CXR) and Wells score performed before undergoing CTPA. We compared our hospital against meta-analysis data on diagnoses rates of PE from CTPA to investigate if PE was over-diagnosed.

Over one year period, 78% of patients underwent CXR and 44% Wells score prior to CTPA, majority of patients with abnormal CXR did not have PE. Rates of diagnoses of PE were in keeping with published data. We presented our findings to the hospital radiology department with the aim of ensuring that CTPAs were not performed unless the guidelines were adhered to; the audit was repeated. CXRs were performed in 82% and Wells score in 82% of cases, representing a small improvement.

Diagnosing PE in orthopaedic patients is far from straightforward; there may be a role for respiratory physicians in guiding management. The limitations of the Wells score in detecting PE in orthopaedic patients are known. We propose a prospective study investigating the reliability of its use in patients undergoing lower limb arthroplasty and the implementation of a specialised protocol for orthopaedic patients with suspected PE.

VENOUS THROMBOEMBOLISM AFTER LOWER LIMB ARTHROPLASTY – DOES CHEMICAL PROPHYLAXIS REDUCE THE RISK?

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Introduction: Venous thromboembolism (VTE) is a significant complication of lower limb arthroplasty. In the UK, the National Institute for Health and Care Excellence (NICE) currently recommends routine use of chemical and mechanical prophylaxis to prevent VTE. Our unit performs a large volume of elective lower limb arthroplasty and adopted this guidance in 2008.

Objectives: This paper reviews our incidences of VTE before and after introduction of chemical thromboprophylaxis.

Methods: We retrospectively gathered data on 2 cohorts of patients- January 2004 to August 2007 (Group 1) and January 2010 to December 2012 (Group 2). Patients in Group 1 received mechanical prophylaxis only (unless particularly high risk for VTE), patients in Group 2 received mechanical and chemical prophylaxis. We recorded VTE occurring within 6 months of surgery. Patients in Group 1 receiving chemical prophylaxis were excluded.

Results: Group 1 had 2320 cases of primary and revision lower limb arthroplasty and Group 2 had 1430 cases. VTE occurred in 37 cases in Group 1 (1.6%), and in 17 cases in Group 2 (1.2%). This difference was not statistically significant ($p = 0.26$). In Group 1, 1 patient died within 6 months due to pulmonary embolism (0.04%), there were no VTE related deaths in Group 2 (0%). This was also not statistically significant ($p = 0.06$).

Conclusions: Although our VTE rate reduced by 0.4% and our VTE related mortality reduced by 0.04% after introduction of chemical thromboprophylaxis, these differences were not statistically significant. Chemical thromboprophylaxis may not be required in all patients undergoing arthroplasty providing appropriate mechanical prophylaxis is used.

IS EXTENDED VENOUS THROMBOEMBOLISM PROPHYLAXIS BEING PRESCRIBED CORRECTLY AFTER ELECTIVE TOTAL HIP AND KNEE ARTHROPLASTY AND FRACTURE NECK OF FEMUR SURGERY?

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Introduction: Hip and knee arthroplasty carries a high risk of venous thromboembolism (VTE), which has a considerable burden of morbidity and mortality. The National Institute for Health and Care Excellence (NICE) in England recommends post-operative pharmacological prophylaxis in elective total hip replacements (THR), elective total knee replacements (TKR), and fracture neck of femur surgery (NOF) for at least 28 days, 10 days, and 28 days, respectively.

Objectives: To evaluate whether extended venous thromboembolism prophylaxis after THR, TKR and fracture NOF surgery was prescribed in accordance with national guidelines.

Methods: A single-centre retrospective audit of electronic discharge letters was performed for all patients who underwent elective THR, elective TKR and fracture NOF surgery from October 2014 to March 2015. Audit criteria included class of pharmacological VTE prophylaxis prescribed, and length of prescription. The standard was set at 95%.

Results: Of a total of 454 patients identified from hospital records, 130 THR, 101 TKR, and 223 NOF patients were analysed. The mortality rate was 0.8% for elective THR, 1% for elective TKR, and 8.5% for fractured neck of femur. VTE was prescribed after surgery in 96.1% of THR patients, 98% of TKR patients, and 98% of NOF patients. The mean length of prescription after THR surgery was 28 days (SD 4, range 10-56), after TKR it was 12 days (SD 4, range 10-42), and after NOF surgery it was 29 days (SD 2, range 28-44). Only THR patients (5.6%) had a subtherapeutic length of prescription.

Conclusions: A combination of local induction practice of new trainees, multidisciplinary education and electronic prescriptions has achieved greater than 96% adherence to national guidelines for extended venous thromboembolism pharmacological prophylaxis after elective total hip and knee surgery, and fracture neck of femur surgery.

RENAL FAILURE IN POST-OPERATIVE LOWER LIMB PRIMARY ARTHROPLASTY PATIENTS

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Introduction: Acute kidney injury is a recognised post-operative complication in primary joint replacement. Previously identified risk factors include. Within our unit an increased rate of acute kidney injury had been noted post-operatively over the last 5 years.

Objectives: Aim was determining whether we could identify a causative factor or those who were at increased risk of post-operative renal impairment.

Methods: Data were collected for 413 patients initially retrospectively but continued prospectively. Data collected included patient demographics, pre-operative risk factors, intra-operative factors and post-operative factors. Univariable and multivariable analysis was performed to determine any causative factors.

Results: 23% of patients developed acute kidney injury, with an increase of 125% of their baseline creatinine. 8.23% of patients developed an increase of 150% in their creatinine levels.

There was no difference between the demographics of the groups. Age, previous renal failure and the pre-operative use of an ACEi were found to be statistically higher in the renal failure group. The uni-variable analysis also demonstrated that patients who received a small volume of post-operative intravenous fluids had a lower rate of renal failure than those who received no fluids (10% vs 23%; $p = 0.04$).

The multivariable regression analysis demonstrated that age was the only statistically significant positive predictive factor in developing renal failure.

Conclusions: Renal impairment has significant impact on patient morbidity and post-operative management. It increases the length of stay, and may potentially require more invasive therapy. We have demonstrated that the identified risk factors are non-modifiable.

ORAL PRESENTATIONS

PREOP PLANNING AND POSTOP EVALUATION THA

ARE THE INFLAMMATORY MARKERS (ERYTHROCYTE SEDIMENTATION RATE, C-REACTIVE PROTEIN, PROCALCITONIN) A GOOD SCREENING FOR TOTAL HIP ARTHROPLASTY? A MULTICENTRIC STUDY

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Introduction: Orthopedic implants have become an essential component of modern medicine. In 2006, More than 91.650 total hip replacements are performed in Italy. The risk for orthopedic total hip arthroplasty-related infections (THADRI) is 1.5% to 2% in Italy.

Objectives: Are Erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) and Procalcitonin (PCT) good for the screening of total hip infection?

Materials and methods: From February 2009 to december 2012 at our department of Orthopedics and Traumatology, Gaetano Rummo Hospital and Ospedale Sacro Cuore di Gesù Fatebenefratelli (Benevento, Italy) and Clinical Center (Banja Luka, BIH), we treated 1248 (patients of mean age 73.4 years old (range 21-85), 678 males and 570 females, with Total Hip Arthroplasty. No one of THA was cemented. We did in all patients the antibiotic's prophylaxis with Cefazolin. The THA's surface were in: 53.7% (n = 670 patients) of Ceramic on Polyethylene, 38.6% (n = 482 patients) of Ceramic on Ceramic and 7.7% (n = 96 patients) Metal on Metal. The 1248 patients were discharged about 7.4 days after the surgery (range 5-12) with the following follow-up program: clinic

radiographic control with pelvic and hip projections (AP, LL, and Axial of Femur) at: 15 days, 1 month, 3 months, 6 months, 12 months, 24 months, 36 months after the surgery. We performed the collection of blood for the determination of ESR, CRP and PCT at: one hour before the surgery, 15 days, 1 month, 3 months, 6 months, 12 months, 24 months, 36 months after the surgery.

We have classified the possible infection with the Widmer's classification.

Results: During our follow up, we had 22 (1,75%) cases of THA infection. According to the Widmer's classification, we split the infection: Hematogenous (≥ 2 years old from the surgery) in 16 (72.73%) cases; Late chronic (≥ 1 month from the surgery) in 5 (22.73%) cases and Early postoperative (≤ 4 weeks from the surgery) in 1 case (4.54%). In All cases, the three markers were considered positive, in 6 (27.27%) cases out of 22 there were no radiological signs of septic loosening of the system. Before to the revision of the prosthetic implant, we performed an aspiration of the intra-articular of the hip under fluoroscopy to determine the white blood cell count and determination of the pathogens. The pathogenes were founded: Coagulase-negative staphylococci in 12 (54.54%) patients, Gram-negative bacilli 7 (31.82%) patients, Enterococci 3 (13.64%) patients. After 5 days from the intra-articular aspiration, we performed a review of the system (two step revision in Hematogenous and Late chronic group, one step in Early postoperative).

Conclusions: ESR, CRP and PCT showed a better diagnostic accuracy than XR count in predicting the infection of THA in Late chronic group and Early Postoperative group. These three markers are a valuable support to the surgeon in monitoring the survival of the prosthetic implant.

MRI EVALUATION AS PREOPERATIVE EXAM FOR PREDICTING POST-OPERATIVE UNSATISFACTORY RESULTS IN PATIENTS WITH TOTAL HIP ARTHROPLASTY

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Introduction: Gluteus muscle trophism is an important factor for satisfactory clinical outcome after total hip replacement.

Objectives: The aim of the study was to verify a correlation between preoperative level of fat degeneration of the medius and minimus gluteus muscle and postoperative clinical outcome.

Methods: We prospectively followed-up 21 male patients. All patients were preoperatively evaluated with clinical examination (Oxford, WOMAC, Harris and HOOS scale). They were also assessed MRI exams. Fat degeneration of the maximus (MXG), medius (MDG) and minimus (MNG) gluteus muscles were classified according to Goutallier et al. and to the Quartile system.

Results: Follow-up was performed at 12 months after surgery. No differences were seen in either of the three muscles analyzed both in regard to Goutallier classifications (MNG: 1.18 vs. 1.27; MDG: 1.18 vs. 1; MXG: 2 vs. 1.9; $p < 0.05$) and in regard to the Quartile classification (MNG: 1.18 vs. 1.27; MDG: 1.09 vs. 0.9; MXG: 1.81 vs 1.81; $p < 0.05$). MNG and MDG muscles showed similar values suggesting they tend to act in similar ways in terms of fat degeneration; on the contrary MXG in all cases showed worse results compared to MDG (2 vs. 1.18 for Goutallier and 1.81 vs. 1.09 for Quartile on the affected side; $p: 0.02$) and to MNG (2 vs. 1.18 for Goutallier and 1.81 vs. 1.18 for Quartile; $p: 0.02$). Pearson's coefficient evaluation showed a moderate linear correlation between values of preoperative fat degeneration and clinical results in regard to MNG ($p: 0.4$) and MDG ($p: 0.5$), while an inverse correlation was found in regard to MXG ($p: 0.9$).

Conclusions: MXG is the first gluteus muscle to start suffering from fat degeneration in hip arthritis. Persistent limping is more frequent in patients with higher preoperative fat infiltration in MDG, (Pearson coefficient: 0.6), suggesting that this muscle is the most involved in determining post-operative persistence of gluteal insufficiency.

THE PATIENT SPECIFIC TEMPLATE FOR THE FEMORAL NECK CUT AND THE ADJUSTMENT OF STEM ALIGNMENT IN SHORT STEM

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Introduction: Considering the revision surgery, the bone preservation of the proximal femur is an important issue in primary total hip arthroplasty (THA). Short stems can be a potential resolution for this problem. However, owing to its short stem length, it is difficult to implant short stem precisely according to the preoperative planning.

Objects: To validate the utility of the patient specific templates (PSTs) that were designed for the indication of the femoral neck cut and stem alignment.

Methods: Sixty primary THAs by short stems (MiniHip: 25 hips and Optimys: 35 hips) with PSTs were included. Preoperative planning was made in all cases with 3D-templating software (ZedHip; LEXI, Tokyo). Two types of PST were designed; one for the indication on the level and direction of the femoral neck cutting for stem valgus and flexion alignment, and the other for the stem anteversion. They were made of acrylonitrile butadiene styrene with 3D printer (Replicator2X, MakerBot, USA). Twenty primary THAs, which were operated without PSTs in the immediately preceding term, were used as a control. Stem alignment, anteversion, valgus and flexion angle, and longitudinal position were measured by postoperative CT with the same software. Precision and accuracy of the PST were respectively evaluated by root mean square error (RMSE) and standard deviation (SD) by comparing between the PST and control groups.

Results: The average of errors, RMSE and SD of the PST group were as follows; -4.7, 4.7 and 4.7 degrees for anteversion, -1.1, 2.5 and 2.6 degrees for valgus, 2.4, 2.0 and 2.0 degrees for flexion, 1.4, 2.8 and 4.7 mm for longitudinal position, respectively. Those of the control group were respectively -0.1, 6.8 and 6.9 degrees for anteversion, -0.7, 4.5 and 4.6 degrees for valgus, 0.8, 2.9 and 2.9 degrees for flexion, 0.8, 5.5 and 6.9 mm for longitudinal position.

Conclusions: The alignment of the short stem could be controlled by PST with the higher precision and accuracy.

ACCURATE ANATOMIC RESTORATION IN PRIMARY TOTAL HIP REPLACEMENT WITH 3-D-HIP-PLANNING

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Preoperative 3-D-hip-planning is a CT based technique to achieve the most accurate restoration of the hip's rotation centre, the correct offset and the leg length in primary total hip replacement. Furthermore, 3-D-hip-planning offers preoperative choice of the best fitting implants adopted to individual needs. Between 2009 and 2013 CT-scans were performed in a cohort of 400 patients who were to have primary THR. All patients had initial CT scans. These data were analysed using special hip plan software for preoperative planning and selection of implants. The aim of this 3-D-hip-planning was to achieve the most accurate restoration of the hip's rotation centre, offset and the leg length to restore good function. To achieve this, the data of different implant models and stem shapes were deposited in the planning software, thus making it possible to select the appropriate prosthetic components for the reconstruction of the rotation centre, the offset and the leg length to suit every individual patient's anatomical needs. The introduction of preoperative 3D hip planning offers the possibility of a preoperative choice of implants adapted to the individual anatomical needs of a patient. In 42% of the surveyed 3-D-hip plans a modular stem in different versions was proposed. The survey has shown the advisability of modular implants in primary THR if accurate restoration of the hips anatomy is the aim. For that reason, preoperative 3-D-hip-planning is recommended to enable the surgeon to identify those patients who require modular implants. Radiation and costs of 3-D-hip-planning are justifiable in view of the expecting benefits of this method.

THE ACCURACY OF RESTORATION OF THE FEMORAL HEAD CENTRE OF ROTATION IN THE ANTEROPOSTERIOR PLANE AFTER UNCEMENTED TOTAL HIP ARTHROPLASTY, A CT BASED STUDY

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Total hip arthroplasty (THA) aims to restore joint biomechanics. Considerable attention has been paid to vertical and horizontal offset in order to restore leg length and abductor lever arm. Femoral head centre in the antero-posterior (AP) plane has received little attention.

This study investigates restoration of joint centre in the AP plane.

Postoperative CT scans of 40 patients who had undergone unilateral unce- mented THA were analysed. Bilateral measurements of AP offset and femoral anteversion were taken. Sagittal tilt of the femoral stem was also measured. AP offset was measured on axial slices and defined as the perpendicular distance between a line drawn from the anterior most point of the proximal femur (anterior reference line) to the centre of the femoral head. The anterior

reference line was made parallel to the posterior condylar axis of the knee to correct for rotation.

28/40 of THAs had an increased femoral anteversion compared to the contralateral native hip. Once corrected for sagittal tilt, 33/40 (82.5%) of hips had a centre of rotation displaced posteriorly compared to the contralateral native hip with a mean posterior displacement of 7 mm (range -4.5-18.7). Linear regression analysis indicated that stem version would have to be increased by 10.8 degrees in order to maintain the head centre in the AP plane. Merely matching the native version would result in a 12 mm posterior displacement of the head centre.

This study demonstrates the significant incidence of posterior displacement of the head centre in uncemented THA. The effects of such displacement of the head centre on the biomechanics of the hip are not understood but may influence the joint reaction force vector, with consequent influence on wear of the acetabular component. There are also potential implications for stem design and operative technique, as posterior displacement of the centre of rotation can result in increased risk of bony impingement in flexion and internal rotation.

MARKER-FREE AND AUTOMATED COMPUTER TOMOGRAPHY BASED SPATIAL ANALYSIS TOOL TO QUANTIFY HIP ARTHROPLASTY STEM MIGRATION. DEVELOPMENT AND VALIDATION

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Introduction: Accurate quantification of hip stem migration allows early detection of inferior implants and helps to diagnose stem loosening. Radiostereometric analysis (RSA) is accurate but requires bone markers and expensive stereo-radiographic equipment.

Objectives: We developed and validated a marker-free automated Computer Tomography based Spatial Analysis tool (CTSA) to quantify stem-bone migration in consecutive CT scans.

Methods: We first segmented bone and stem within both three-dimensional images, then we pairwise registered these elements. By comparing the rigid transformations of stem and bone, we calculated stem migration compared to the bone and transferred the translation and rotation parameters to an anatomic coordinate system. Accuracy was assessed in a stem-bone model by calculating the difference between imposed and measured rotations and translations in 39 cases. Precision, defined as stem migration calculated in a zero-migration model, was assessed in 8 experimental cases and in 5 patients.

Results: The in-vitro accuracy of CTSA was below 0.20 mm for translations and 0.19° for rotations in all cases (95% tolerance interval (95% TI) below 0.22 mm and 0.20°, largest standard deviation of the signed error (SD_{SE}) 0.081 mm and 0.057°). The in-vitro precision was below 0.05 mm and 0.08° in all cases (95% TI below 0.06 mm and 0.08°, largest SD_{SE} 0.012 mm and 0.020°). The precision in five patients was below 0.48 mm and 0.37° (95% TI below 0.59 mm and 0.61°, largest SD_{SE} 0.202 mm and 0.279°). However, this could be largely improved by optimizing scanning conditions.

Conclusions: Our marker-free automated CT-based spatial analysis can detect hip stem migration with an accuracy and precision comparable to that of radiostereometric analysis (RSA), but without the burden of bone markers and the cost of stereo-radiographic equipment. As such, it could become a new standard to quantify of hip stem migration in an experimental setting but also in clinical practice.

DENSITOMETRIC EVALUATION OF PERIPROSTHETIC BONE RESORPTION AFTER SURGICAL PLACEMENT OF ACCOLADE I TMZF HIP STEM AT 36 MONTHS

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Purpose: This study aims to evaluate the effects of the Accolade I® TMZF® metaphyseal stem on the periprosthetic bone density at the level of the

7 Gruen zones and to define the evolution of bone resorption associated to the design of the stem. The periprosthetic bone remodeling data were collected with DXA scan. Therefore, this study also intends to predict, based upon the collected results, the long-term duration and stability of the stem, as they are directly related to the periprosthetic bone resorption process.

Methods: 25 patients (11 men and 14 women) were selected in this study in accordance with specific inclusion and exclusion criteria. Patients underwent total hip replacement with Accolade I® TMZF® hip stem (average age of 66). They were all clinically evaluated based on Harris Hip Score and Womac Score, and preoperative radiology examinations were performed. Clinical, radiological and bone density evaluations were performed on each patient within six months and at 12, 24 and 36 months after surgery.

Results: The results at 36 months show a statistically significant increase (p<0.001) of the HHS scores, from 64 during preoperative phase to 93 at 36 months. No patients underwent secondary replacement surgery and no radiolucency was found during radiological assessments. The bone mineral density changes in the 7 Gruen zones seen with DXA scan showed a decrease of 2.9% only at the level of the calcar region (R7), a moderate increase at the level of R1, R2 and R3 and a statistically significant increase of BMD (p<0,05) at 24 and 36 months after surgery at the level of R4 (+6.2%), R5 (+7.2%) and R6 (+8.15%).

Conclusions: Our study revealed that the Accolade I® TMZF® uncemented stem is safe as far as periprosthetic bone resorption is concerned, after a middle-long term follow-up evaluation at 36 months, since it shows a definitely positive BMD evolution at the level of all Gruen zones and especially at the level of the medial region (R5, R6). The only exception where BMD results mildly decreased (from 1.03 to 1.00) is at the level of R7, most likely due to weight load increase at a lower level (R6) compared to patient's physiological condition. Therefore, the DXA scan shows evidence of weight load changes mainly on the medial metaphyseal aspect, which results to be a fundamental parameter of the long-term stem longevity.

THE CORRELATION BETWEEN FEMORAL OFFSET AND CLINICAL OUTCOME

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Introduction: Femoral offset (FO) is represented by the perpendicular distance from the center of the femoral head to the long axis of the femur. It is involved in abductor function and its respect in Total Hip Arthroplasty (THA) seems to be associated with better outcome.

Objectives: Our purpose is to evaluate the association between the respect of native femoral offset and clinical and functional outcome.

Methods: We retrospectively evaluated all THA performed between 2011 and 2014. Inclusion criteria were follow-up longer than 24 months and primary THA, exclusion criteria were follow-up shorter than 24 months and presence of a contralateral THA. Among the 234 patients that meets inclusion criteria pre- and post-operative XR were revalued. We considered as "respected" a FO when the difference between the THA and native side was no higher than 5 mm. On the other hand when this difference was higher than 5 mm we considered the FO as "not respected". 23 patients presented a "non respected" FO and were matched with 23 patients with a "respected" FO. VAS and Harris Hip Score (HHS) were collected. The statistical analysis is conducted through Student's t test and Fisher's exact test for categorical data.

Results: Although a greater number of patients with "respected" FO showed a higher HHS no statistically significant difference was observed between two groups, as well as no difference was observed regarding VAS.

Conclusions: Despite the observation that restoration of FO is associated with better hip function and lower wear rate It is still unclear its correlation with clinical and functional results.

ORAL PRESENTATIONS

PRIMARY THA (PART 2)

FUNCTIONAL OUTCOMES OF TOTAL HIP ARTHROPLASTY IN PATIENTS AGED 30 YEARS OR LESS

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A systematic review of the published literature on total hip arthroplasty (THA) in patients aged 30 years or less and meta-analysis was performed to assess whether THA in this very young patient group provides significant functional improvement. Primary outcome measure was pre-operative Harris hip score (HSS) compared with score at final follow up. Secondary outcome measures were implant survivorship and the effect of fixation type and bearing surface. The 14 studies meeting the inclusion criteria represent the results of 743 primary THA procedures. Weighted mean patient age was 22.7 years. All studies showed similar significant improvement in HHS with heterogeneity index (I^2) of 97%. HHS improved after surgery by a weighted mean difference of 42.17 points out of 100 (95% CI 36.48 to 47.86 points, $p < 0.001$). 37 hips (5.0%) were revised following a weighted mean follow up of 8.4 years, resulting in an annualized revision rate of 0.6% per annum. Radiographic evidence of loosening was reported in 38 (5.4%) of the unrevised hips after a weighted mean follow up of 8.4 years. 8 studies reported the results of 457 exclusively uncemented THAs with a weighted mean follow up of 9.9 years. HHS in this subgroup improved by a weighted mean difference of 42.07 points out of 100 (95% CI 33.78 to 50.36 points, $p < 0.001$). The revision rate in the all-uncemented subgroup was 1.3% at 9.9 years or 0.1% per annum. Loosening was seen in only 1 hip from the all-uncemented group (0.2%) compared with 38 hips (5.4%) of unrevised hips in the overall cohort. When the effect of bearing type was analyzed, the HHS improved by 45.8 points (95% CI 36.9 to 54.9 points, $p < 0.00001$) at a weighted mean follow up of 12.2 years in the uncemented, ceramic-on-ceramic group. The annualized revision rate in this subgroup was 0.06% per annum, the lowest of any bearing/fixation combination. Our results suggest that uncemented, ceramic-on-ceramic THA may be optimal for THA in this very young age group.

LONG-TERM RESULTS OF TOTAL HIP REPLACEMENT IN HEALTHY UNDER-30 PATIENTS. RESULTS AT A MINIMUM OF 10 YEARS

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Introduction: The evolution in diagnostic techniques and tribology contributed to the increase of total hip replacement (THR) surgical indications in subjects under 35. Avascular necrosis, juvenile arthritis, rheumatic and oncologic diseases represent the most common findings in this patients. Revision rate at 5 years range from 4 to 10% and the analysis of clinical scores allowed to draw encouraging results.

Objectives: The purpose of this study was to analyze the clinical and radiological outcome of THR in a group of healthy under-35 patients; minimum follow-up 10 years. We also investigated failure rate and its cause. Collected data were compared to the ones obtained from a control group.

Methods: In our institution, from 1995 to 2015, 243 under-35 patients undergone THR. The following inclusion criteria were assumed: age at the surgery 18-35, 10 years minimum follow-up, primary implant, absence of underlying systemic disease and ipsilateral lower limb prostheses. A control group aged between 50 and 60 years was matched by sex and BMI. After investigating surgical indication and additional revision procedures, all patients were clinically evaluated using Harris Hip and Oxford Hip Score. A radiological assessment was conducted too.

Results: The study is still in progress, however preliminary results shown an higher revision rate in the under-35 group (8% vs. 4%). The most common indications to the surgery were avascular necrosis and developmental hip dysplasia. Higher clinical scores were evidenced in the control group, although the difference was not statistically significant; an increase in statistical power could confirm these preliminary results.

Conclusions: Total hip replacement can restore a good range of motion and allow to the patients a pain-free solution; however long-term results are influenced by age, activity level, functional needs and expectations. Under-35 years patients show inferior clinical results and higher revision rate than over-50.

THA IMPLANT CHOICE IN YOUNG ACTIVE PATIENTS UNDER 60 YEARS. EVIDENCE IN THE LAST TEN YEARS

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Introduction: In recent years, advances in THR surgery have broadened the range of hip system options and promoted the development of more conservative (resurfacing) and smaller implants (neck preserving) with new hard bearing surfaces. These implants are less invasive, tissue sparing and more durable in time. As more young patients experience hip joint disease, these implants strive to maintain quality of life and mobility, preserving tissue for predictable next revision for these young active patients. These patient still active in works and sports ask for a short recovery time and a quick return to ADL. We have analyzed our implant choice in the last ten years (2004-2013) in patients under 60 years of age and analyzed the changes with new surgical options, clinical evidence and results.

Materials and methods: During the last ten years (2004-2013) in the Orthopaedic Department of University of Modena (2004-2011) and afterward in OPA Nigrisoli of Bologna (2011-2013) we have implanted 2165 hip prosthesis of which 768 (35%) in 581 patients under 60 year of age at the time of the index operation. We have reviewed recently the clinical form of these young adult patients and analyzed the pathology, sex, mean age at the operation, type of implant, bearing surfaces and FU clinical and radiographic at 1 year post-operation and the last year for the ultimate control.

There were 348 female (59%), the mean age was 53.8 year (18-60) while pathology was mainly DHD (28%), FAI with OA (22%), idiopathic necrosis (18%) post-traumatic (15%), inflammatory arthritic disease (10%) and developmental disease like epiphysiolysis and Perthes disease (5%). The approach was or direct lateral or postero-lateral in lateral decubitus. In 487 cases (63%) we have implanted conservative prostheses (resurfacing or hybrid with conventional stem and big metal head) with MoM bearing of which 185 resurfacing implants. These implants mainly in the period from 2004 and 2008. In the other instances conventional or neck preserving stems or short stems, based on femur pathology with ceramic on ceramic bearing surface.

All the implants excluding part of resurfacing (BHR or ASR) were not cemented in both acetabular and femoral components.

Results: In this ten years experience with hip implants in patient aged 60 years or less we have analyzed the type of implant and bearing surface and its success in a relatively short period of FU. At the FU (min 2 years max 10 years we have had only 27 (3.5%) failures with as end point the revision of the implant, 19 in resurfacing and metal-metal implants (70%) while only 8 cases (30%) with ceramics on ceramics: 3 cases of instability, 2 implant breakage in modular implants, 2 infections and 1 periprosthetic fracture. The causes of failure in MoM group were multifactorial: early neck fracture, pseudotumors, aseptic loosening and pain for soft tissue impingement. The patients not revised were very satisfied of the operation with return to previous activity.

Discussion: Resurfacing replacement and MOM hybrid implant has shown in register and in our hand early failure in short time after operation when precise indication were not respected (sex, age, head diameter, mineral bone density, non-distorted anatomy). The lowest rate of revision was in men with OA, younger than 55 years and with a head diameters of 50 mm or more. In Avascular Necrosis, a relative contraindication for resurfacing we have implanted uncemented resurfacing implant BMHR removing more necrotic bone. In young and active patients the aim is to have full ROM without risk of dislocation, (head diameter <36 mm) durability of implants without wear (MoM or CoC), bone preserving for future re-implants (resurfacing or neck-preserving stems). In USA MoHXLPE is the implant of choice for reducing wear without increasing risk for mid-term failure, while ceramic on ceramic is criticized for risk of fracture and squeaking and MoM for early fracture, adverse local tissue reactions and metal ions release. Modern ceramics are extremely hard, scratch-resistant, biocompatible, low coefficient of friction, high lubrication and lower wear rate. In our experience after few years (2004-2008) of enthusiasm for MoM bearing, after the warning for early failure we have turned to ceramic on ceramic implants with extreme satisfaction for our

patients. In this group of patients we had only 1,5% of revision unrelated to the bearing surface except for 1 ceramic head rupture after a fall.

Conclusions: We have analyzed a period of time (2004-2013) with great changing in hip implants mainly in a young and active population. We have begun with MoM implants and resurfacing with enthusiasm in 2001 as many other colleagues. These implants meet some of the purpose for long-lasting replacement: big diameters head, stability, conservative, less wear but ions problems and bad indication lead to unexpected early revision. Young adults need stable implants, high ROM, less wear for longevity of the prosthesis. Nowadays ceramic on ceramic bearing hard surface seems to meet the great expectation of this part of population that need a replacement surgery in middle age.

TOTAL HIP ARTHROPLASTY IN JUVENILE IDIOPATHIC ARTHRITIS: A LONG TERM FOLLOW UP WITH CUSTOM MADE IMPLANTS

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Introduction: Juvenile Idiopathic Arthritis (JIA) is a common rheumatologic disease that frequently involves the hip joint and requires treatment with total hip arthroplasty (THA). The procedure is often complicated by the presence of multi planar deformities, poor bone quality and small size of patients. A custom-made femoral component is required by the bone size and may also address the proximal femoral deformities.

Objectives: The aim of this study was to review the results of THA in patients with JIA with an average follow-up of 10 years. We evaluated the survivorship of the implants and patients were reviewed clinically and radiographically.

Methods: 10 primary THA using custom-made cementless femoral component were performed into 5 patients with JIA. The average age was 26 years, the mean weight was 37,4 kg and the average follow up was 12,1 years. The primary outcome data was implant survival. Functional evaluation using Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and patients satisfaction using Forgotten Joint Score (FJS) were carried out at the last follow up. Residual pain was evaluated using the NRS (Numeric Pain Intensity Scale: 0-10). Radiographs of the hip were obtained annually.

Results: The survivor rates of both femoral and acetabular components were 100%, at a mean of 12,1 years. Mean pain evaluation were 0,4 (range 0-2) at rest and 3,1 (1-7) during physical activity. The mean WOMAC was 78,3 (range 46,1-88,7). All patients with low score had JIA affecting other lower and upper limb joints. All the patients were satisfied and the FJS was 68,17. There was no evidence of radiographic progressive loosening of the components.

Conclusions: The results of our study allow to recommend custom-made cementless stems for the treatment of JIA of the hip in presence of proximal femoral deformities and small size, as well as poor bone quality. They should be considered the gold-standard treatment for this challenging patients.

TOTAL HIP ARTHROPLASTY IN RHEUMATOID ARTHRITIS: LONG-TERM FOLLOW-UP WITH UNCOATED UNCEMENTED IMPLANTS

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Introduction: Rheumatoid arthritis (RA) is a systemic disease characterised by multiple joint involvement. Total hip arthroplasty (THA) is a successful procedure in RA patients, achieving pain relief, functional improvement and patient satisfaction. Cemented THA has been considered the treatment of choice for RA. It is believed that the biomechanical changes in the rheumatic bone may increase the risk of complications during THA when using cementless implants.

Objectives: We conducted a retrospective follow-up analysis of RA patients treated with uncemented, uncoated PPF stem (Biomet Inc., Warsaw, IN, USA) and uncemented cup during primary THA.

Methods: Between 1998 and 2011, 151 patients affected by RA (204 hips) underwent primary THA, all of which received the PPF stem with a variety of uncemented cups. Patients were invited to follow-up assessment a mean of 10.9 ± 2.7 years after the procedure. Baseline variables were gathered from hospital records. Participants were administered the Forgotten Joint Score questionnaire, a standard ambulation questionnaire and a pain visual analogue scale. All patients were examined radiographically on anteroposterior and lateral views.

Results: Clinical and radiological data was available for 99 patients (149 hips). On Kaplan-Meier analysis, 10-year survival of the stem was 98.8% (95% confidence interval (CI), 95.2-99.7%) and 15-year survival was 94.5% (95% CI, 82.8-98.3%). The median postoperative FJS was 91. Functional outcomes were good in the majority of patients. Radiolucent lines were observed in 41.2% of patients, and 38.8% had Grade I or II ossification. Femoral osteolysis was recorded in 9.4% patients, without clinical symptoms.

Conclusions: The cementless implant achieved good mid-term results in a large population of RA patients. This is the first study to show a good postoperative functional outcome following primary THA in RA patients.

OUTCOME OF CHARNLEY TOTAL HIP REPLACEMENTS - SINGLE CENTRE EXPERIENCE

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Introduction: Charnley Total Hip Replacements are currently used limitedly. One of our surgeons uses this prosthesis locally and has so far had good outcome. In January 2000, the department of health (UK) issued a report stating that there was little justification for the use of other prostheses in older patients. It costs less and the revision rates at 10 to 20 years were low.

Objectives: To look at the outcome in our practice of usage of Charnley Total Hip Replacements.

Methods: We looked at as many patients as we could from our database who had Charnley Total Hip Replacements under the care of this surgeon from 1993 to 2013. Oxford hip score questionnaires were sent out to the patients.

Results: We looked at a group of 23 patients who have had 33 hip replacements. 10 had bilateral Charnley hip replacements and 13 had one side done. The average age was 62.4 and the age range was 51 to 82. All of the patients had the surgery for primary osteoarthritis except one who had it for posttraumatic osteoarthritis. Where 16 hips were done (48.5%), there was no change to mobility status but all these patients were able to mobilise with the maximum aid of one stick. In 6, (18.1%), there was improvement by a single level in terms of mobility. And in 3, there was a deterioration by a single level of mobilisation (9.1%). Overall post-operative complication rate was 12.1%. Average follow – up time was 15.3 years with a range of 4 to 20 years. With this follow up period, no patient required revision surgery. There was also no radiological evidence of heterotopic ossification. There were 14 questionnaires returned by 9 patients. 1 patient had died and there was no returns from the rest of the patients. The average Oxford Hip Score was 47 out of 48 with a range of 6 to 48.

Conclusions: We concluded that the usage of Charnley Hip Replacements is very much justified as per advice from the department of health (UK).

OUR EXPERIENCE OF HIP REPLACEMENT USING THE MAKO-RIO SYSTEM (MAKOPLASTY)

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In the context of joint replacement interventions, the aims of the orthopaedic surgeon are to implant a long-lasting prosthesis that respects the biomechanical characteristics of the treated joint and to carry out the operation in a way that hastens post-operative recovery and reduces the aggressiveness of the surgery. For years, technological research has been trying to supply surgeons with high-precision, navigable, robotic instruments that can reduce the margin of error in positioning prostheses, which is otherwise difficult for surgeons. In 2006, the MAKO-RIO robotic system was introduced in the USA, initially for use in prosthetic knee surgery (mono- and bi-compartmental) and then extended to total hip arthroplasty. The strengths of this system are the high precision of prosthesis positioning, reliability and reproducibility. This method enables constant control and monitoring of the essential parameters of hip replacement surgery, such as the centre of rotation, the level of the osteotomy of the femoral neck, the size and rotation of the stem, and the size and position of the acetabular cup, taking into account anteversion and femoral offset (anteversion and combined offset). These elements are fundamental for optimising the muscle forces acting on the prosthesis, controlling the length of the operated limb and ensuring stability, thus accelerating functional recovery.

Between December 2012 and December 2014, this method was used at San Francesco Clinic to treated 140 patients with hip arthritis (76 males, 64 females). Corin Trinity cups and Metafix stems were used. These are currently the only components that can be implanted in Europe; the whole Stryker range of prostheses will become available towards the end of 2015.

Each patient underwent pre-operative standard radiographic imaging and bilateral computed tomography of the hips and knees. The information acquired was recorded by the software of the robotic system. The patient was placed on the operating table in a lateral decubitus position and an antero-lateral surgical approach was used. Through the temporary placement of specific supports in the acetabulum and a screw in the trochanter at the beginning of the operation, transmitters were applied which, interfacing with a system of infrared rays, enabled the surgeon to record the exact anatomical characteristics of the joint, to perform the femoral osteotomy at the level planned pre-operatively, and to prepare the site for the acetabular cup using the robotic arm. The acetabular cup was implanted with the help of the same robotic arm which was set and blocked with the planned inclination and anteversion, maximising the surgeon's precision. The median time of use of the robotic system was 51.4 minutes per operation.

The patients were evaluated pre- and post-operatively using the HIP score and underwent radiographic controls at 2 months, 6 months and 1 year.

All complications were recorded. There were two infections: one was accompanied by dehiscence of the surgical wound 30 days after the operation, treated with open-air cleaning of the wound and intravenous antibiotics, while in the other case the prosthesis was removed and a temporary antibiotic-treated spacer was introduced. There was one case of sciatic nerve paralysis with complete recovery of the tibial nerve and partial recovery of the common peroneal nerve at one year and one case of luxation of the prosthesis, which occurred 4 months after its placement as the consequence of a fall with forced rotation of the leg. The post-operative controls have been completely satisfactory, although the duration of the follow-up is still too short to be able to draw definitive conclusions.

In our opinion the MAKO-RIO robot-assisted system is a valid technological procedure, enabling surgeons to avoid misplacement of the components of prosthetic joints thanks to the precise, continuous control of predefined values. The method is also reliable and reproducible, although it does have a long learning curve.

OUR EXPERIENCE IN HIP REPLACEMENT WITH MAKO RIO SYSTEM

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Introduction: The objective of hip arthroplasty is to perform an implant that replicates the biomechanical features of the joint, that it is durable and allows a fast functional recovery.

Technological researches are ongoing to allow surgeons to work with more precise devices to carry out such implants.

Objectives: The robotic system has been introduced into the United States for knee arthroplasty and now extended for hip arthroplasty. This method is accurate, reliable and reproducible and allows to recreate the anatomic center of rotation, the correct level of the femoral osteotomy and control version and offset of the stem and cup. This is basic for the implant stability and to optimize the muscular forces acting on the system.

Methods: At Clinic San Francesco, between December 2012 and June 2015, 182 patients (102 males, 80 females), all affected by osteoarthritis, were treated with Makoplasty.

Each patient was assessed by pelvis radiographs and CT scan of hip-knee ipsilateral.

The surgical approach used is anterolateral in lateral decubitus.

The surgeon, through the use of specific tools, is able to record the anatomical features of the joint and do a planned femoral osteotomy and correctly shape the cup.

The acetabular cup is implanted by the use of the robotic arm, which would have previously been set accordingly.

Results: All the patients were evaluated by the Harris Hip Score. A pelvis radiograph view was made after two months and after one year.

The complications that were recorded were as follows: 2 infections, a temporary paralysis of the sciatic nerve, a prosthetic dislocation after four months. Our results are positive thanks to the good post-op response from the patients.

Conclusions: The robotic system can help the surgeon avoid mistakes during operation.

The technique is absolute reliable and reproducible, with a long learning curve.

LONG-TERM OUTCOMES OF HIP ARTHROPLASTY WITH NEW KAZ. NIITO PROSTHESIS

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Introduction: Research and evaluation of long-term outcomes after hip replacement is an urgent problem.

Objectives: To study long-term outcomes after hip arthroplasty using a new femoral prosthesis Kaz. NIITO.

Methods: Comparative analysis of the long-term outcomes after implantation of the femoral component of the endoprosthesis were studied in 109 patients after 2 and 3 years. Control group consisted of 49 patients, study group consisted of 60 (prosthesis Kaz. NIITO). There were 47 men and 62 women. High percentage of patients ranged in age from 52 to 65 (75.5%). The evaluation of long-term outcomes was conducted by Harris scale.

Results and conclusions: In the dynamics anatomical and functional condition of the joint was not worse than in the closest period and remained at the same level. For example, in the control group, the mean score on Harris scale after 2 years was $85 \pm 1,4$ (95% CI 82-88) points, in 3 years was the same, 85 points. In the study group, the mean Harris score in 2 years was $89 \pm 1,2$ (95% CI 87-91) points, after 3 years was $90 \pm 1,1$ (95% CI 88-92) points. However, it should be noted that after 2 and 3 years the anatomical and functional status of hip joint after surgery became deteriorated slightly, but remained stable. Thus a comparative analysis of long-term outcomes showed that better results were observed in the study group using the Kaz. NIITO prosthesis.

ORAL PRESENTATIONS

REVISION: FEMORAL SIDE

REVISIONS OF HIP RESURFACINGS FROM AN INDEPENDENT SPECIALIST CENTRE

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Background: Reasons for revision of metal-on-metal hip resurfacing (MoM-HRA) have included early revisions often due to neck fractures and later revisions with adverse local tissue reactions (ALTR) to wear debris. Revisions of MoMHRA with ALTR have an increased risk of re-revision. The purpose of this study was to identify causes of failure and factors improving revision outcome.

Methods: 180 consecutive HRA revisions were performed in 172 patients. Eight different HRA designs were revised mainly in females (60%). Component orientation was measured on Xrays using EBRA. Ion levels were measured since 2006 (n = 153). Harris-Hip-Score (HHS) was obtained pre-revision and at last follow-up. The initial experience of the first 42 cases (Initial Group) was compared to cases 43-180 (Later Group).

Results: Mean time to revision was 38 months (0-160). 8 HRA were revised for fracture, 8 for infection. Component malpositioning (acetabular 48%; femoral 10%) was most common and associated with high metal ions (62%). Intra-operative findings included ALTR (48%), metallosis (36%) and impingement (29%). Metal sensitivity was suspected in 8 patients (6F/2M). ASR were revised earlier (21 months, SD:10) than BHR (38 months, SD:25) (p = 0.05). HHS significantly improved post-revision (93, 42-100) (p<0.001). 14 complications (9 dislocations; 5 infections) and 9 re-revisions occurred. Outcome was significantly better in the Later Group than the Initial group (p = 0.005). The incidence of complications/re-revisions significantly reduced since the introduction of metal ions (p = 0.004). The presence of ALTR did not significantly affect outcome (p = 0.65) but patients with ALTR in the Later group (n = 51) had reduced complication and re-revision rates.

Conclusions: Component malpositioning is the most common cause of HRA failure. Metal ion measurements are an excellent tool to detect wear at an early stage. Patients with soft tissue reactions can have good outcome if operated prior to extensive soft tissue destruction.

FEMORAL OSTEOLYSIS AND ITS IMPLICATION IN REVISION HIP SURGERY

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Introduction: Femoral fracture and perforation are associated complications when undertaking revision hip surgery.

Objectives: We aimed to assess whether the presence of osteolysis in pre-operative radiographs was associated with an increased incidence of femoral complications.

Methods: The National Joint Registry and the Electronic Patient Records system were analysed to identify revision hip procedures performed between 2012-2014. Radiographs were reviewed for all the revision hip arthroplasties where a femoral stem was removed as part of the revision procedure. Stem position and the presence of osteolysis on AP and Lateral radiographs were recorded to assess whether stem position and the presence of osteolysis were associated with femoral complications.

Results: 442 revision procedures were identified having been performed by four surgeons of which 192 cases had a stemmed femoral component removed as part of the procedure. All surgeries were performed using a posterior approach. 32 patients (17%) sustained an untoward femoral complication (12 uncemented stem and 20 cemented stem revisions). 38 (20%) patients underwent an osteotomy to facilitate stem removal.

14 (43.8%) of the 32 patients with a femoral complication had no evidence of osteolysis on pre-operative radiographs. 9 (28%) of femoral complications were associated with osteolysis in all 14 Gruen zones. Of the 160 cases without an untoward femoral complication, 34 (17.7%) had evidence of osteolysis in all 14 Gruen zones. Stem malpositioning was not found to be associated with increased complications. There was no significant increase in complications when removing a cemented versus uncemented stem.

Conclusions: This study did not reveal an association with osteolysis in a particular Gruen zone with an increased risk of femoral complication during revision hip surgery.

A TRENCH LOZENGE OSTEOTOMY TO REMOVE FEMORAL COMPONENTS IN HIP PROSTHESIS REVISION SURGERY: A SUCCESSFUL SPARING TECHNIQUE

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Introduction: Revision of THA (Total Hip Arthroprosthesis) is an ever increasing challenge in relation to the rising rate of new primary implants and the major longevity of patients. Often, primary prostheses implant's failure is subsequent to aseptic mobilization of one or more components, debris formation, or technical errors. Major use of cementless osteointegrative implants increased revision difficulties.

Objectives: Our purpose is to obtain a new revision implant without a serious destructive surgery while removing the primary one, in order to preserve maximal integrity of proximal metaphyseal bone segment of the femur however insuring a stable bone-prosthesis interface.

Material and methods: Between 1995-2014, 410 patients have undergone a THA revision surgery; a posterior- lateral surgical approach was used; 135 (33%) cases needed an osteotomy to remove femoral component. We adopted a new variant of Wagner open book osteotomy, consisting in a lozenge osteotomy with lance tip edge profile on lateral face of femoral diaphysis; the length was variable relative to the stem and the need to access the medullary channel to remove femoral component, cement, cap and debris. This osteotomy didn't exceed 25% of femoral circumference; at the end, the osteotomised segment was repositioned as a cover and bending wire was applied.

Results: In all cases we encountered a strong stem fixation on distal femoral diaphysis; a lozenge osteotomy allowed a safe and successful removal of femoral component; it permitted also to clean intramedullary space avoiding reaming procedures that can weaken the femur and dispose to iatrogenic intraoperative damage. We didn't have any case of pseudoarthrosis, necrosis or fracture.

Conclusions: One of the major difficulties encountered during revisional surgery concerns the removal of strongly fixed femoral components; this obstacle had been overcome with a lozenge osteotomy at right level of femur, avoiding a devastating surgical approach and intraoperative comminution complications: it allowed a fast and easy access to the intramedullary space thereby preserving the integrity of proximal metaphyseal segment, that

permitted the use of less invasive and more stable revision implants. We recommend the use of this technique.

REVISION OF COLD-WELDED HIP IMPLANTS; IS ISOLATED FEMORAL HEAD EXCHANGE A SIMPLE PROCEDURE?Ahmed Zaghloul¹, Harry Hothi², Rob Whittaker², G. Blunn², John Skinner², A. Hart²¹Royal National Orthopaedic Hospital, London - United Kingdom; ²University College London, London - United Kingdom

Introduction: When undertaking revision hip surgery most hip surgeons aim to retain a stem that is well fixed, well positioned and non-infected. However, some heads are inseparable from the stem: they are "clinically cold-welded". As a result the stem is removed, often requiring specialized instruments, osteotomy and a new stem with diaphyseal fixation. To our knowledge, there are no studies that help the surgeon: a) predict which patients and stems are at risk of this problem; b) solve the problem intra-operative; and c) explain why this occurs.

Methods: We have retrieved 22 hip implants that have the head fixed to the stem. Those were of various manufacturers. Median age at the time of primary procedures was 61 year-old, 10 cases were females, median head size was 40 mm. We attempted disassembly using 2 methods: manually in the first instance, using commercially available femoral head-neck separators (n = 5) by two surgeons if necessary; and then, if the separation was not successful, using an Instron mechanical testing machine which also enabled measurement of the force required to separate.

Results: The overall success rate for dis-assembly of the femoral heads was 50% (11/22). The JRI femoral head separator was the most successful, separating 10 out of the 11 separated specimens. The Biomet Magnum/Taperloc combination was most difficult to dis-assemble with only 2 successful separations out of 8 specimens. Forces up to 5000N were still unable to dis-assemble the head/neck junction.

Conclusions: Surgeons should be aware of the possibility of a "clinically cold-welded" head when planning revision hip surgery so that they can order appropriate equipment. This problem appears to most commonly affect the Biomet Taperloc-Magnum MOM hip and is most likely caused by the Ti-Ti junction between the taper sleeve and the stem. We recommend improved designed of head-neck separator.

THE BIOBALL TAPER ADAPTER IN REVISION HIP ARTHROPLASTYTim Waters¹, Simon West², Gavin Schaller¹, Ben Bloch²¹West Hertfordshire Hospitals Hip and Knee Unit, London - United Kingdom;²Three Shires Hospital, Northampton - United Kingdom

Introduction: Retaining a well-fixed femoral stem in revision arthroplasty simplifies the operation but raises the issue of implanting a new bearing on a old, possibly worn, trunnion. Taper adapters provide a new trunnion and new bearing options with the added advantage of being able to alter the length, offset and version of the existing stem. However there are very few published reports of the outcome of taper adapters.

Objectives: This study assesses the results of revision hip arthroplasty using the BioBall taper adapter.

Methods: Between 2008 and 2013, we performed 88 revision hip replacement procedures with a retained stem and BioBall adapter with a 1-7 year prospective follow-up (mean 3 years).

The average age was 64 years (range 43-95). An offset adapter was used to change version and/or inclination in 42 cases.

Results: There have been two revisions - one for infection at 12 months (all components removed) and one for instability (acetabular component revised only - bioball and head were retained).

The remaining hips are functioning well with satisfactory outcome scores and radiological assessment.

At this early stage we have not noted any concerns relating to the native trunnion/adapter interface.

Conclusions: At short-term follow-up the BioBall taper adapter in revision total hip replacement has good results with good functional outcomes. It has greatly simplified cases which may otherwise have ended up with the need for megaprotheses. This is one of the largest studies of this implant and we will continue to report on this cohort.

CEMENT IN CEMENT FEMORAL COMPONENT REVISION IN THE MULTIPLE REVISED HIP: RESULTS WITH A MINIMUM FOLLOW UP OF 5 YEARS

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Introduction: Revision of well cemented femoral components in revision THA can be challenging and destructive to bone. The cement in cement (CiC) technique was developed to address these issues. Results of femoral components which have undergone multiple CiC revisions have not previously been reported.

Objectives: We present the clinical and radiological outcomes of femoral components which have undergone more than one revision using the CiC technique with a minimum follow up of 5 years.

Methods: Forty nine revision procedures were performed in 24 patients. Seven patients died due to unrelated causes. The outcomes of all patients are known.

Clinical assessment were performed using the original version of the Oxford Hip Score (OHS) (with a score of 12 being the best and 60 being the worst outcome), Harris Hip Score (HHS) and the Charnley Modification of the Merle d'Aubigne Postel (MDP) score. Statistical analysis was performed using the unpaired student's *t*-test. The level of significance was set at $p = 0.05$.

Radiographs were reviewed by 2 assessors for signs of loosening.

Results: Ten males and 14 females were included. Mean age was 67.5 years (Range 36-92 years). Mean duration of follow up was 81.7 months (range 24-240 months). Each patient had undergone an average of 2 revision procedures (Range 2-4). Four procedures were performed for infection.

Mean preoperative Harris, Oxford and Merle D'Aubigne Postel scores were 38 (Range 3-44), 43 (Range 27-56) and 7 (Range 3-13) respectively.

Average post operative Harris, Oxford and Merle D'Aubigne Postel scores were 68 (Range 45-70) ($p = 0.0199$), 31 (Range 12-56) ($p = 0.0397$) and 13 (Range 4-18) ($p = 0.0423$) respectively.

There were no signs of loosening at the last follow up.

Conclusions: Cement in cement femoral revision is a versatile, viable and efficient procedure for patients requiring multiple revisions of a well fixed cemented stem. It is associated with pain relief and significant functional improvement in the medium term.

EVALUATING THE USE OF THE RECLAIM™ MODULAR HIP SYSTEM IN REVISION HIP SURGERY - INITIAL FINDINGS

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Introduction: This report sets out our evaluation of revision hip surgery using the RECLAIM™ Modular Hip System (DePuy Synthes). At the time of writing, no such data has been published about this system.

Objectives: To obtain clinical, radiological and functional outcome data from patients undergoing revision hip surgery using this system, and compare pre and post-operative data.

Methods: Patients were identified from our revision hip database. Using this and our electronic patient record, we obtained pre-operative functional scores (Oxford hip score and the EQ-5D™ scoring system), demographic and operative data, as well as follow up data. Pre-operative and post-operative radiographs were also analysed. Post-operative scores were collected prospectively.

Results: 22 patients were identified. Our multidisciplinary approach accounted for a marked similarity in their clinical management. 13 (59%) were male and the overall average age was 70 years. 18 had failed implants and 4 had fractures pre-operatively. Overall average length of stay was 10 days (3-23). At the time of analysis two (9%) implants had been removed because of infection. 5 patients were at 2 years post-operatively, 12 patients at 1 year and 3 patients under 1 year. 9 (45%) of patients had pre-operative scores available. Post-operatively, we noted an overall 20 point rise in Oxford hip scores and a 31.5 point rise in visual analogue scores for health. Across the five domains of the EQ-5D™ there was a general trend of improvement in scores post-operatively. There was a move to using larger diameters and shorter stem lengths over the same time period. No deaths were observed in the cohort.

Conclusions: Our data shows improvement in functional scores and a complication rate in keeping with revision hip surgery. The importance of obtaining functional data pre-operatively is highlighted. Initial data supports the use of this system in revision hip surgery and we will continue to monitor outcomes and emerging trends.

MODULAR PROXIMAL FEMORAL ENDOPROSTHETIC REPLACEMENT FOR NON-NEOPLASTIC CONDITIONS

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Introduction: Proximal femoral endoprosthesis replacements (EPR) were first designed and used for reconstruction after wide resection of neoplasm around the hip joint. However, presently, EPRs are used more and more in salvage surgery following failed trauma, peri-prosthetic fractures and failed multiple revisions with severe bone loss.

Objectives: Aim of this study was to evaluate long-time survival and clinical outcome of hip reconstructions with use of new generation modular segmental endoprosthesis proximal femoral replacements in non-neoplastic conditions, as most of studies in literature are for their use following neoplasm resection.

Methods: We conducted a retrospective study of all patients who underwent modular proximal femoral EPR for non-neoplastic conditions treated by a single surgeon at our institution from 2008 to 2014. Clinical and functional outcome were reviewed at latest follow-up. Survival of modular endoprosthesis reconstruction was determined using Kaplan-Meier survival analysis, any revision of the implant as final end point. Clinical and functional results were recorded according to Oxford Hip Score (OHS).

Results: 34 patients had modular proximal femoral EPR during this period. There were 20 males and 14 females with mean age at surgery was 76 (range 49-90) years, and most patients had several medical co-morbidities ($n = 28$). Indications for proximal femoral EPRs included – Failed trauma with implant failure after multiple attempts (Failed fixation - Dynamic hip screws, Plate osteosynthesis and intramedullary nails for proximal femoral fractures, $n = 12$, 35%), periprosthetic fractures ($n = 7$, 21%), failed multiple revisions with severe bone loss ($n = 8$, 24%) and recurrent periprosthetic infections with severe osteolysis ($n = 7$, 21%). Mean time from the previous surgery to definitive EPR was 29 (range 6-102) months, and the average number of previous surgical procedures were 2 (range 1-7). EPR was carried out as single stage procedure in 27 (80%) and as two stages in 7 (20%) patients. Mean length of stay after definitive procedure was 10 days. The average OHS after replacement was 25. All patients were painfree at last follow-up. There were 4 complications (11.7%). 2 deep infections leading to two stage revision surgery, 1 superficial wound infection treated successfully with antibiotics and 1 dislocation needed revision with constrained liner.

Conclusions: Our results indicate that EPRs can be performed with good results in patients with non-neoplastic conditions of proximal femur (failed trauma, recurrent infections and revision surgeries with massive bone loss) with effective pain relief and immediate restoration of functions.

ORAL PRESENTATIONS

REVISION: ACETABULAR SIDE

TRABECULAR METAL CUPS FOR ACETABULAR REVISION SURGERY

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Introduction: Reconstruction of the failed acetabular component in total hip arthroplasty can be challenging; multiple reconstructive options are available, being a cementless acetabular component the reconstructive method of choice for the majority of revisions whether at least 50% of the implant contacts host bone.

Objectives: To report our experience with the use of Trabecular Metal cups, and to demonstrate if its theoretical advantages (because of material properties and unique nanostructure) allow for increased structural stability and promote biological fixation.

Methods: We retrospectively review 52 patients (38 females and 14 males), who underwent revision surgery at an average age of 70 years, due to aseptic loosening in most cases (>90%). Preoperative Harris Hip Score was 30. Bone loss was classified IIIA in 17 cases and IIIB in 12 cases according to Paprosky. All patients were operated using a direct lateral approach (extended transtrochanteric approach was preferred in complex revisions to improve surgical exposure and to remove the femoral stem); revision of the only acetabular component was performed in 20 cases. The acetabular reamers were used in increasing diameters to obtain the best possible press-fit of the trial shells between the anterior and posterior walls of the acetabulum; decision to use an augment was made intraoperatively if an oblong bone defect was recognized that could not support the hemispherical component. If necessary, particulate allograft was placed to fill any medial defect and into the augment.

Results: At a mean follow-up of 5 years, the Harris Hip Score improved to 78 points, with no clinical and/or radiological failure of the cup: all patients were satisfied but one patient who had a sinking and loosening of the femoral stem.

Conclusions: Trabecular metal cups for acetabular revision surgery are associated with good clinical and radiographic results and show excellent survivorship in the mid-term follow-up; in revisions for defects of type IIB and IIIA-IIIB according to Paprosky, the use of the hemispherical cup combined with a trabecular metal augments, obviating the need for a structural allograft, increases the surface area for host-bone contact and allows anatomic positioning of the hemispherical cup, facilitating the bone ingrowth and restoring the hip biomechanics.

FOUR YEAR RESULTS WITH A MINIMUM OF THREE YEAR FOLLOW UP OF A MODULAR TRABECULAR METAL CUP IN MANAGEMENT OF ACETABULAR RECONSTRUCTION FOLLOWING ADVERSE REACTION TO METAL DEBRIS WITH ALVAL FROM SINGLE SURGEON IN THE UNITED KINGDOM

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Introduction: Reconstruction in patients with acetabular bone deficiency following adverse reaction to metal debris (ARMD) and ALVAL remains a major challenge. The system we reviewed, Delta One Revision (LIMA Corporate) utilises internal augments within the acetabular shell to allow optimal orientation of the articular face (face changers) with or without additional external augments, which allows the surgeon to gain maximum purchase in poor host bone.

Objectives: To review our use of this modular trabecular titanium cup and both internal face changing augments and external cup augments in the management of acetabular deficiency following adverse reaction to metal debris and ALVAL.

Methods: A retrospective review of 48 patients who underwent revision hip arthroplasty using this trabecular titanium system. Indication for revision was ARMD or raised or rising metal ions. Minimum follow up was 24 months. All defects were classified according to Paprosky classification.

Results: Average Harris hip score improved from 55 preoperatively to 76 postoperatively. At most recent radiographic evaluation all 48 cups demonstrate no lucent lines.

There are no failures. Initial dislocation rate post operatively was high using a single interface bearing 15% (3 in 20 cases). In all subsequent cases a dual, mobility bearing was utilized with no further episodes of dislocation.

5 cases involved the use of an external augment and 3 an internal face changer. All cases showed poor host bone in which excellent primary stability was achieved without the need for supplemental screw fixation.

Conclusions: This trabecular titanium cup system with the ability to utilise modular augments both externally and face changers within the acetabular shell is a valuable asset in the management of poor host bone with deficiency following ARMD and ALVAL. Internal cup augments add a useful dimension for management of ARMD. Dual mobility bearing is recommended for revision in the face of ARMD.

ACETABULAR REVISION WITH TRABECULAR METAL™ CUP: CLINICAL AND RADIOGRAPHIC RESULTS AT 10 YEARS FOLLOW-UP

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Introduction: Main problems in acetabular revision surgery are to manage bone loss and to obtain implant osseointegration. Porous tantalum acetabular implants provide a new potential solution for these challenges. The literature presents many studies with promising clinical and radiographic results at short and medium term. There is, instead, a paucity of data on long-term results using acetabular trabecular metal (TMT) devices.

Objectives: The purpose of this study is to assess the clinical and radiographic outcomes at 10 years follow-up of acetabular reconstructions using TMT cup.

Methods: At our institution, between 2002 and 2008 were performed 70 acetabular revisions on 69 patients using the TMT Revision Cup, some with augments and morcelized graft material. Of the 69 patients 17 died and 9 lost during follow up. We retrospectively reviewed 43 patients (44 hips) at a mean follow up of 10 years (range 7-13). The mean age was 68 years (range 30-83). There were 16 males (one bilateral) and 27 females. According to Paprosky classification there were 9 type 1 (20,5%), 7 type 2A (15,9%), 10 type 2B (22,7%), 5 type 2C (11,4%), 4 type 3A (9,1%), 7 type 3B (15,9%). Outcomes evaluated were: acetabular implant survivorship, radiographic loosening, Womac and Merle d'Aubigne score.

Results: Cup survivorship at 10 years was 97,73%. The only TMT cup removed was for infection. Other complications included five dislocations (11,36%), four of these no required operative treatment and one was treated with substitution of the liner. In addition there were two periprosthetic femoral fracture treated with plate osteosynthesis. Clinical evaluation evidenced good results in "pain" and "stiffness" categories and fair scores in "function". The radiographic analysis found no macroscopic loosening and optimal osseointegration of the cup.

Conclusions: The data suggest that the TMT revision cup may be a good solution in acetabular revision because of the low rate of failure and the optimal osseointegration at 10 years follow-up.

METALLIC AUGMENTS WITH CEMENTED SOCKETS AND IMPACTION GRAFTING IN ACETABULAR RECONSTRUCTION

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Introduction: Managing bone loss is a challenge in acetabular revision hip surgery. The use of porous metals has increased due to their excellent in growth potential and versatile applications. Impaction bone grafting is a proven technique to rebuild lost bone for contained defects.

Objectives: To report the short and medium term results of porous metal augments used to manage cavity and segmental acetabular bone loss in revision surgery with cemented cups.

Methods: Retrospective review of clinical and radiological results of 31 patients (32 hips) who underwent revision surgery at our hospital. After component extraction the bone loss was assessed using the Paprosky classification. The augments were fixed to contain segmental defects in all cases which facilitated impaction grafting. A single augment was sufficient in 29 hips, whereas 03 hips required 2 augments. Clinical and radiological data was available for all patients and no patient was lost for follow up.

Results: 21 males and 9 females. Mean age 70.5 years (21-85). Most common indication was aseptic loosening (25). The average follow up was 26.8 months (6-76). Gription augments were used in 11 hips and porous tantalum augments in 21. Impaction grafting was performed in 30 hips. All patients had cemented cup only. No socket migration was observed. No augment failure seen in any patient. Successful incorporation of the impacted bone was seen at latest follow up. 1 patient had asymptomatic radiological loosening of the socket. 4 dislocations occurred postoperatively, two of which needed further stem revision. 1 post-operative peri-prosthetic fracture of femur was treated non-operatively.

Conclusions: We found the surgical technique straightforward and reproducible. Porous material augments provide a reliable short to medium term option to reconstruct both segmental and cavity bone defects and can be

combined with impaction bone grafting to reconstitute bone defect. Long term follow up will be essential.

BONE IMPACTION GRAFTING WITH A TRABECULAR METAL REVISION CUP SHOW PROMISING EARLY RESULTS

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Background: Trabecular metal (TM) cups have gained in popularity in revision hip arthroplasty during the last decade. Bone impaction grafting is a biomechanically and biologically appealing option in acetabular revisions. Early proximal migration of the revision cup is a predictor of late aseptic loosening. The aim of this study was to compare the risk for late aseptic loosening of the TM cup and a cemented design used in acetabular revision with bone impaction grafting. The early proximal migration of the acetabular component measured with RSA was used as an indicator of late aseptic loosening.

Patients and methods: 42 patients were included. The mean age at revision was 66 (40-79) years. 22 were females. Hips were randomised to an all polyethylene cemented cup (n = 19) or a TM cup (n = 23). Radiostereometric (RSA) and conventional radiographic examinations were performed at regular intervals up to 2 years or until exchange or removal of the cup. The demographic data did not differ between the groups.

Results: Up to two years the proximal migration was higher in the cemented group (p = 0.02). At two years the median proximal migration was 1.45 and 0.25 millimetre in the cemented and the uncemented group, respectively. One cemented cup was revised due to dislocation. There were no revisions in the TM group.

Discussion and conclusion: Lower proximal migration of the TM design indicates that this design is associated with lower risk of aseptic loosening when compared to the cemented design. To obtain a complete risk analysis also other reasons for revision have to be considered. A longer follow-up is needed to establish any long-term clinical advantages when the TM design is used in acetabular revision with less than 50% host bone implant contact.

MINIMUM 12 MONTH FOLLOW-UP OF TRABECULAR TITANIUM CUPS FOR ACETABULAR REVISIONS WITH CAVITARY DEFECTS

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Introduction: Acetabular revision for cavitory defects in failed total hip replacement remains a challenge for the orthopaedic surgeons. Bone graft with cemented or uncemented revision is the primary solution, however, there are cases where structural defects are too large. Cup cage constructs have been successful in treating these defects but they do have their problems with early loosening and metalwork failure. Highly porous cups that incorporate metal augments have been developed to achieve greater intra-operative stability showing encouraging results.

Objectives: We report patient outcomes radiographic analysis of forty-nine consecutive Trabecular Titanium™ cups (Lima Corp, Italy) with a minimum twelve months follow up.

Methods: This is a retrospective analysis of forty-nine consecutive acetabular revisions with Trabecular Titanium cups. Inclusion criteria included aseptic cases, adult patients, end-stage disease with signs of loosening, no trauma nor peri-prosthetic fractures.

Data was obtained for patient demographics, Paprosky classification, use of bone graft, use of acetabular augment, and Moore index of osseointegration.

Results: Forty-nine subjects were included in the study. Four patients were lost to follow up due to death. The average age was 73 years (range 50-91). Paprosky type II was the most common acetabular defect (46.9%), followed by type I (32.7%). Type III was the least common (20.4%). Three fourth cases had Moore's index of 3 or more at 6 months post operatively. At 12 months, 83.3% had Moore's index of 3 or more whereas, 2.8% had 1 or less sign.

Conclusions: The Trabecular Titanium™ cup demonstrates good initial stability at implantation, and excellent osseointegration at twelve months follow up. These results are comparable to published results for similar trabecular cup designs. Further long-term studies are welcome and we continue to monitor this group of patients.

REVISION HIP ARTHROPLASTY WITH GRIPTION POROUS COATING ACETABULAR SHELLS AND AUGMENTS

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Introduction: This paper provides a review of the authors' clinical experience with Gription TF augments and porous coating acetabular shells in Paprosky type I to III defects. The GRIPTION TF material is a completely porous structure made from commercially pure titanium which makes allowance for immediate stability, good bone tissue ingrowth and vascularisation onto and around an implant.

Objectives: The aim of this study was to evaluate early results of acetabular revisions of total hip replacement using fully cementless Pinnacle Gription revision cup and Chronos vivify allografts filled with PRP/MSCs.

Methods: Between March 2012 and May 2014 Pinnacle Gription revision cup was used in 54 consecutive acetabular revisions. The augments were used in 16 of the cases. The mean age at revision was 68 years (32-84 years). There were six patients revised for type 1, 8 for type 2A, 13 for type 2B, six for type 2C, 10 for type 3A and 11 for type 3B acetabular defects according to the Paprosky classification. Frozen morselised bone allografts were used in 53 cases and Chronos vivify allografts in twentythree cases.

Results: The mean pre-operative HHS functional score was 47 and 81 at the time of last follow up. There was two revisions due to instability of the acetabular component. Two cases with Paprosky type 3B defect showed cranial migration of the acetabular component by 6 mm, but stabilised after six months. In a 2- to 3-year follow-up, 86% of the shells showed no radiolucent lines. Of 14 hips with postoperative radiolucencies, seven had cleared by the last follow-up, while one had increased. Average VAS for postop. pain was 12; the median postop HOOS at last f. up was 74.

Conclusions: Pinnacle Gription revision cups, hemispherical modules and augments facilitate reliable and reproducible biological fixation in acetabular revision surgery with excellent results. Extended follow-up is necessary to evaluate the long-term performance of these modular implants.

RESULTS OF A MODULAR POLYAXIAL STEMMED CUP IN PATIENTS WITH PREVIOUS ACETABULAR REVISIONS

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Introduction: Severe acetabular defects are challenging in hip revision however, the iliac isthmus usually remains supportive, thus providing the rationale for the use of stemmed cups (SC). The major limitation of non-modular SC is the fixed stem position which determines the orientation of the cup, potentially leading to its inadequate version or inclination. To overcome this drawback, a modular polyaxial SC (Sansone®, Citieffe, Italy) was implanted in a consecutive series of patients affected by severe acetabular defects after multiple acetabular revisions. The Sansone is a titanium-made, uncemented cup with a hole for the modular polyaxial isthmus screw and additional conventional holes for peripheral screw fixation.

Objectives: To evaluate clinical and radiological results of the Sansone cup at a minimum 2 years follow up.

Methods: Twenty-three patients aged between 50 and 89 years (mean 75 years) who had at least two previous acetabular revisions with acetabular defects grade 2B-3B according to Paprosky's classification were enrolled. The main indication for revision was aseptic loosening (17 cases). Average follow up was 54 months. Clinical outcome was assessed with Harris Hip Score (HHS). Radiolucencies were measure on X-rays.

Results: An improvement in the mean Harris Hip Score was observed at final follow up (pre-op 33.9, post-op 77.7; p<0.05). The vertical distance from the tear drop to the hip centre of rotation decreased from a mean 4.2 cm to 3.5 cm. At last available follow up, there were 4 cases of radiolucencies: 3 in zone 3 and one in zone 2 according to DeLee and Charnley. All of them were less than 2 mm without clinical relevance. One patient underwent a Girdlestone procedure 2 months after surgery due to recurrent dislocation.

Conclusions: The Sansone stemmed cup seems to be a viable option for patients with multiple previous revisions and severe acetabular defects. A larger series with longer follow up is necessary in order to confirm these positive results.

MASSIVE PELVIC ALLOGRAFT RECONSTRUCTION OF THE ACETABULAR AREA: MANAGEMENT OF HIP MECHANICAL FAILURE

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Introduction: The use of pelvic massive allograft reconstruction, after bone sarcoma resection, may restore the pelvic architecture and provide a suitable bone stock for acetabular prosthetic implant. The major complication is deep infection whatever the method of reconstruction; however, high mechanical complication rates are reported.

Objectives: The aim of the paper is to assess the better revision method in a loosened cup previously inserted in a bulk allograft.

Methods: In the last 25 years 75 cases of allograft prosthetic composite (APC) have been performed in the pelvis. Between October 1992 and February 2015, 21 patients (14 female/7 male) underwent 29 major revisions for cup loosening implanted in APC after tumor resection. The majority of the cases performed were reconstructed with allograft and prosthesis 24, while only 5 with allograft without the femoral stem. Radiographic and functional evaluation (MSTS score) were performed. Revision surgery was performed once in 15 patients, in 5 were performed two times. Among 29 revisions a Burch Schneider cage was used in 11 cases (Group A), other cage reconstructions in 9 (Group B), trabecular metal in 6 (Group C) and stem-cup in 3 (Group D). The mean FU of the series was 56 months (6-205).

Results: After a mean FU of 42 months (13-85) 8 revision implants of the whole 29 cases (28%) had a second mechanical failure. The worst results were observed in group B (6 out of 9; 67%). Other 2 failures occurred in Group A (18%), while no failure were observed in Group C and D. The radiographic evaluation showed at the final FU 7 reconstructions with one or more sign of cup loosening. In Group D, 2 out of 3 cases showed halo around stem. The mean functional evaluation score was 22. The better results are reported in Group C (shorter follow-up time).

Conclusions: Revisions surgery in mechanical failed cup applied on allograft for tumor resection should be considered the most difficult setting in THA revisions. During time, allografted bone tend to loose its mechanical integrity. Burch Schneider cage resulted as a versatile modality of reconstruction, while, less invasive devices are not enough performing in this very difficult clinical setting. In recent time the incoming use of tantalum based cups seems to be a more reliable choice in cup substitution.

ORAL PRESENTATIONS REVISION

ONE FIFTH OF REVISION ACETABULAR COMPONENTS RE-REVISED FOR SYMPTOMATIC ASEPTIC LOOSENING DO NOT MEET RADIOLOGICAL CRITERIA OF LOOSENING

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Introduction: Symptomatic aseptic loosening is a common indication for revision surgery.

Current radiological criteria for loosening are: migration in any direction greater than 5 mm (Trumm et al, 2014); change in inclination greater than 5 degrees (Haenle et al, 2007 and Kalteis et al, 2006); or radiolucency greater than 2 mm in all three De Lee Charnley zones (DeLee, Charnley, 1976).

No study to date has correlated radiographic criteria for loosening with intraoperative findings.

The aim of this study was to correlate radiographic criteria for loosening with intraoperative findings in a cohort of revision acetabular components confirmed loose at re-revision surgery.

Methods: Inclusion criteria were all revision acetabular components re-revised for symptomatic aseptic loosening between 1978 and 2014 at our institution, which were confirmed as loose intra-operatively.

Exclusion criteria were any other reason for revision including infection, dislocation and peri-prosthetic fracture.

Intra-operatively loosening was defined using three grades: 1- fluid movement at the prosthesis/bone interface, 2-slight movement, requires hammering or strong leverage; 3 – loose, removal by hand or gentle leverage (Howie et al, 1990).

The proximal and medial translations, and sagittal rotations of each component were measured using EBRA (Einzel-Bild-Roentgen-Analysis) on serial AP radiographs. Radiolucency in all three De Lee Charnley zones were assessed on IMPAX (Agfa Impax 6.3, Agfa-Gevaert N. V, Mortsels, Belgium) using a calibrated scale.

Results: Fifty-six revision acetabular components re-revised for loosening (48 patients) from a total 675 revisions (307 patients) met the inclusion criteria. Three acetabular components were excluded because a loosening grade was not documented intra-operatively. Seven acetabular components did not have suitable radiographs for EBRA analysis. Hence, 46 acetabular components (39 patients) were included in this study. The mean survival time was 110 months (range 3 to 259).

The intraoperative loosening grades for the 46 acetabular components were; grade 1 in three hips, grade 2 in 23 hips, and grade 3 in 20 hips.

Thirty-seven of the 46 acetabular components (80%) met at least one of the three radiological criteria for loosening.

Nine of the 46 acetabular components (20%) did not meet any of the three radiological criteria. Two cases had grade 1 loosening, five cases had grade 2 loosening and 2 cases had grade 3 loosening. The mean survivorship of these cases was 108 months (range 11-215 months).

Conclusions: 20% of revision acetabular components re-revised for isolated aseptic loosening, confirmed intraoperatively, did not meet any radiological criteria for loosening.

AN ALGORITHMIC APPROACH TO ACETABULAR COMPONENT REMOVAL, IN CASE OF INTRA-PELVIC CUP MIGRATION

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Introduction: Intrapelvic protrusion of the acetabular component following total hip replacement is an uncommon, but severe complication and retrieval of the socket through the regular approaches without mobilizing and protecting the intra-pelvic vessels may lead to severe complications.

Objectives: The aim of this study was to identify an algorithmic approach for a safe removal of cup and screws when the acetabular component had migrated medial to Kohler's line.

Materials and methods: 32 patients acetabular revisions, performed from 2008 to 2013, in which the acetabular components was beyond the ilio-ischial line were selected.

Four parameters were identified to stratify the risk levels: 1) The percentage of the cup beyond the ilio-ischial line as measured on X-rays. 2) The proximity of cup and hardware to vessels in the Ct-angiogram. 3) The timing of protrusion. 4) The presence of signs of infection.

Results: Based on the pre-operative assessment three category of risk of damage of neuro-vascular structures were identified.

Low risk patients: (8 cases 25%): No specific action was performed.

Medium risk patients (14 cases 44%): The removal of the migrated socket was performed through a routine surgical approach, but the surgery was conducted in the presence of a vascular surgeon. *High risk patients* (10 cases 31%): In 8 cases (subgroup A) the iliac vessels were exposed and looped by a vascular surgeon with a retroperitoneal approach, but the surgery was performed with a standard approach. In 2 cases (subgroup B) a retroperitoneal/transabdominal approach was necessary not only to isolate the vessels but for removal of the intrapelvic socket too.

Conclusions: Managing THA loosening with pelvic migration requires a complete preoperative clinical assessment. We elaborate a risk matrix that allows us to define the proper surgical strategy and to assess if the surgical procedure should be performed through a standard approach or, staged procedures with a retroperitoneal exposure of the iliac vessels, should be necessary.

THE USE OF BALLOON CATHETER INTO THE INFRARENAL AORTA FOR PREVENTION OF MASSIVE HEMORRHAGE DURING REVISION HIP REPLACEMENT AT HIGH RISK: A CASE REPORT

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Introduction: Intraoperative bleeding is one of the most dangerous complications of revision surgery of the hip. In this study we present our experience and the method used to prevent a massive hemorrhage during revision surgery of hip replacement.

Materials and methods: In May 2014 in our department we have performed revision surgery of hip implants in a patient with aseptic loosening of the cup that had taken contiguity for a distance of 2.5 cm with the right external iliac artery. During surgery with the help of an interventional radiologist using ultrasound guided catheterization of the left common femoral artery it was positioned a valved introducer with apex in infrarenal abdominal aorta. It was later made the revision surgery for hip replacement.

Results: The operation has been carried out and there has not been any bleeding during the extraction of the cup. The final angiographic control supports the absence of vascular lesions.

Conclusions: The use of this protection has allowed the team to perform the surgery with less anxiety and stress. In fact, the radiologist in case of bleeding was ready to inflate the ball and create a transient ischemia for the time required to repair the artery and the conclusion of the intervention. Our opinion is that this is a safe and reproducible method to utilize in selected cases at risk of major bleeding.

RECONSTRUCTION OF FAILED ACETABULAR COMPONENT IN THE PRESENCE OF SEVERE ACETABULAR BONE LOSS: A SYSTEMATIC REVIEW AND POOLED ANALYSIS

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Introduction: Acetabular revision especially in the presence of deficient bone loss (Paprosky Type IIIA and IIIB, and AAOS Classification of Acetabular Bone Loss Type 3 and 4) is challenging. There is however, insufficient literature comparing the contemporary techniques of revision acetabular reconstruction and their outcomes.

Objectives: The purpose of this study was to systematically review the literature and to report clinical outcomes of contemporary acetabular revision arthroplasty techniques.

Methods: Full-text papers and those with an abstract in English published from January 2001 to April 2015, identified through international databases, Medline (PubMed), EMBASE, CINAHL, Cochrane and Google scholar databases, were reviewed. Studies reporting the use of tantalum metal systems, jumbo cups, reinforced devices as cages and rings, oblong cups, custom-made triflange cups and cone cups.

Results: A total of 59 papers of level IV scientific evidence, comprising 4592. 1950 hips (311 of them classified Paprosky Type 3A, 119 3B and 15 AAOS type 3 and 6 type 4) with a mean follow-up 46.7 months, were reconstructed using tantalum metal cups with a mean overall re-revisions rate of 4.05%. 1359 hips (190 of them classified Paprosky Type 3A, 113 3B and 329 AAOS type 3 and 54 type 4) with a mean follow-up 87.3 months, were reconstructed with cages and rings devices and had a mean of re-revisions rate of 7.28%. 427 hips (41 of them classified Paprosky Type 3A and 60 3B) with a mean follow-up 84 months, were reconstructed using oblong cups and were associated with a mean of re-revisions rate of 4.68%. In 536 hips (66 of them classified Paprosky Type 3A, 25 3B and 134 AAOS type 3) with a mean follow-up 117.4 months, jumbo cups were implanted and revision rate was 8.2%. Custom-made triflange cups were used in 218 hips (31 of them classified Paprosky Type 3A, 44 3B and 124 AAOS type 4) with a mean follow-up 65.2 months, were revised in 7.34% of cases. Cone cups were implanted in 102 hips (19 of them classified Paprosky Type 3A, 8 3B and 10 pelvic discontinuity, 47 AAOS type 3 and 1 type 4) with a mean follow-up 56.2 months and were revised in 8.82%.

Conclusions: This review confirms successful acetabular reconstructions using several techniques and highlights key features and outcomes of different techniques.

IMPACTION BONE GRAFTING USING A 50:50 COMPOSITE OF MORSELISED ALLOGRAFT AND DEMINERALISED BONE MATRIX IN COMPARISON WITH BONE GRAFT ALONE FOR REVISION HIP ARTHROPLASTY

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Background: We conducted a review of clinical and radiological outcomes for revision hip arthroplasty with impaction bone grafting (IBG) using a 50:50 composite of morselised allograft and demineralised bone matrix (DBM) in comparison with using bone graft (BG) alone. DBM as an additive can incorporate osteoinductive properties to the osteoconductive bone graft. Our hypothesis was that graft incorporation and subsequent success of the procedure using the composite grafting technique would be no worse than bone graft alone.

Methods: Revision arthroplasty for aseptic loosening performed from September 2006 to January 2007 in 10 hips in each group with a minimum one year follow up were included in the study. The mean age of BG-DBM group was 64.6 years (range 54-80 years) in comparison with 61.2 years (range 42-80 years) in the BG group.

Charnley low friction torque arthroplasty with trochanteric osteotomy was used with hand prepared crouton sized morselised cancellous bone graft, mixed with DBM (DBX® Depuy Synthes) and impacted using hemispherical metal impactors. The components were then cemented in the standard manner.

Clinical outcome measures analysed were revision surgery and surgical complications. Radiographic assessment was performed to look at component loosening and graft incorporation.

Results: At a mean follow up of 61 months (range 12-101 months) no patient needed revision surgery in the BG-DBM group. Radiographs showed satisfactory graft incorporation or remodelling in majority of the hips revised. Similar outcomes were noted in the BG group, with no revisions needed at mean follow up of 73 months (13-90 months) and good allograft uptake.

Conclusions: The biological enhancement of the allograft with the addition of DBM is a theoretical advantage which translates to equally good clinical and radiological outcomes in revision hip arthroplasty. Our results are promising enough to recommend continued use of DBM as a graft enhancer and a graft extender in IBG for revision hip arthroplasty.

MULTIPLE REVISION HIP ARTHROPLASTY: 30 YEARS OF ASEPTIC LOOSENING

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Introduction: Incidence of revision total hip arthroplasty (THA) is increasing worldwide, with re-revision surgery therefore also a growing phenomenon. Yet due to the relative short follow up in comparison to primary and revision hip arthroplasty, less is known about cohorts of patients who have had multiple revision surgeries.

Objectives: To undertake a pilot study in advance of a large retrospective study to evaluate outcomes of multiple revision hip surgeries.

Methods: Retrospective data collection from hospital notes of a sample of patients who had revision hip surgery between January 2003 and December 2013. Only patients who had a history of multiple (2 or more) revision episodes were included, a revision episode being a completed single or two-stage revision.

Results: A sample of 47 patients were identified as having had multiple revision hip surgeries but only 38 had a complete data set. The oldest primary total hip arthroplasty was from 1971 and the most recent was implanted in November 2007. The oldest revision hip was performed in 1983 and the most recent revision surgery was performed in November 2013.

In 29 of 38 patients (76.3%), first revision surgery was performed for aseptic loosening at an average 3687 days post-primary THA (range 243-12731 days). Of these 29 patients, 16 (55.2%) went on to revision for further aseptic loosening at a mean 3625 days (524-6951 days). 4 of these patients went on to be revised for a third time, 3 of which were again for aseptic loosening (18.8%) at 482, 946 and 7563 days respectively. Only one of these patients had further revisions, requiring seven single-stage revision surgeries to date, some in close succession, for combinations of loosening and dislocation.

Conclusions: The most common indication for revision surgery in multiply revised hips at our centre was aseptic loosening. Primary and first revision

implant life is approximately 10 years. Thereafter, complex revision surgery may be required sooner and can prove challenging.

REVISION ACETABULAR RECONSTRUCTION IN PAPROSKY II C AND III A, B LESIONS

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Introduction: The main reasons for the revision of interventions are: instability and dislocations (22,5%), mechanical loosening with periprosthetic osteolysis (32,5%) and infection (14,8%) of Kevin J. Bozic, Md, Steven M. Kurtz, Phd. 2009).

Objectives: According to the classification of W. Paprosky the greatest difficulties are the defects of type II c and III a, b. In III a, b defects reinforcement rings are often useless due to the vastness of the destruction and osteoporotic pelvic bones.

Methods: Analyzing the experience of our early reconstructions with large amounts of bone grafting, we came to the conclusion about the necessity of the use of modern materials to replace the deficiency of bone. We took in our analysis 111 patients. According to Paprosky classification we divided them in defects II c-43 patients, III a-47 patients, III b-21 patients. The mean follow up was 5 years (from 2 to 6 years).

Results: During this period we noted a satisfactory and good results by Harris scores and PCI scale in group II c 36 (83,4%) patients in group III a in 41 (87,2%) patients in group III b in 18 (85,7%) patients. The most serious complications were observed early or late instability components, deep periprosthetic infection. There were 4 (5,9%) early instability from 5 months to 2 years in III a, b defects in cases and late instability in 3 cases (4,4%). Deep periprosthetic infection were in 3 (4,4%) cases in 3 years. This group of patients subsequently performed a two-stage revision surgery. All cases instability and deep infection were combined with reinforcement rings and were associated with large amounts of bone grafting.

Conclusions:

1. In type III a, b we recommend to use of support rings only in the absence of osteoporosis in pelvic bones or the use rings with augmentation,
2. Tantalum components is the choice for successful midterm stability,
3. We recommend to avoid large amounts of bone grafting.

THE USE OF DUAL MOBILITY COMPONENTS IN REVISION TOTAL HIP ARTHROPLASTY

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Introduction: Instability is considered the most common cause of failure in revision arthroplasty Dual-Mobility cups (DM) provide for an additional articular surface, with the goal of improving ROM and posterior horizontal dislocation distance. At one Institution DM components have been routinely used for >30 years in primary and revision THAs.

Methods: A retrospective study of 68 acetabular revisions were performed from January 2008 through January 2012 in 65 patients (3 bilateral cases), 48 females and 17 males, mean age 65 years, the mean follow-up was 3.9 years. The indication for revision include aseptic loosening (48), hip instability (3), periprosthetic osteolysis (6) and periprosthetic infection (11); 6 where revisions. Clinical Scores (HHS) and Bone Loss Classification (Paprosky) were performed. Survivorship of DM cups was assessed.

Results: In 26 revisions where DM components have been utilized alone in non cemented reconstruction (Paprosky Type I, IIa, IIb) no early or late dislocations and no radiographic evidence of loosening were observed. In 23 cemented cup-cage construct with structural allografts (Type IIb, IIc, IIIa, IIIb) were reported 2 early dislocations. In 10 cemented cup-cage construct with porous metal augments and morcellized bone grafts (Type IIc, IIIa, IIIb) is reported one case of early dislocation successfully managed with closed reduction without recurrence. The survivorship of 59 revisions was 94.9% at 45 months follow-up.

Discussion and conclusions: In this study of 68 revisions no dislocation was reported after the first three post-operative months. However, in cup cage construct with structural allografts concerns exist regarding the potential for graft resorption and loosening. Early rates of success following reconstruction with DM cups in conjunction with modular porous augments, morcellized grafts and

antiprotusio cage seem promising with no clinical or radiographic evidence of components loosening: long term follow-up studies are needed.

ORAL PRESENTATIONS INFECTION

"INFECTION COMPLIANCE" A SYSTEM TO LINK DATA ABOUT PATIENTS WITH INFECTED JOINT REPLACEMENTS

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Introduction: Based on the success of the "Beyond Compliance" project which has been available to implant manufacturers for nearly 3 years, we are developing a similar system to monitor the different types of treatment for infection in TJR.

By presenting this concept to the Joint Meeting we hope to generate discussion and recruit surgeons who are interested in joining the network that will be formed for the surveillance we think is so important.

Objectives: To link data about the management of patients with infected total joint replacements so as to make it easier to evaluate different methods of treatment.

Methods: Hospitals that wish to be involved in the network/study will find that when they upload the data about a patient who has had a revision operation for infection into the NJR, the surgeon will be sent a questionnaire by NJR which they will complete detailing the patients history, (previous NJR data will be pulled in) microbiology, operative details etc.

Further questionnaires will be automatically sent for ongoing monitoring.

The details of all the patients that are being studied will be kept in a separate repository in NJR for analysis by the Infection Compliance group of surgeons. NJR will prepare 3 monthly reports.

Results: There are no results at present but there has been a lot of enthusiasm shown by the major units in the UK that deal with infected TJRs.

Conclusions: The National Joint Registry has been shown to be able to collect data on implants going through "Beyond Compliance" and issue worthwhile reports.

There are a lot of "small series" reports and papers showing the results of treatment for infection in TJR but when all the variables are considered many of these studies are not particularly helpful.

Aggregating data, using the National Joint Registry from units who are committed to excellence would be a useful way forward.

We need to know what works, when and how.

ANALYSIS OF THE RISK FACTORS PREDISPOSING TO PERIPROSTHETIC HIP INFECTION AND TREATMENT OPTIONS

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Introduction/purpose: To define the risk factors predisposing to infection and the most effective treatment protocol.

Material and methods: Between 2012 and 2015 we collected and treated 27 cases of periprosthetic hip infection on a base of 521 outpatients observed. Clinical (anamnesis, HHS, VAS, Sf-12 and Womac), radiographic and hematological parameters were recorded at each follow-up. A statistical analysis was performed to identify risk factors and to obtain indications about the most effective treatment options adopted.

Results: The risk of infection was significantly associated with: age (>75 years), ASA classification (18 cases ASA III), rheumatoid arthritis (3 cases), diabetes insulin therapy (4 cases), prosthetic dislocation (8 cases) and periprosthetic fracture. No significant association were detected with urinary tract infection, cigarette smoking, duration and kind of perioperative antibiotic therapy.

5 cases recognized as early infections were treated within the first month after surgery with open debridement and antibiotic therapy. Among these, only one case needed further surgical treatment.

22 cases were late infections and were treated with specific antibiotics and 2-stage revision surgery sometimes associated with different procedures as new debridement and substitution of antibiotic spacer, VAC Therapy, hyperbaric-therapy. In two cases it was necessary to proceed to Girdlestone procedure and prolonged antibiotic therapy. At a mean follow up of 21 months after treatment we didn't registered any recurrence of infection or death.

Discussion: Hip periprostheses infections have a low incidence but the consequences are still devastating. An early follow-up (2-4 weeks after surgery) is necessary to identify early infection that respond good to more conservative surgical debridement. The chronic cases are more unpredictable: the treatment of choice is a two-stage reimplantation, supported by appropriate antibiotic therapy and when necessary associated specific procedure.

Conclusions: It is critical to recognize the predisposing factors for proper counseling intervention, and for implant selection. Advanced age, ASA class III, and dislocation are predisposing factors to infection. The infection management requires a multidisciplinary experienced team: low surgical invasiveness, timely and accurate diagnostic method to identify the infectious and an early, appropriate treatment are the key for a good management.

ACUTE LATE INFECTION IN METAL-ON-METAL HIP ARTHROPLASTY: ANOTHER SEVERE COMPLICATION?

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There is increasing evidence that metal-on-metal (MoM) hip arthroplasty has a higher late infection rate than other bearing combinations. Adverse local tissue reactions occurring in MoM arthroplasty can make the diagnosis of infection challenging. The authors report on 16 cases of acute late infection in MoM arthroplasty presenting as emergency admissions between 2010 and 2015.

The study is a retrospective review of the 16 infected cases presenting greater than 1 year after arthroplasty with a previously well functioning implant in our revision database.

Cases included 9 females and 7 males, mean age 66 years, with 2 resurfacings and 14 total hips. The mean time from primary operation was 5.5 years (1.5-10.6). Our cohort included patients with failing and well functioning implants. There were 12 *Staphylococcus aureus* and 4 streptococcal infections. All patients presented or rapidly became systemically unwell with pyrexia, raised CRP and leucocytosis. 9/12 had positive blood cultures and 11/11 positive hip aspirates. Initial direct cultures on theatre specimens confirmed the microbiological diagnosis in all cases. All patients underwent 2 stage surgical management with 56% requiring multiple surgeries prior to the second stage. 9 required Critical Care admission, with an average stay of 8.8 days. 8 of the Required Care admissions were in the *Staphylococcus* group. Antibiotic treatment was prolonged with 5 cases developing secondary polymicrobial colonisation. Treatment courses ranged from 64-318 days.

Acute late PJI in MoM arthroplasty was primarily caused by *Staphylococcus aureus* in our cohort. These infections were very severe, frequently requiring critical care admission and multiple operations. The combination of delayed diagnosis, impaired immunity, and highly pathogenic organisms can result in complex patient journeys. Awareness of this should be raised amongst acute specialities, as early recognition and prompt diagnosis are essential.

THE ROLE OF NOVEL INFLAMMATORY BIOMARKERS IN THE DIAGNOSIS AND PROGNOSIS OF PERIPROSTHETIC JOINT INFECTION: A PROSPECTIVE COHORT STUDY

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Introduction: Periprosthetic joint infection (PJI) is a relevant challenge in joint arthroplasty. A gold standard for diagnosis and prognosis of PJI is still lacking. In this background, there is an urgent need for improved diagnostic

tools. A new emerging inflammatory biomarker named Presepsin (sCD14-subtypes) was studied in the diagnosis of sepsis: compared with other markers, Presepsin seems to be more sensitive and specific. Other molecules correlated to Presepsin are investigated as a potential method for diagnosis of infection: Triggering receptor expressed on myeloid cells (TREM-1), C-X-C motif chemokine 10 (CXCL10), Soluble urokinase-type plasminogen activator receptor (suPAR), Matrix Metalloproteinase-9/12 (MMP-9/MMP-12) and Surfactant protein-D (SP-D).

Objectives: The purpose of this study is to evaluate the diagnostic and prognostic role of Presepsin and its correlated molecules for PJI. The diagnostic characteristics of these biomarkers are investigated, as compared with routine inflammatory biomarkers (C-reactive protein, erythrocyte sedimentation rate, white blood cell, pro-calcitonin), the results of local infection tests (synovial fluid alpha defensin) and cultures.

Methods: The study prospectively includes almost 30 patients admitted for revision arthroplasty for suspected PJI. Blood samples for concentration of Presepsin, correlated and conventional markers are taken preoperatively and on the first, seventh, thirtieth and sixtieth postoperative days. Peri-implant fluids collected during surgery are evaluated for these markers.

Results: The results of this study will not be available for the next 3 months. They will be discussed at the meeting if the paper is accepted.

Conclusions: Biomarkers are emerging as a valid diagnostic and prognostic method in the management of infective conditions. This observational prospective study wants to assess the possible clinical application of these new inflammatory biomarkers in the early detection and treatment of PJI.

"SYNOVASURE" ARE WE REALLY SURE?

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Introduction: Prosthetic joint infection (PJI) remains a serious complication. The management of these cases is difficult and challenging. There are no standardised validated and established methods of procurement of microbiological samples. Two stage revision surgery remains the gold standard for such cases however quite often diagnosis of infection is not clear in single stage surgery. The aim of our study was to investigate the sensitivity and specificity of new on table test "Synovasure" to identify infection.

Methods: We looked at the consecutive 15 cases of aspiration of prosthetic joints as a work up for revision surgery. A "Synovasure" test was performed in theatre under aseptic measures and fluid was also sent to lab in clean bottle and also blood culture bottles for extended microbiology culture and sensitivity.

Results: 15 Synovasure tests were performed on fluid aspirated from 2 THR and 12 TKR. 1 was excluded due to invalid Synovasure test. There were 7 Males and 7 females with a mean age of 69. 11 of these were performed for undiagnosed painful prosthetic joints, and 3 on acute presentations. 5 out of 14 were positive on Synovasure, but only 3 were positive on microbiology, giving a sensitivity of 80%. 9 out of 14 were negative on Synovasure, but only 8 of these were negative on microbiology, giving a specificity of 89%. The overall accuracy of Synovasure was 79%.

Discussion: Synovasure is based on synovial fluid biomarker of alpha defensin 1 (AD 1) protein in synovial fluid of prosthetic joint. Human AD 1 is anti microbial peptide which is released from neutrophils as a result of host innate immune response and this peptide interacts with pathogen cell membrane and cause destruction of pathogen.

AD1 has shown promising results in different studies and has been found to be 97% sensitive and 96% specific, however the results from our small study group did not closely correlate.

Conclusions: In our limited experience of Synovasure, we found it less sensitive and specific than literature suggests, although more clinical trials are recommended to ascertain the role of "Synovasure" in clinical settings.

THE OUTCOME OF TWO-STAGE REVISION FOR INFECTED TOTAL HIP ARTHROPLASTY IN A TERTIARY CENTRE

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We report on the five-year outcomes for a two-stage approach for infected total hip replacement. This is study conducted in a tertiary centre and reflects the experience of a single surgeon.

This is a prospective review of 125 patients (51 male, 74 female) with a mean age of 68 years (42 to 78). Harris hip score (HHS) was used to assess the functional status. The mean HHS improved from 38 (6 to 78.5) pre-operatively to 81.2 (33 to 98) post-operatively. The most commonly isolated microorganism was *Staphylococcus* in 85 patients (68%).

The rate of infection control was 96% at five years. A total of 19 patients died during the period of the study. The one-year mortality was 0.8% and overall mortality was 15.2% at five years. None of the patients were lost to follow-up. Two-stage revision arthroplasty for infection is a complex procedure with high rates of success but long-term follow-up is needed.

DOES CEMENTED OR CEMENTLESS SINGLE-STAGE EXCHANGE ARTHROPLASTY OF CHRONIC PERIPROSTHETIC HIP INFECTIONS PROVIDE HIGHER INFECTION ERADICATION RATES THAN A TWO-STAGE? A SYSTEMATIC REVIEW

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Background: The best surgical modality for treating chronic periprosthetic hip infections remains controversial, with a lack of randomised comparative studies available. This systematic review of the literature compares the infection eradication rate after a single-stage exchange arthroplasty versus a two-stage exchange for chronic periprosthetic hip infections.

Methods: Full-text papers and those with an abstract in English published from 1974 to October 2014, identified through international databases, were reviewed. Those reporting the eradication rate of infection following a single-stage or two-stage exchange arthroplasty were included, with a minimum follow-up of 12 months and a minimum sample size of 5 patients.

Results: Twenty-five original articles reporting the results after a single-stage exchange ($n = 1454$), and 68 papers reporting a two-stage hip exchange ($n = 3615$) were included. The mean infection eradication rate after a single-stage exchange was 82.3% (mean follow-up: 67.2 months), and 91.3% after a two-stage exchange (mean follow-up: 58.4 months) ($p < 0.0001$). Comparing studies with a minimum of 36 months, the respective mean infection eradication rates were 89.2% and 94.0% ($p = 0.0165$).

Considering single-stage cementless exchange arthroplasties ($n = 142$), the average infection eradication rate was 83.1% (mean follow-up: 71.8 months), compared to 82.4% after single-stage cemented hip exchange arthroplasty (mean follow-up: 61.8 months) ($p = 0.90$), and to 94.6% after two-stage cementless exchange (mean follow-up: 51 months) ($p = 0.0003$).

Conclusions: Nearly all studies available were case series (Level of evidence IV). The methodological limitations of this study and the heterogeneous material in the studies reviewed notwithstanding, this systematic review demonstrates that a two-stage exchange arthroplasty is associated with a higher rate of infection eradication than a cemented or cementless single-stage exchange for chronic periprosthetic hip infections.

PARTIAL IMPLANT RETENTION IN REVISION HIP ARTHROPLASTY FOR INFECTION

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Background: There is debate around the optimal treatment of the infected arthroplasty. In the setting where there is an ingrown component on one side of the arthroplasty and a loose component on the other, treatment is typically revision of the entire construct. There is an argument to retain an ingrown implant where removal would create significant damage. We present 18 cases where the ingrown component was retained during revision with a minimum 2 year follow up.

Methods: The technique was to remove the loose component, undertake a thorough debridement, synovectomy and extensive lavage. The ingrown component, be it femoral or acetabular was thoroughly cleaned, lavaged and scrubbed. Once there was a clear field, re-draping was carried out and new instruments were used to re-implant the other side.

This technique was applied in 18 cases. In 12 cases the ingrown cementless femoral component was kept insitu and femoral head and acetabular component were exchanged. In 6 cases a complex acetabular reconstruction including augments and/or cages was left insitu, and femoral revision with liner exchange was performed.

In all cases intravenous antibiotics were used post-operatively for a minimum of 5 days and oral antibiotics for a minimum of 6 weeks based on serology, wound-healing, and nutritional markers.

Results: Minimum follow up was 2 years, median follow up was 5.1 years. Re-infection occurred in 3 cases at 3, 9 and 10 months; all were treated by two-stage revision. No re-infection was noted in the other cases.

Conclusions: Standard dogma suggests that these cases should be treated by full revision, but this could result in bone damage and compromised function. Our alternative technique should only be considered after ensuring the implant is ingrown, and appropriate surgical expertise and antibiotics are available.

Implications: The short term results are reassuring. Long-term data is awaited before this technique is more widely adopted.

ACETABULAR RECONSTRUCTION USING TANTALUM AUGMENTS AND IMPACTION GRAFT IN SINGLE STAGE REVISION FOR PERIPROSTHETIC INFECTION

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Introduction: Acetabular defects are commonly seen in revisions for periprosthetic infection. Impaction bone graft have been suggested to restore bone stock while tantalum augments are successfully used in reconstructing peripheral segmental defects.

Objectives:

1. Study the results of combining antibiotic loaded impaction bone graft and tantalum augments in reconstructing combined segmental and cavitary acetabular defects
2. Evaluate the suitability of metal augments in single stage revisions for infection

Methods: In the period between July 2008 and August 2012, 47 patients with periprosthetic infection of the hip have been treated by single stage exchange arthroplasty. The inclusion criteria for performing the single stage revision was absence of a sinus tract or septicemia and identification of the infecting organism pre-operatively. Fourteen out of these 47 patients had combined segmental and cavitary acetabular defects grade IIB, IIC and IIIA according to Paprosky's classification system and were reconstructed using the combination of tantalum metal augments and antibiotic loaded impaction graft using fresh frozen femoral heads.

All revisions were performed through sliding trochanteric osteotomy with insertion of polyethylene cemented cups (32 mm inner diameter) on the acetabular side and long cementless (Wagner) stem on the femoral side. Antibiotics were added to the bone graft (4 grams per femoral head) and used for 8-12 weeks post-operative according to sensitivity tests.

Patients were prospectively evaluated using the modified Harris Hip Score (HHS) in addition to radiological evaluation at 3, 6 and 12 months then annually afterwards.

Results: At an average 4 years (range 2-6) all patients were free of infection. All metal augments were stable good incorporation of the impacted bone graft was observed. The HHS has significantly improved from 29 pre-operative to 87 post-operative ($P < 0.002$). None of the cases was revised or awaiting revision.

Conclusions: Metal augments can convert massive acetabular defects to a contained defect suitable for impaction graft. The combination of tantalum augments that provide strong structural support and antibiotic loaded allograft is successful at the mid term in single stage revision for infection.

ORAL PRESENTATIONS TRAUMA (PART 1)

SURGICAL HIP DISLOCATION FOR THE MANAGEMENT OF IRREDUCIBLE POSTERIOR HIP DISLOCATION WITH FEMORAL HEAD FRACTURE: A CASE SERIES

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Introduction: Irreducible Posterior hip dislocation associated with femoral head fractures (pipkin) are rare injuries that not well described. Surgical ap-

proach and managements of this type of injuries are challenging and there is no universal agreement on the best approach.

Objectives: To evaluate the results of the surgical hip dislocation in the management of the irreducible pipkin fractures.

Methods: Five cases of irreducible pipkin type 2 fractures without any acetabular fracture was included. All of them were young males. Closed reduction under general anesthesia tried two times for all of them that were unsuccessful so all of them underwent Open reduction using Ganz technique of surgical hip dislocation. Patients followed 18 months (15-29 month) with Harris hip score (HHS) and radiography to evaluate joint congruency, avascular necrosis of the head (AVN) and osteoarthritis (OA).

Results: In all cases there was a common clinical and radiographic features. The patient leg was in neutral rotation with no internal rotation and no adduction. On the radiography the head is impacted and locked on the posterior and superior of the acetabulum. During surgery, the head was buttonholed through a large capsule-labral flap tear from the 12 o'clock to the end of the posterior rim that was repaired by anchor sutures. Four cases had congruous reduction at the last follow up and Mean HHS was 87 without OA. In one case that surgery delayed for 36 hours after dislocation, AVN happened that needed total hip arthroplasty.

Conclusions: In the rare cases of irreducible pipkin dislocation, we need two approaches for classic treatment. Hip surgical dislocation could give the opportunity to manage both the dislocation and the fracture simultaneously and complete access to the acetabulum to repair labral injuries. Besides comminuted fracture of the head only could be repaired with this technique.

MINIMAL-INVASIVE POSTERIOR APPROACH IN THE TREATMENT FRACTURES OF THE ACETABULUM: THE ITALIAN EXPERIENCE, CONSIDERATIONS AND INDICATION AFTER 10 YEARS

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Introduction: The classic Kocher–Langenbeck posterior approach provides access to the posterior wall and posterior column of the acetabulum. The risk encountered by using this surgical approach is to damage the superior gluteal artery and nerve. This fact has been attributed to surgical extended approaches. Our approach can be thought as the distal part of the typical Kocher–Langenbeck approach (about 12-18 cm). The purpose of this article is to report the advantages of a less invasive surgical approach in this kind of surgery, which gives the same results in terms of fracture healing as a more invasive surgery.

Objectives: The most common indication we give for this kind of minimally invasive approach is posterior wall fractures, but it can be extended to selected transverse fractures and posterior column fractures. The only absolute contraindication is obesity.

Methods: Between 2004 and 2014 we have treated 54 patients affected by a posterior wall fracture or a transverse fracture, most of which were male. The fractures were classified according to Letournel classification. All surgical procedures were performed by the first Author. The age of the patients ranged between 22 and 64 years. The clinical evaluation was based on the schemes of Merle d'Aubigne and Postel scoring which has been modified by Matta. The radiographs were according to the criteria developed by Matta.

Results: The result for clinical outcome according to Merle d'Aubigne and Postel we obtained (68%) patients classified as excellent, very good (22%) and good (10%). The latest follow-up X-rays were excellent in (68%), good in (32%).

Conclusions: The classic Kocher–Langenbeck approach is implicated in the formation of HO after acetabular fracture surgery. For this reason many authors use to give their patients Indomethacin to prevent such a complication. In this work only 50% of patients received Indomethacin as prophylaxis. One case we observed a massive ossification (Brooker's class 3), without limiting of motion. This patient had an important head trauma associated and rested in coma in ICU for many weeks before and after surgical treatment.

TECHNIQUES FOR REDUCTION OF ACETABULAR FRACTURES INVOLVING THE QUADRILATERAL PLATE

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Introduction: The quadrilateral plate refers to the medial wall of the acetabulum, and is not specifically considered as a parameter in most of the classification systems.

Quadrilateral plate fractures represent a heterogeneous group of acetabular fractures. Traditionally, acetabular fractures have been associated with high energy trauma in younger patients. However, with the increasing prevalence of osteoporosis amongst an ageing population, low impact fractures in the elderly are likely to become ever more predominant. Older patients tend to have acetabular fractures with medial displacement patterns and associated comminution, particularly of the quadrilateral surface.

Central fracture dislocations of the hip with medial migration of the quadrilateral plate are most frequently associated with both-column, anterior column and posterior hemitransverse, posterior column and combined transverse or T-shaped fractures.

Objectives: The goal of treatment relies on restoration of articular anatomy with stable internal fixation, allowing early mobilisation for the patient, restore function by restoring the normal hip joint anatomy. With regards to its anatomical reduction and stable fixation they are difficult to achieve, mainly due to its location in the true pelvis, limited bone stock, juxta-articular nature and its comminution especially in the presence of osteoporosis.

Methods: Authors introduce their experience on the treatment of acetabular fractures involving the quadrilateral plate stressing tips and tricks for the fixation of these fractures.

Results: Selection of a specific method of treatment of any acetabular fracture depends on numerous factors including age, functional status, fracture pattern, degree of displacement, associated injuries pre-existing local and general condition as well as the available surgical expertise.

Current treatment options for acetabular fractures include both conservative and operative methods. Over time, prognostic indicators of outcome have been defined and this has led to an increasing trend towards operative fixation. Techniques used include open reduction and internal fixation with pins, screws, plates and screws, percutaneous screws, cerclage wiring and cable fixation, delayed and acute total hip arthroplasty (THA).

Conclusions: Plating is currently the most frequently employed method, with various operative techniques, implants and approaches.

The standard ilioinguinal approach and modified Stoppa approach have been described for the surgical access to the quadrilateral plate. Both the approaches have some limitations in addressing quadrilateral plate fracture.

ACUTE FIXATION AND TOTAL HIP REPLACEMENT FOR THE MANAGEMENT OF ACETABULAR FRACTURES IN PATIENTS OVER 55

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Introduction: Acute total hip replacement (THR) is a useful treatment for older patients with acetabular fractures as it enables earlier weight-bearing and early return to good function. When THR is used for post-traumatic hip osteoarthritis, there is an interval of pain, stiffness and poor function for the patient. For acute THR, there is controversy relating to higher complication rates including infection, loosening and revision surgery.

We report the functional outcome and complications experienced by patients who sustained an acetabular fracture and underwent open reduction and internal fixation (ORIF) plus acute THR.

Materials and methods: A prospective review was performed in our centre of 80 consecutive patients over the age of 55 sustaining an acetabular fracture (age range 55 to 98). Patients completed a Merle d'Aubigné (MA) questionnaire and the Short Form 36 Health Survey (SF-36) at their follow-up appointments.

Results: A total of 18 patients within our cohort were treated with acute ORIF and THR with a mean age of 76.4 years and mean follow-up of 16 months (range 10 to 40 months). ORIF and THR were performed through a

single Kocher Langenbeck (KL) approach or a Stoppa and a KL approach as a sequential or staged procedure. Operative technique, complications and outcomes are described in detail.

Conclusions: Acute ORIF and THR for acetabular fracture has a significant complication rate. Satisfactory outcomes were associated with adherence to the principles of THR for acetabular fracture. These include sufficient lateralisation of the centre of rotation, maximal bony contact with the acetabular implant, maximal fixation of implant to bone and restoration of stability. The cases illustrate that at least one of these principles was compromised in the patients with complications. We favour a trabecular metal system which offers versatility in acetabular implant positioning. We suggest further studies to determine the long term outcome of this treatment method.

DELAYED TOTAL HIP ARTHROPLASTY AFTER ACETABULAR FRACTURE

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Introduction: Total Hip Arthroplasty (THA) after acetabular fracture presents unique challenges to the orthopedic surgeon. This includes immediate total hip replacement for certain rare cases and late reconstruction following failed non-operative or operative treatment, leading to symptomatic arthritis, posttraumatic avascular necrosis of the femoral head, malunion or non-union.

Materials and methods: A retrospective study was performed on 37 patients (27 men and 10 women with a range between 19 and 70 years) treated for pelvic ring and acetabulum fractures between January 2008 and May 2013. The fractures were classified according to Tile (pelvic ring) and Judet & Letournel (acetabulum). Actually, Total hip arthroplasty was performed for avascular necrosis of the femoral head in 5 cases.

Results: THA secondary to acetabular fractures is often more difficult than routine THA due to extensive scarring, retained internal fixation devices, residual deformity of the acetabular bone, undetected infection and bone loss. In order to achieve a high survivorship rate of hip prosthesis, optimizing the anatomy of the reconstructed hip center at reconstruction is paramount. In our experience, after 2 years, the average Harris Hip Score improved from 37 points pre-operatively to 82 postoperatively. To date, no patient needed a revision surgery.

Conclusions: The indications for delayed total hip replacement after failed treatment of acetabular fractures could be classified into two groups: avascular necrosis of the femoral head and symptomatic post-traumatic or post-operative arthritis. An open, anatomic reduction and internal fixation afford the best opportunity for joint preservation and minimize the risk of post-traumatic osteoarthritis. Advances in fracture management and cementless acetabular fixation in THR demonstrate improved results for post-traumatic arthritis and avascular necrosis of the femoral head following acetabular fracture.

CLINICAL OUTCOME AND SURVIVAL OF TOTAL HIP ARTHROPLASTY AFTER ACETABULAR FRACTURE: A CASE-CONTROL STUDY

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Introduction: There is a perception that patients undergoing total hip arthroplasty for the complications of acetabular fractures have an adverse outcome in terms of implant longevity and functional score following surgery. This study was done to answer that question.

Objectives: The aim of this study is to compare the long term clinical and radiographic results in patients who have undergone THA after acetabular fracture treatment as compared to patients who underwent THA for primary hip osteoarthritis.

Methods: Eighty patients were identified in our total hip database who were treated for acetabular fracture and subsequently underwent total hip

arthroplasty for post-traumatic arthritis or avascular necrosis. The primary outcome measurements for revision rate, time of revision and complication rates. These patients were matched to 80 patients of the same age and gender undergoing hip arthroplasty for osteoarthritis.

Results: The cohort of acetabular fracture patients included 55 male and 25 female patients with a mean age of 52 years (Range, 25-85 years) and mean follow up of 8.1 years (Range, 2-23 years). The number of revisions for patients with THA following acetabular fracture was 24/80 (30%) as compared to 12/80 (15%) ($p = 0.038$) in the control group. There was a significant difference in the time from the initial THA to the revision between patients with previous acetabular fracture (7.7 years; SD, 5.1 years) and the matched cohort (12.8 years; SD, 5.9 years; $p = 0.015$). Patients with a previous acetabular fracture had a 6.25% infection rate and a 10% dislocation rate compared to no infections and a 2.5% dislocation rate in the matched group.

Conclusions: Patients with a prior acetabular fracture had a higher complication rate, a higher revision rate and those requiring revision were done earlier than those patients without a prior acetabular fracture.

MINIMALLY INVASIVE POSTERIOR-LATERAL APPROACH WITH SUPERIOR CAPSULOTOMY VS CONVENTIONAL POSTERIOR-LATERAL APPROACH IN MEDIAL FEMORAL NECK FRACTURES IN ELDERLY. A RETROSPECTIVE STUDY

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Purpose: The aim of this paper is to match clinical, functional and imaging outcomes of patients, suffering from medial femoral neck fractures, who had undergone a total hip arthroplasty (THA) by minimally invasive posterior-lateral approach, with superior capsulotomy, (MIS group) to standard posterior-lateral one (standard group).

Methods: This is a retrospective study on 208 patients with a mean age of 76 years (Range 45-106 years) with medial femoral neck fracture (Type III-IV of Garden Classification) who had undergone total hip arthroplasty from 2008 and 2010, assessed at an average follow-up of 5 years. Cementless acetabular cups and stems were used in all cases. The MIS group included 104 patients (59 males and 45 females), the standard group included 104 patients (57 males and 47 females). Pre-operatively, the day before the scheduled surgery, the Harris hip score (HHS), the Oxford hip score (OHS), the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) questionnaire forms were administered to all patients. Data on duration of surgery, complications, volume of blood loss, and length of hospital stay were also recorded. The level of pain was examined at discharge time using a visual analogue scale (VAS). Patients were examined at 3 months, 1 year and at a minimum follow-up of 5 years after surgery. At follow-ups, the HHS, the OHS and the WOMAC questionnaire forms were administered, again, to all patients. Patients were also asked for return to daily, occupational and recreational sports activities. Standard pelvis radiographs were undertaken preoperatively and at follow-ups. Radiographic features involving acetabular cup inclination and anteversion angle and varus/valgus femoral stem were assessed. Osteolysis was also examined.

Results: The 2 groups of patients were homogeneous for defect size and follow-up, well matched for age, gender, BMI, and preoperative disease ($p > 0.05$). The mean duration of surgery and hospitalization, the mean blood loss and the number of patients who needed for blood transfusions were significantly lower in the MIS group. The incision length averaged 6.8 cm in the MIS group, and 11.2 cm in the standard group. After 2 weeks, patients who had undergone minimally invasive surgery were more able to independently get out of bed (90 in the MIS group vs 67 in the standard group; $P = 0.002$), climb stairs (82 in the MIS group vs 60 in the standard group; $P = 0.002$), and use the toilet independently (95 in the MIS group vs 78 in the standard group; $P = 0.001$). In both groups, the HHS, the OHS and the WOMAC scores improved significantly from preoperative to 3 month follow-up ($P < 0.0001$) with better scores for MIS patients. At 1-year follow-up, the average score improved significantly in both groups compared to 3 month follow-up scores, with still better scores for patients in the MIS group. At imaging assessment, the mean socket inclination angle was 40.1° in the MIS group (SD = 7.1) and 45.3° in standard group (SD = 8.3); the mean socket anteversion angle was

17.1° in the MIS group (SD = 3.5), and 19.8° in the standard group (SD = 4.3). Two dislocation, an early infection and a reversible venous thromboembolism (VTE) occurred in the standard group. Intraoperatively, a femoral calcar crack occurred in 1 patient in the MIS group.

Conclusions: Following a medial femoral neck fractures, a minimally invasive total hip arthroplasty performed through a posterior-lateral approach, with superior capsulotomy, offers significant benefits within the early postoperative period compared with the standard posterior-lateral approach.

ORTHOPAEDIC SURGERY FOR FRACTURE OF HIPS IN A MIXED-USE EMERGENCY THEATRE – DOES IT COMPROMISE PATIENTS' INTEREST?

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Introduction: Early operation for fractures of hip in elderly has proved to lead to better outcomes. Only 72% of patients in the United Kingdom met this standard last year. We occasionally utilize mixed-use emergency theatre to facilitate early surgery. Increased risk of infection has been raised as a concern due to microbial surface contamination from a preceding dirty case and lack of laminar flow in these theatres. Recent evidence raises a question mark on the usefulness of laminar flow in orthopedic theatres but there is no study on the effect of mixed-use theatres or surface contamination in orthopedic surgery.

Objectives: Is there an increased risk of surgical site infections or indirect harm to patients who had hip fracture surgery in a mixed-use emergency theatre?

Methods: A consecutive series of patients with hip fracture surgery in mixed-use emergency theatre (Gr A, n = 74) was compared with remaining hip fractures operated in a dedicated orthopedic theatre (Group B, n = 1370) in the same period. Almost all of the patients in Group A were preceded by drainage of abscess, laparotomy or other dirty case. The primary outcome measured was diagnosis of a wound infection. Secondary outcome measures were reoperation, length of stay (LOS), readmission and 30 days mortality.

Results: None of the patients in Gr A was re-operated within 30 days or had a wound infection. Reoperation rate in Gr B was 1.1%. The 30 days mortality in Gr A was 4% as against 8% in Group B. The average LOS for group A was 20 days (median-14, range 3-117) as compared to the average of 19 days for group B. Surgical site infection was not the cause of late discharge in Group A patients with a LOS of more than 14 days.

Conclusions: Operating on hip fracture in mixed-use emergency theatre does not lead to an increase in infection or obvious adverse outcome. It may be safe to use these theatres when faced with lack of time on trauma list.

Limitations: Retrospective, observational, bias, small sample.

ORAL PRESENTATIONS TRAUMA (PART 2)

DISLOCATION AND COMPLICATIONS AFTER THR FOR ACUTE FEMORAL NECK FRACTURES

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Introduction: NICE recommends THR for patients with displaced intracapsular femoral neck fractures who were able to walk independently with no more a stick, are not cognitively impaired and are medically fit for surgery. High complication rates, particularly dislocations, (10-22% - almost 4 times higher than THA for osteoarthritis) are reported in literature in this cohort resulting in current use of larger heads and constrained bearings routinely which have their own problems, failure mechanisms and additional expense. A dislocation in this patient group is linked to higher mortality figures.

Aim: We report our results and complications after THR using standard 28 and 32 mm heads and standard acetabulum components for acute femoral neck fractures.

Methods: This was a Retrospective review of clinical and radiological records of patients identified from prospectively collected data for the National Hip Fracture Database specifically looking at dislocation rates and other complications in patients treated over a 5 year period.

Results: 65 patients (female: male 50:15) with mean age 71.5 years underwent primary THR from 2009-2014 by surgeons routinely performing hip replacement surgery. 56 patients had ASA grade 2 or 3. 62 had all-cemented THR. Suitability was determined by the on-call consultant and the operating surgeon. All had posterior approach with formal soft tissue repair. Antibiotic and VTE prophylaxis was as per trust guidelines. All except 4 cases had a 28 mm metal head. No patient had a constrained or dual mobility bearing. The 30 day mortality was 0%. There were 9 deaths at more than 12 months (14%). There were no early wound problems and no deep infections. There was no nerve injury. 3 patients had symptomatic deep DVT and 1 patient had symptomatic pulmonary embolism 4 weeks postoperatively. One periprosthetic femoral fracture in a cemented hip required revision. There was 1(1.5%) revision surgery performed for recurrent dislocation (28 mm metal head). There were no other readmissions within one year. There was no mechanical failure.

Conclusions: THR in this particular cohort was shown to have good functional outcomes and quality of life with low dislocation rates. In our study we found 1(1.5%) dislocation and all patients had posterior approaches. Our overall percentage of patients suitable for THR is lower than the expected national average despite being a specialist hip centre. Even after introduction of NICE guidelines we have not seen the expected increase in this number. This may reflect unique patient characteristics of the local population or stringent selection criteria.

THE EXPERIENCE OF DUAL MOBILITY CUP TOTAL HIP ARTHROPLASTY IN PATIENTS WITH FRACTURED NECK OF FEMUR

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Introduction: Dislocation after total hip arthroplasty (THA) remains the second most common reason for revision. This also applies to THA in patients for neck of femur (NOF) fracture. Despite many different strategies to reduce the risk of dislocation, the simplest and most enduring appears to be the concept of SERF dual mobility arthroplasty (DM-THA), originally implanted in 1975. According to National Institute for Health and Clinical Excellence (NICE) and British Orthopaedic Association Standards for Trauma (BOAST) guidelines, THA should be offered to those with an intracapsular fracture NOF who were able to walk independently outdoors with no more than one stick, not cognitively impaired and fit for surgery.

Objectives: To assess the incidence of dislocation in SERF Dual Mobility THA in patients with fractured NOF in a busy trauma unit.

Methods: Retrospective study of 37 patients (28 females; 9 male, age range 60-92) with NOF fracture, who underwent SERF DM-THA (Aug 2012 to Feb 2015). All procedures were performed by single surgeon using posterior approach.

Results: There was no evidence of radiological loosening in any of the cases. Follow-up was up to 26 months. One dislocation was reported until the last follow-up (3%) and one mortality not related to THA surgery. There were 24 right and 13 left-sided procedures. There have been no revision surgeries performed.

Conclusions: The SERF DM-THA appears to offer a simple solution to a difficult problem of dislocation in total hip arthroplasty in patients with neck of femur fracture.

RETENTIVE CUP ARTHROPLASTY IN SELECTED HIP FRACTURE PATIENTS – A PROSPECTIVE SERIES FOLLOWED FOR A TWO YEAR MINIMUM FOLLOW-UP PERIOD

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Introduction: The treatment of sub-capital hip fracture is controversial, with recent literature tending to support the use of primary total hip replacement (1). The drawback of primary total hip replacement is a high dislocation rate of up to 20 percent (2).

The current series describes our experience with prospective follow-up of a selected series of patients that underwent primary retentive cup total hip replacement (Lefevre Cotyle Retentif, *Groupe Lepine*) for subcapital fracture.

Objectives: Efficacy of the use of retentive cup primary total hip replacement in high-dislocation risk subcapital fracture patients.

Methods: During the years 2008 to 2012, 354 patients with displaced subcapital fracture were operated at our institute. The patients were selected to undergo primary constrained total hip replacement according to the following criteria: 1. A pre-injury grade 4 or more on the FIM mobility subscale. 2. A disease leading to poor motor control. Exclusion criteria included normal muscular control and known infection of the involved joint.

Results: 87 of 354 patients fulfilled the inclusion criteria. Constrained total hip was performed. Average age was 78 years and there was a female predominance (73%). 15 patients had prior hemiparesis, 19 patients had Parkinson's disease, 35 patients had generalized sarcopenia. 85 patients had uneventful recovery with the average HOOS score at 2 years at 76 ± 7 . In two patients the prostheses dislocated. In both cases the dislocation was due to ring displacement and the inner head dislocated. One case was infected and the patient was treated by a Girdlestone procedure. In the other case the prosthetic head was revised. The patient remained asymptomatic and at 4 year follow-up had an 85 HOOS score.

Conclusions: It appears that constrained prosthesis is a suitable treatment for patients with poor muscular control suffering from subcapital fractures. The functional results appear to be superior to those of bipolar arthroplasty and similar to results of primary total hip reported in the literature (3) and the dislocation risk is less than 3%.

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OUTCOME OF DISLOCATION AFTER HEMIARTHROPLASTY - A RETROSPECTIVE REVIEW IN TWO DISTRICT GENERAL HOSPITALS

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Introduction: Hip fractures are common with a UK incidence of 70,000 cases and reported mortality rates of up to 30% at 1-year. Hip Hemiarthroplasty is an accepted treatment for displaced intracapsular fractures in patients with poor functional mobility. Dislocation is a recognised complication and subsequent management can be complex requiring consideration of multiple factors.

Objectives: We wanted to identify the dislocation rate following hip hemiarthroplasty, factors leading to dislocation, mortality rates following a dislocation.

Methods: A retrospective double centre analysis of 1153 Hip hemiarthroplasties between 2008 and 2013 in two UK district general hospitals. Review of case notes, radiographic analysis, operative notes and further management of patients with dislocated hip hemiarthroplasties.

Results: 1153 hip hemiarthroplasties were performed with 33 post-operative dislocations (dislocation rate = 2.8%). Dislocations occurred at a mean time of 31 days postoperatively. Initial treatment included revision to total hip arthroplasty or bipolar hemiarthroplasty, girdlestone procedure, open reduction and closed reduction in 2, 2, 4 and 25 cases respectively. 24 patients (72%) had re-dislocations, 22 of whom had further operative treatment. Final treatment included closed reduction, revision to total hip arthroplasty and girdlestone procedure in 4, 7 and 11 cases respectively. Multiple dislocations occurred in 24 cases and single dislocations occurred in 9 cases. Cognitive impairment and nursing home residential status was present in 55% and 62.5% of multiple dislocators and in 11 and 11.1% of single dislocators. The mortality rates at 1, 3, 6 and 12 months were 8.5%, 37.1%, 45.7% and 54.2% respectively.

Conclusions: Dislocation of hip hemiarthroplasty is a serious complication with a high mortality rate. Patient and social factors for multiple dislocations include cognitive impairment and nursing home residential status. With closed reduction, re-dislocation is common and revision to total hip should be considered after first dislocation if the general health allows for major surgery.

DYNAMIC LOCKING PLATE VS SIMPLE CANNULATED SCREWS FOR NONDISPLACED INTRACAPSULAR HIP FRACTURE: A COMPARATIVE STUDY

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Introduction: Intracapsular hip fractures (ICHF) are a common cause of morbidity and mortality and pose a great economic burden on the health care systems. Appropriate surgical treatment requires balancing optimal outcomes with the cost of treatment to the health care system. While in elderly patients with displaced ICHF arthroplasty became the standard of care, the internal fixation method for conserving the femoral head in younger patients or in nondisplaced ICHF is still in debate. We compared a dynamic locking plate with the standard cancellous cannulated screws (CCS) for treatment of nondisplaced ICHF.

Methods: All patients treated with internal fixation for nondisplaced ICHF between July 2009 and December 2012 at our level one trauma center were included in this study. Patients treated with Targon FN (Aesculap) implants and CCS (Synthes) were compared. Charts were reviewed for demographics, intraoperative data and peri/post operative complications retrospectively. Radiographical analysis, pain (VAS), quality of life (SF12) and function (MHHS) data were prospectively gathered.

Results: One hundred and fifteen non-displaced ICHFs were treated with internal fixation, 81 with CCS and 34 with Targon FN implant; the mean follow-up was 19 and 28 months respectively. Group fracture characteristics (Garden/Powel classification), and demographics, excluding age, were not significantly different. Post-operative revision rates of the Targon FN and CCS groups, perioperative complications were not statistically different ($p > 0.05$). Quality of life (SF-12), function (Modified Harris Hip Score) and Visual Analogue Scale (VAS) pain scores were not statistically different.

Conclusions: Complication rates and clinical outcomes for the treatment of nondisplaced ICHF with Targon FN and SCC showed no significant differences. Based on this evidence in consideration of the substantial cost differential between the Targon FN and SCC we suggest SCC for treatment of nondisplaced ICHF.

INTERNAL FIXATION OF INTRACAPSULAR NECK OF FEMUR FRACTURES – TWO-HOLE DHS OR CANNULATED HIP SCREWS?

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Introduction: Fractured neck of femurs are one of the most common Orthopaedic injuries. If intracapsular fractures are non displaced or occur in a young and fit patient they are amenable internal fixation by a two-hole dynamic hip screw (DHS) or multiple cannulated screws (MCS).

Objectives: To compare the outcomes associated with these two fixation methods over a 5 year period.

Methods: We identified 161 patients with an intracapsular fracture treated with internal fixation over a 5 year period. The clinical notes and imaging of these cases were analysed to determine failure rate and length of stay.

Results: Ninety-three patients were treated with DHS compared to sixty-eight treated with MCS. The mean age of the DHS group was 75 years, 8 years higher than those treated with MCS. When the age of patients suffering a failure was compared to those undergoing a successful treatment there was no significant difference.

The length of stay in the group treated with MCS was on average 4.7 days longer than those treated with DHS ($p < 0.01$).

The failure rate was significantly higher ($p < 0.05$) in patients treated with DHS (18%) compared to those treated with MCS (7%).

The DHS group was subdivided by the use of a derotation screw and further analysed. Employing a permanent derotation with a 2-hole DHS reduces the rate of failure, nullifying the significance of the difference in failure rates between DHS and MCS. The failure rate associated with the group employing a derotation screw was 9% compared to 24% in the group without. This gives a number needed to treat of 6.42 to prevent 1 failure.

Conclusions: We found a significantly lower rate of failure in patients treated with MCS compared to two-hole DHS. When a two-hole DHS is used inserting a derotation screw is associated with a lower rate of failure compared to using DHS alone. When a 2-hole DHS is used in combination with a permanent derotation screw the difference in failure rate between DHS and MCS loses statistical significance.

INTRAMEDULLARY NAILS VERSUS EXTRAMEDULLARY IMPLANTS FOR EXTRACAPSULAR HIP FRACTURES: 1-YEAR MORTALITY AND PERIOPERATIVE BLEEDING IN A COMPARATIVE RETROSPECTIVE STUDY OF 615 PATIENTS

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Introduction: The best options of internal fixation for stable or unstable inter-subtrochanteric femoral fractures in elderly osteoporotic patients remain controversial in literature.

Objectives: We studied whether intramedullary nail or extramedullary plate provides better treatment for different types of fracture patterns in terms of perioperative bleeding, 1-year and 2-years mortality, length of surgery and length of hospitalization.

Methods: 615 patients surgically treated in our hospital between 2004 and 2012 were retrospectively evaluated. We divided the population in two groups according to fracture pattern (Stable and Unstable) and then statistical analysis were conducted in every group to compare intramedullary and extramedullary fixation. We also analyzed the entire population risk factors for 1-year mortality.

Results: No statistical differences were found in terms of perioperative bleeding, 1-year and 2-years mortality and length of hospitalization between the two types of fixation. We found less length of surgery for extramedullary implants in unstable fractures. We found correlation with 1-year mortality only of age (>80), ASA score (3-4), Charlson Comorbidity Index (>7) and Haemoglobin value at emergency room (<12 g/dl).

Conclusions: Both implants seem to provide good results and can be useful to fix stable and unstable fractures. Risk factors for 1-year mortality are related in particular to patients comorbidities and general pre-fracture conditions.

CLINICAL OUTCOME OF PERITROCHANTERIC FRACTURES TREATMENT WITH AN ANTERGRADE TROCHANTERIC STATIC LAG SCREW NAIL (INTER TAN)

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Background: The preferred implant (cephalomedullary or extramedullary) of peritrochanteric fractures treatment is still on debate. The new cephalomedullary nail InterTAN permits intraoperative linear compression and prevents the excessive neck sliding, control shortening and varus collapse of the neck, minimizing the risk of malunion or nonunion of the fracture. The aim of this study is to determine the clinical and functional outcomes of unstable peritrochanteric fractures treatment with the use of the InterTAN.

Methods: 154 consecutive unstable peritrochanteric fractures treated with an antegrade trochanteric nail InterTAN introduced to the study. The patients studied clinically and radiologically with the Harris Hip Score, Up and Go test, Visual Analog Scale score and standard two view x-rays. Have been calculated intraoperatively and postoperatively at every follow up meeting the Tip Apex Index and the fracture Gap.

Results: The mean follow up was 19 months, mean age of the patient's was 80.8 years and mean hospitalization time was 7.8 days. The mean TAD immediately post-operatively was 22.34 mm. The mean fracture gap immediately post-operatively was 3 mm. The TAD and the fracture gap remain invariable until the last follow up. The modified- HHS was 85.7/91 at the last follow up (67-91) and the VAS 0.6 (0-10).

Conclusions: The new intertrochanteric antegrade nail Inter Tan throughout its lag screw locking after maximum intraoperative compression of unstable peritrochanteric fractures have good clinical outcomes with high union rate.

INTRAMEDULLARY FIXATION OF COMPLEX FRACTURES IN PROXIMAL FEMUR

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Aims: Complex femoral fractures are peritrochanteric fractures with added basicervical fracture of the femoral bone or such with subtrochanteric component. This type of fractures are caused by high energy trauma of young people or home incidents with elderly patients with poor bone quality.

Intramedullary fixation offers the theoretical advantage of a shorter lever arm with a more stable construct. This has to some extent been confirmed in biomechanical studies. In addition intramedullary fixation can often be undertaken with smaller incisions and less soft tissue disruption, which may result in less blood loss, reduced incidence of infection, less postoperative pain, faster rehabilitation and fewer non-unions (biological fixation).

Materials and methods: For a 15 year period-Retrospective evaluation of 37 patients. Average age of 55 years. These were: women - 12, men-25 (14 patients - home incidents, 11 after crash accident, 8 after high falling trauma and 4 sport (ski) trauma. We had 9 patients with polytrauma. We used second generation implants with 4 patients - IMHS and Reconstructive Russell-Taylor nails. With 33 patients third generation implants were used - Versanail, PFNA and Fi nail. The mean operative time was 78 min. The average consolidation time - 15 weeks. In 12 of the cases open reposition of the fractures and a fixation with a screw, plate or cerclage were needed.

Results: We did not have incidents with pulmonary embolia, infection and deep vein thrombosis. We had one case of migration of the antirotation sleeve with IMHS, which led to 20 degree varus deformation. We didn't have cases of implant cut-out or non-union. One case with lower extremity with 1 cm. One with intraoperative fractures of femoral diaphysis (In both cases we used Reconstructive Russell-Taylor nail). We followed up 37 (100%) of patients to bone union: excellent -32 (86%) and good -5 (14%). We use Sanders Trauma Hip point scale.

Conclusions: Cephalomedullary nails as osteosynthesis device offer excellent stabilization and the biological advantages of intramedullary nailing. The technical complications that we had with the second generation nails were avoided with third generation. The locked reconstruction femoral nail permitted adequate fixation of unstable proximal femoral injuries in the elderly patients.

ORAL PRESENTATIONS TRAUMA (PART 3)

PRIMARY HIP PROSTHESIS AFTER FAILED INTERNAL FIXATION

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Introduction: Hip fractures, both intra and extracapsular, continue to be clinically challenging, with new implants introduced to make treatment more simple and stable. Loss of fixation, non-union, malunion (mainly malrotation and shortening), and osteonecrosis of the femoral head are the main complications: their treatment may provide a new stabilization with internal fixation, osteotomies and prosthetic replacement.

Objectives: To present the hip replacement after failed internal fixation as method of choice, outlining indications, technical difficulties, hardware solutions, possible complications and results.

Methods: A retrospective analysis of 54 cases (failed internal fixation after hip fractures treated with prosthetic replacement) treated in the period January 2003-December 2013 was undertaken: 37 women and 17 men, age 54-96, 21 neck and 33 intertrochanteric fractures. Reasons for reoperation was loss of fixation in 30, malunion in 14, osteonecrosis in 10 cases. Evaluation graded as good cases with return to normal activities and X-rays evidence of implant stability; fair with some difficulties in daily living but stable implant; poor with inability to deambulate with or without assistance, persistent pain and other major complication, implant modifications. All operations included hardware removal, a direct lateral approach, uncemented total hip in 38 cases, hybrid in 7, biarticular hemiarthroplasty in 9. Immediate rehabilitation with assisted weight-bearing, and control at 1-3-6- 12 months and yearly were observed.

Results: 38 cases (70,4%) were rated as good, 30 total and 6 hemiarthroplasty; 11 (20,4%) fair, 10 total and 2 hemiarthroplasty; 5 poor (9,2%), 3 total and 2 hemiarthroplasty. Major complications 1 death after 4 months for systemic failure; 1 recurrent dislocation revised with constrained cup; 2 delayed wound closure; 1 superficial infection.

Conclusions: Treatment of failed internal fixation after hip fracture is demanding procedure in terms of patient involvement, surgeon engagement and general cost. Nevertheless surgeon must face all the related problems, trying to utilize the most effective procedure in terms of problem solving, early rehabilitation and recovery, easy nursing and possibility of normal daily life. Primary hip replacement seems to address all needs.

FOLLOW-UP OF 810 CONSECUTIVE TITANIUM HYDROXYAPATITE COATED UNCEMENTED STEM HEMIARTHROPLASTIES FOR NECK OF FEMUR FRACTURES

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Objectives: To review outcome measures (intra-operative complications, mortality and revision surgery) in a prospective series of uncemented HAC stem Hemiarthroplasties.

Introduction: A Cochrane review (1) influenced new NICE guidelines, which recommended surgeons: 'Offer cemented implants to patients undergoing surgery with arthroplasty' (2). However our trust routinely uses HAC uncemented stem (Taperloc®, Biomet) hemiarthroplasties. No HAC uncemented stem studies were analyzed within this Cochrane review. One Randomised Controlled Trial has compared a HAC stem (Corail®) with a cemented stem (Spectron®) hemiarthroplasty (3). This revealed no difference in measured outcomes at one year. Another series of 480 patients, received Furlong HAC LOL® (JRI) hemiarthroplasty. At four years, 88% had slight or no pain and 89% walked independently, or with only a stick (4).

Methods: A series of consecutive uncemented hip hemiarthroplasties were entered prospectively into database between January 2008 to June 2014. Outcome data were gathered from electronic medical records; radiographs and notes review.

Results: 810 consecutive Taperloc uncemented hemiarthroplasties with monopolar heads were performed in 763 patients, with minimum 12 month (12-90) follow-up. Mean age 83 years; 71% female. Mean post-operative hospital stay (including in-patient rehabilitation) was 22 (3-153) days. Mean time to operation was 28.5hrs. 30-day mortality: 4.4% (33/763). One-year mortality: 11.2% (89/763).

2.5% (20/810) were readmitted at separate admission with a Periprosthetic fracture; the majority were internally fixed except 3 that were revised to long stem THRs. 0.9% (7/810) were complicated by dislocation and 0.7% (6/810) were revised to THR for subsidence and associated pain. 2.5% (20/810 including those above) were converted to THR at a later date. Only 0.6% (5/810) had intraoperative calcar cracks or fractures, all of which were treated with intra-operative cabling.

Conclusions: Cemented hemiarthroplasty is associated with a 25% one-year mortality; 5.3% further surgery rate and 3% conversion rate to THR (follow-up 3.7 years) (5). Although our follow-up period is minimally shorter, our results are comparable with these and other data (6,7). We believe that uncemented proven stem design hemiarthroplasty remains a safe and reasonable surgical option for displaced intracapsular fractures.

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BIPOLAR HEMIARTHROPLASTY USING ANTERIOR APPROACH IN ELDERLY PATIENTS WITH FEMORAL NECK FRACTURE - FASTER REHABILITATION, LESS COMPLICATION

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Introduction: Femoral neck fractures in elderly patients are frequent and concerning health care problem. Traditionally, hemiarthroplasty through posterior approach for these patients were associated with greater risk of dislocation and complication.

The purpose of this study was to investigate if bipolar hemiarthroplasty for elderly patients with femoral neck fracture through an anterior approach was associated with better outcome and less complications comparing to standard posterior approach.

Methods: From January 2010 to January 2013, we performed bipolar hemiarthroplasty through anterior approach in 45 elderly patients with femoral neck fracture (group A) and compared them with hemiarthroplasty through posterior approach in 45 sex- and age-matched patients (group B).

Results: There was no significant difference between sex and age of the patients in two groups ($p = 0.21$). Patients in group B received higher amounts of blood transfusion ($p < 0.001$). In addition, dislocation and infection rates were significantly lower in group A ($p < 0.001$). Finally, patients in group A had significantly lower postoperative hospital stay and earlier ambulation ($p < 0.001$).

Conclusions: Bipolar hip arthroplasty via anterior approach is a viable option for elderly patients with femoral neck fracture. It is associated with lower complication rate, hospital stay and faster rehabilitation.

HEMIARTHROPLASTY VERSUS TOTAL HIP ARTHROPLASTY FOR THE TREATMENT OF FEMORAL NECK FRACTURES. A PROSPECTIVE COMPARATIVE STUDY

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Introduction: The treatment of femoral neck fractures may affect the post-operative functional outcome in the elderly.

Objectives: This comparative prospective study was carried out to evaluate the outcome of total hip arthroplasty (THA) versus hemiarthroplasty for femoral neck fractures.

Methods: We selected 80 patients (17 males and 63 females) who underwent hemiarthroplasty (40 cases; mean age 74.0 ± 5.5 years) or THA (40 cases; mean age 71.4 ± 6.5 years) for a femoral neck fracture at our Institutions between January 2011 and April 2012. These two therapeutic groups were carefully matched for their preoperative characteristics including age, gender, body mass index, ASA class, comorbidities (CIRS score), cognitive function (MMSE). Four- and twelve-month mortality, walking ability, and activities of daily living (ADL Index) were prospectively assessed in the two groups. Hip-related and general complications also were specifically noted. Models of multiple regression analysis were constructed to evaluate the effect of the surgical treatment (hemiarthroplasty or THA) on functional outcomes and mortality.

Results: The mortality at 4 and 12 months was not significantly different in the two therapeutic groups. The walking ability at 4 months ($P < 0.05$) and the ADL score at 4 months ($P < 0.01$) and one year ($P = 0.01$) was superior in patients with THA as compared to those who underwent hemiarthroplasty. The pre-fracture functional level ($P < 0.001$) and the use of THA versus hemiarthroplasty ($P = 0.01$) represented strong predictors of the four-month ambulatory activity and ADL Index. The use of THA versus hemiarthroplasty was not associated with a better one-year functional outcome. There was a higher risk of hip-related complications at four months in patients undergoing THA ($P = 0.002$).

Conclusions: Despite more hip-related complications, THA can benefit patients with femoral neck fractures with higher four-month functional scores.

OUTCOMES FOLLOWING TOTAL HIP ARTHROPLASTY FOR NECK OF FEMUR FRACTURES

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Introduction: Intracapsular fractures of the proximal femur in independently mobile, medically fit patients can be treated with total hip arthroplasty (THA).

Objectives: The outcome of patients treated with THA for Neck of Femur (NOF) fractures in our unit with at least 12 months follow up.

Methods: Consecutive patients from our unit between 2011 and 2014 with at least 12 months follow up were reviewed. Patient demographics, morbidity, mortality and perioperative details were collected. The Oxford Hip Score (OHS) was used to assess functional outcome.

Results: 1683 patients presented with NOF fractures in this time period of which 744 (44.2%) underwent a hemiarthroplasty. 101 (6%) patients underwent THA (23 male), with a mean age of 73.39 (50-89). 91 patients completed the OHS. 7 patients were lost to follow up (2 patients with a diagnosis of dementia and 5 patients died after one year). There were 3 mortalities within one year. There were a total of ten different consultants that conducted the THA's.

The mean ASA score was 1.7 (1-4) and the mean number of co-morbidities was 1.47 (0-4). 36 cemented THA's had a mean OHS of 42.33, 30 hybrid hips had OHS 40.43 and 25 uncemented 37.44. 30 hips were done through a posterior approach (OHS 41.83); 61 anterolateral approach (OHS 39.64).

9 patients developed complications:

- Periprosthetic fractures: (1 hybrid; 1 uncemented)
- Dislocations: (1 posterior; 1 anterolateral)
- Aseptic cement loosening: (1 anterolateral)
- Persistence of pain: (3 uncemented anterolateral; 1 hybrid anterolateral)

Conclusions: THA provides excellent functional outcomes following NOF fractures, however guidance still remains ambiguous leading to inappropriate patient selection demonstrated by a 3% mortality and 9% complication rate at one year.

EXPERIENCE OF A DISTRICT GENERAL HOSPITAL IN PATIENTS TREATED FOR FRACTURED NECK OF FEMUR WITH TOTAL HIP ARTHROPLASTY – IS THERE A CHANGE IN POST-OPERATIVE MOBILITY?

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Introduction: Fractured neck of femur (FNOF) is an increasing public health issue with an estimated 75,000 hip fractures occurring each year in the UK. NICE guidelines advise offering total hip replacements (THR) to patients with displaced intra-capsular fractures who are not cognitively impaired, are fit for the anaesthetic required for the procedure and walk independently outdoors with the use of no more than a stick.

Objectives: Which patients benefit most from THR in regards to post operative mobility at 2 years? Do patients return to baseline mobility following THR?

Methods: 48 patients were identified over a 2 year period that were treated with THR. Their mobility were assessed pre-operatively and then followed up post THR at 30, 120 and 365 days. The percentage of patients who maintained their pre operative baseline mobility was then calculated.

Results: 38/48 patients mobilized without any walking aids pre-operatively. Of this group at the 30 day stage 74% were using 2 aids to walk. At 3 month follow up 63% were still using 2 aids. At the one year follow up 28.9% were back to baseline pre morbid mobility, with the majority requiring one stick. Of patients using one stick pre THR (5/48), 3/5 returned to baseline at 1 year, with one of the patients walking independently without aids. A small subset (5/48) patients were mobilizing with 2 aids pre-operatively. Of this cohort 3/5 remained using 2 aids.

Conclusions: The largest group were those completely independent pre THR, with only 28.9% returning to their pre morbid mobility, why this should be so is likely multifactorial but will require further study; particularly to see if changes or improvements to the post operative recovery process are possible. By one year the minority of patients had regained this level of independence. All of these patients had the optimal post-operative care with

orthogeriatric assessment and intensive physiotherapy input. Larger numbers are required to draw conclusions on the level of rehabilitation and post operative independence that can be expected from patients presenting with FNOF treated with THR.

THE "KAPUZINER INTERMEDIAL" CUP AND UNCEMENTED BIPOLAR HEAD IN THE SURGICAL TREATMENT OF MEDIAL FRACTURES OF THE FEMORAL NECK IN THE LARGE ELDERLY PATIENTS. PRELIMINARY CONSIDERATIONS

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Introduction: The purpose of this clinical study is the evaluation of "Kapuziner Intermedial" Cup and head bipolar cementless in the surgical treatment of fractures of the medial femoral neck in large elderly and debilitated patients.

The potential benefit of the Kapuziner Intermedial Cup is the fact that during surgery removes only the femoral head, in addition to only regularization of the fractured femoral neck. Do not perform any acetabular milling, surgical times appear so very low. The surgery is indeed very fast, the technique is very simple, the implant Cup Kapuziner presents no technical problems and the instruments is very simple to use. The surgical times are reduced to a minimum, such as bleeding. There is a considerable saving tissue for failure acetabular; the sub-chondral bone and acetabular articular cartilage remains virtually intact.

Kapuziner is an acetabular cup material CoCrMo of progressive measures outside diameter with outer surface structure-like spongy in CoCrMo dimensional, interconnected open porosity >400 microns and inner insert in PTE. The geometry of the cup is to tapered surface to provide greater surface contact with the acetabulum and a consequent better seal in the bone.

Materials and methods: Since 2012 and 2014 at our department 18 very old patients were treated, in very general terms expired, all suffering from medial fracture of the femoral neck (or its recent after effects); of these, only 12 patients were reviewed, with a median follow-up of at least 1 year with satisfactory results that encourage us to continue the use of this system, but restrict it to only patients in whom, to the general conditions, you decide not to place a T.H.P., thereby reducing surgical time and bleeding.

Results: The clinical and radiographic evaluation was performed in the pre-operative, immediate postoperative and after 1, 3, 6 and 12 months postoperatively. In follow-up post-surgery we performed a radiographic (Rx hip AP + axial), evaluation of the ROM and the Harris Hip Score. 3 patients did not show up to the controls (deceased), 8 have completed 12 months of follow-up post-operative, 4 patients to 6 months, while for all others (3) the implant is more recent. No coxalgia was reported to the control at 1 year (no finding of "cotiloidite"); was found only mild joint pain in the hip operated on one patient to control at 12 months.

We have not registered dislocations or subluxations; no paralysis of the sciatic nerve, no vascular lesion and no infection.

Radiographs of control at 1 year showed in all cases a good bone quality peri-prosthetic and peri-acetabular, no osteolysis or evident acetabular peri-prosthetic bone loss.

Conclusions: Our first 18 cases treated have shown then the validity of the "Kapuziner Intermedial" Cup and bipolar cementless head for the surgical treatment of the medial femoral neck fractures in large elderly and debilitated patients, with clinical and radiographic results similar to those reported in the literature for the same indications and with the same follow-up. The ROM post-op. is very good in all patients. This cup can improve the surgical treatment of prosthetic medial femoral neck fractures in the elderly, with limited life expectancy, in which, for the compromised general conditions, you decide not to place a full denture.

IS THERE A DIFFERENCE IN ACETABULAR COMPONENT ORIENTATION AND POST-OPERATIVE DISLOCATION BETWEEN ELECTIVE AND TRAUMA TOTAL HIP REPLACEMENTS?

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Introduction: Acetabular component orientation in Total Hip Replacements (THRs) is important in reducing dislocations, which may affect up to 5% of

THRs. Optimal acetabular component orientation has been defined by several 'safe zones'.

Objectives: To ascertain whether potential difficulty in identifying the Transverse Acetabular Ligament in arthritic hips (elective patients) may influence component position compared with non-arthritic hips (trauma patients). Cup positioning and post-op dislocations between elective and trauma THRs will be compared.

Methods: A retrospective series of 100 consecutive trauma and 100 elective primary THRs at a District General Hospital were compared. One observer measured post-operative antero-posterior (AP) pelvis radiographs for cup abduction and anteversion using sectraPACS software. The component position in relation to four different 'safe zones' was recorded. Dislocations at 6 months were identified.

Results: 99 and 98 hips from the elective and trauma groups respectively were identified. Proportions (%) of cups from the elective and trauma group respectively were: 51 and 53.5 in Lewinnek's zone, and 23.5 and 27.3 in Callanan et al zone. In relation to all four 'safe zones' used there was no statistically significant difference. In the elective group; 2 patients dislocated; one at 3 and one at 7 weeks. In the trauma group, 3 patients dislocated; including one that dislocated twice and another dislocating 4 times. Time to first dislocation was 26 to 39 days, and the latest dislocation occurred at 5 months. There was no statistically significant difference in dislocation rate between the groups ($p = 0.091$), however the sample size was small.

Conclusions: Cup positioning was consistent in elective versus trauma patients, despite the fact that the TAL may be more difficult to locate in the arthritic acetabulum. The patients found with recurrent dislocations in our trauma group may reflect that they are higher risk.

ORAL PRESENTATIONS

MANAGEMENT AND COMPLICATIONS OF TRAUMATIC PATIENTS

THE ASSESSMENT OF STANDARDS OF PATIENT CARE FOLLOWING TOTAL HIP REPLACEMENT IN FRACTURED NECK OF FEMUR: A COMPARATIVE STUDY

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Introduction: According to National Joint Registry (NJR) in 2012, 76,448 primary total hip replacements (THR) were performed in England and Wales of which 3% (2,440) were for neck of femur (NOF). The consensus document issued by British Orthopaedic Association (boa) 'Primary Total Hip Replacement: A guide to good practice' has been published in UK to ensure the best possible care for patients undergoing primary THR in the UK.

Objectives: The aim of the study is to ascertain if the postoperative management of THR in fracture NOF is compliant with the best practice guidelines published by BOA in November 2012 and compared to the practice of elective primary THR in our institution.

Methods: Between 2009 and 2012, retrospective cohort review of 70 patients undergone THR with mean age of 68.95 (59-82); M:F = 21:49. In group one (elective) there is 36 patients and 34 patients in group 2 (trauma). Patients' demographic details, radiographic details and complications were documented. We compared a few of the postoperative parameters to assess the standards of care between 2 groups.

Results: For deep venous thrombosis (DVT) prophylaxis:- 69.4% (group 1) versus 20.6% (group 2)

For post-operative physiotherapy:- 50% (group 1) versus 61.7% (group 2)

For post-operative contact details:- 41.6% (group 1) versus 23.5% (group 2)

For out-patient clinical appointment:- 86.1% (group 1) versus 35.3% (group 2)

For long term follow-up:- 30% (group 1) versus 0% (group 2)

Conclusions: There is a discrepancy of post-operative management of THR in fracture NOF as compared to the THR in elective patients.

We advocate a robust integrated care pathway to this subgroup of patients to address the inequalities.

THE SWINDON HIP COMPLEXITY SCORE VALIDATION

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Introduction: We developed a four-group simple hip fracture complexity score at The Great Western Hospital Swindon and have published the study. The Aim was to stratify patient care according to physiologic and anatomic parameters. Mortality has shown to correlate with complexity. We do not know if this can be off use nationally to help differentiate between hospitals performance fairly within the National Hip Database. Some hospitals may have higher mortality due to a higher incidence of complex patients, rather than poor performance.

Our Objective is to test the external validity of the hip fracture scoring system by conducting a study at the University Hospitals of Leicester.

Materials and methods: A total of 354 consecutive Hip fracture patients admitted to the Leicester Royal Infirmary were classified retrospectively according to the Hip Complexity Classification. Outcomes include; age, sex, mini mental test scores, ASA grade, length of Hospital stay, 30-day and 1-year mortality rates. Outcome measures were gathered from prospective data submitted to National Hip Fracture database. Results were then compared with a cohort of 273 patients admitted at The Great Western Hospital. A logistic regression analysis will then be run onto the Swindon cohort to see if there is a predictive value.

Results: For the 30-day mortality, age and complexity were the most significant variables. As regards the 1-year-mortality: age, sex and complexity were found to be most significant. Data has been found to be correlating to the scoring system in both hospitals and two formulas have been constructed to predict mortality risk.

Conclusions: The Swindon Hip Complexity score is a valid score that can help predict mortality and fairly differentiate between hospitals performance.

A SYSTEMATIC REVIEW OF PAIN ASSESSMENT AND ANALGESIA IN PATIENTS WITH COGNITIVE IMPAIRMENT AND NECK OF FEMUR FRACTURES

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Introduction: The estimated number of hip fractures in the UK is 70,000-75,000 per annum (1). This costs the National Health Service around £2 billion (1). Up to 30% of these patients also suffer from dementia or cognitive impairment (2). Very little is known about the optimal pain assessment tool and the management of pain in these patients.

Objectives: We undertook a systematic review to identify how the assessment of pain in these patients could be improved and how modality of treatment could be optimised.

Methods: We conducted a systematic review following the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) (3), using PubMed, OVID, EMBASE and the Cochrane Register of Controlled Trials (CENTRAL).

Results: The systematic review conducted by searching key words produced 24 results of which only 8 were specific to hip fracture. 1 paper was excluded as this was an opinion article and published in a non-peer reviewed periodical. Analysis of the other 7 papers showed two were level I evidence, one was level II evidence and four were level III evidence. The commonest pain assessment tools for use in the cognitively impaired included the DOLop-lus-2, Abbey Pain and PAIN-AD tools, utilising non-verbal and physiological parameters to assess pain.

Conclusions: There is poor evidence in the literature to recommend a specific pain assessment tool in patients with cognitive impairment. Evidence on the optimal pain management in such patients following hip fracture remains limited. Further research in this patient population is required to identify the optimum pain assessment tool and analgesia to be administered.

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30 DAY READMISSION RATE OF PATIENTS MANAGED FOR NECK OF FEMUR FRACTURE; A POPULATION BASED TOOL FOR TARGETED LONG TERM MANAGEMENT

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Introduction: Out-come based measure such as re-admission within 30 days of discharge is used to assess performance and promote improvement. Identifying reasons for readmission could be crucial in designing local measures in reducing avoidable causes of readmission and improve long term care of patient following discharge from hospital.

Objectives: Reduce length of stay in hospital, improve patient experience, improve discharge planning and reduce readmission.

Methods: Retrospective study of 167 patients admitted and managed for neck of femur fracture in 2013.

Results and discussion: 19 patients (11.3%) were readmitted within 30 days of discharge. The age range was 56-101 years with mean age of 78.8yrs. The mean length of hospital stay before discharge was 15 days and the mean time from discharge to readmission was 11 days. 13 patients were readmitted for reasons related to previous admission; chest infection (38%), falls (30%) and procedure related complications (23%). 79% of these patients were readmitted under the care of the medical team.

Majority of these patients were re-admitted for reasons related to previous admission. This study is different from other studies which have shown surgical complications as the main cause of readmission. Hence in this population, a good measure would be a community based management which identifies high risk patients prior to discharge and would prompt targeted follow up on discharge by multidisciplinary team in the community.

Conclusions: Re-admission rate within 30 days following surgery for neck of femur fracture is an out-come measure which can be used to design local measures to improve patient care following surgery.

ANALYSIS OF A.S.A. SCORE IN GERIATRIC HIP FRACTURES AS A PREDICTIVE FACTOR FOR COMPLICATIONS AND READMISSION IN HOSPITAL

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Hip fractures is the second cause of hospitalization in geriatric patients, and the treatment cost increased annually. American Society of Anesthesiologists (ASA) classification scheme was created to establish a scoring system for the evaluation of patients health and comorbidities before an operative procedure. Purpose of this study is to analyzed if the ASA score is predictive

factor for complication (peri-postoperative) in geriatric hip fractures and readmission in hospital

Material and methods: Between 2007 -2014 hospitalized 198 patients with an average age 85,4 years old (range 67-103 years) with hip fractures. Majorities of patients were female (72,3%). Were reviewed information including age, gender, medical comorbidities, ASA score, date of admission, date of operation, date of hospital discharge, type of operation and complications peri-postoperative. Main comorbidities which collected from patients were: hypertension, myocardial infarction, atrial fibrillation, cerebrovascular disease, chronic obstructive pulmonary disease, dialysis dependency, cancer and diabetes.

Results: ASA score were in 76 cases type II, in 91 type III, and in 31 patients type IV. In patients with ASA score II the median time to operate were 2 days, complications were minor (urinary infection) and the median days of hospitalization were 6,4. Patients with ASA score III and IV the median time to operation were 5,2 and 8,4 days, the more common complication were cutaneous ulcer, respiratory dysfunction and the median time of hospitalization were 10,4 and 13,5 days. In this groups were 3 deaths, 5 cases with pulmonary embolism and 1 cases myocardial infarction.

Conclusions: The ASA classification system show to be correlated with multiple factors that increased length to stay, delay to surgery and final cost of surgical treatment of geriatric hip fractures. Patients with a greater number of comorbidities increase the rate of postoperative complications that required more hospitalization.

A FALL IN ESTIMATED GLOMERULAR FILTRATION RATE IS A POSITIVE PREDICTIVE RISK FACTOR FOR 30 DAY MORTALITY IN FRACTURED NECK OF FEMUR PATIENTS. A RETROSPECTIVE ANALYSIS

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There is little evidence to suggest whether a percentage decrease in haemoglobin (Hb) or deterioration in renal function is a better predictor of 30-day mortality. A retrospective analysis on all hip fracture patients admitted to our Trust over the last 2 years was performed. The aim was to find a positive predictor of 30-day mortality. We reviewed the peri-operative blood tests; specifically the Hb and estimated Glomerular Filtration Rate (eGFR) at pre op and day 1, whilst investigating the deaths further via the Global Trigger Tool analysis.

Over this two year period, 616 patients were admitted to our unit (Male 28%; Female 72%, age range 63-106, median age 88), with a 30-day mortality of 13% (80 patients). Seven patients were excluded because they died pre-operatively. Conventionally, a fall in Hb by 25% or to below 100g/L should be significant. Analysis of eGFR was performed for comparison.

17% of the deaths had a greater than 25% decrease in Hb at day 1. However, so did 20% of the survivors. Furthermore 50% of the deaths had post-operative Hb of less than 100g/L, compared to 53% of the survivors. Further analysis showed 23% of patients who died had an Hb of less than 90g/L, as did 25% of the survivors.

Importantly we found that 20% of the deaths had at least a 25% fall in eGFR whereas only 14% of the survivors had the same recorded decrease in eGFR. There was an overall average fall in eGFR of 7.4% in the mortalities, but only a 2.4% fall in the surviving group.

We understand there are various confounding factors which affect mortality, but in conclusion, the change in renal function is a more sensitive and specific indicator of 30 day mortality from day 1 post operatively than the Hb level in patients with a neck of femur fracture.

HIP FRACTURES AND ANTICOAGULATION: THE EFFECTIVENESS OF WARFARIN REVERSAL

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Introduction: Prompt surgery significantly reduces mortality associated with hip fracture however anticoagulation problems are often the source of surgical delay. Early administration of Vitamin K reverses the effect of warfarin and reduces delay.

Objectives: To re-audit the effectiveness of warfarin reversal in hip fracture patients on anticoagulation.

Methods: 251 hip fracture patients at our hospital during 2013 were identified. 14 patients were on warfarin anticoagulation. Initial INR, Vitamin K administration and timing of surgery were recorded and compared with previous audit. Audit standards were (1) if INR >1.6, administer 10 mg IV Vitamin K, and (2) NOF patients should be operated on within 36 hours of admission.

Results: No patient had INR <1.6 on admission, mean INR 2.77 (s.d 1.14). 3 patients were medically unfit for surgery for reasons unrelated to coagulation and were excluded. 90% were correctly reversed using Vitamin K (38% in 2011) and 90% were operated on within 36 hours. No patient had surgery delayed because INR was not in range. Average time to theatre from admission was 18hrs (45hrs in 2011).

Conclusions: Compliance with guidelines has improved with reduced time to operation and hospital stay. Trust-wide, this implementation equates to a saving of approximately 47 bed days per year, costing £11,408. In addition, for meeting the 36hr surgical deadline, the Trust stands to gain £1,335 per patient in Best Practice Tariff rewards from the Department of Health's initiative, equating to over £900,000 in 2013. The implementation of these guidelines therefore delivers considerable savings whilst saving significantly more lives.

PROSPECTIVE STUDY OF A NEW DUAL MOBILITY CUP MODEL: COMPARISON OF SURVEY AND EFFICACY WITHIN DEGENERATIVE CASES AND FRACTURES USING TOTAL HIP ARTHROPLASTY WITH DUAL MOBILITY CUP

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Introduction: Dislocation continues to be a major and early complication of Total Hip Arthroplasty (THA), especially for elderly patients and after neck fracture. In British National Register 2012, risk of revision for instability for uncemented THA is 1.37% during first year, independently of closed reductions. In 2010 Swedish register, 35% of revisions during first year after implantation are due to instability. More specially, published studies have found that three-quarter of hip dislocation occur within one year of the procedure. Mortality rate is also directly depending of dislocations: 8% during first year and 16% in case of dislocation (French Orthopaedic Society data).

Objectives: Dual mobility cups (DMC) were first introduced in France 40 years ago. First results confirmed efficacy against instability (rate <2%). We wanted

to evaluate specific efficacy of the latest generation of DMC in preventing early dislocation in both situations, degenerative disease and neck fracture.

Methods: A DMC with a spherical shape without cylindrical extension beyond his equator was implanted in 634 THA by 6 different surgeons at 4 facilities for arthritis, necrosis (group 1, 551 hips) or fractures (group 2, 83 hips) between May 2012 and December 2013. Results were analysed as a prospective, continuous and multicentre study.

Results: At last follow up (min 16 months, max 2 years), survival rate was 99,3% in group 1 and 100% for THA after neck fracture. There were one acetabular component revision (groin pain) and one bipolar revision (infection) in group 1, but none dislocation. Only one dislocation occurred in second group, without any other complication. Mortality rate was 0% for group 1 and 12,5% for group 2 at mean follow up (18 months).

Conclusions: Latest generation DMC has confirmed its efficacy against THA instability and improved results of first generation ones; its use for neck fracture is a good option to decrease dislocation rate and mortality risk.

UNUSUAL COMPLICATIONS FOLLOWING TOTAL HIP REPLACEMENT

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Introduction: There are few early and late complications following THR like infections, dislocations, intraoperative or postoperative fractures of the femur, sciatic nerve injuries, vascular complications etc. This is a presentation of some unusual complications of this procedure.

Patients: During the years 1995-2014, among a series of successive 1,200 patients some of them operated elsewhere, we had 1.3% of loosening 1.2% of dislocations, 1% of periprosthetic fracture and 0.5% of infections. However, during that time we observed also some unusual cases of complications, such as iatrogenic femoral stem penetration of the femur (1 case), complete migration with dislocation of the femoral stem out of the canal (1 case), break of the femoral stem (2 cases), Girdlestone's operation due to persistent THR infection followed by periprosthetic fracture of the femur (1 case), a second periprosthetic fracture of the femur (3 cases) and marked protrusion of the implants in the pelvis (1 case).

Results: All of these patients were operated upon except the last case with either THR revisions or fixation of the fractures, with satisfactory results.

Conclusions: There are some unusual complications following hip arthroplasty. Meticulous planning and careful performance are essential during primary THR in order to prevent dislocations, infections, intraoperative stem penetration or intraoperative periprosthetic fractures.