

## CONGRESS PROCEEDINGS

# 64<sup>th</sup> South African Orthopaedic Congress 2018

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## ABSTRACTS

### Paper 2

#### *Orthopaedic surgeon density in South Africa*

AJ Dell, S Gray, R Fraser, M Held, R Dunn

*Background:* In the era of Global Surgery, there are limited data regarding the available surgical workforce in South Africa.

*Methods:* This aim of this study was to determine the orthopaedic surgeon density in South Africa. This involved a quantitative descriptive analysis of all registered specialist orthopaedic surgeons in South Africa.

*Results:* The results showed 1.63 orthopaedic surgeons per 100 000 population. The vast majority were male (95%) with under two-thirds (65%) being under the age of 55 years. The majority

of the orthopaedic surgeons were found in Gauteng, followed by the Western Cape and Kwa-Zulu Natal. The majority of specialists reportedly worked either full or part-time in the private sector (95%) and the orthopaedic surgeon density per uninsured population (0.36) was far below that of the private sector (8.3).

*Conclusion:* Interprovincial differences as well as intersectoral differences were marked indicating geographic and socioeconomic maldistribution of orthopaedic surgeons. This parallels previous studies which looked at other surgical sub-disciplines in South Africa. Addressing this maldistribution requires concerted efforts to expand public sector specialist posts as well as quantifying the burden of orthopaedic disease in both private and public sectors before recommendations can be made regarding workforce allocation in the future.

### Paper 5

#### *Assessment of the reliability and reproducibility of the Langenskiöld classification in Blount's disease*

J du Plessis, G Firth

*Background:* The Langenskiöld classification is the most commonly utilised classification system for the radiological features of Blount's disease. Although there is only a single study on the inter-observer variability and none found on the intra-observer variability, it is commonly used for prognostication and guiding management decisions. The aim of this study was to determine the reliability and reproducibility of the Langenskiöld classification.

*Methods:* A retrospective review of radiographs was done of patients treated for infantile and juvenile Blount's disease at Chris Hani Baragwanath Academic Hospital from 2006 to 2016. There were 70 radiographs of acceptable quality which were reviewed and staged on two occasions according to the Langenskiöld classification by three orthopaedic surgery consultants and three orthopaedic surgery senior registrars. Pearson correlation

coefficients, percentage agreements and Kappa statistics were used to evaluate both the reliability and reproducibility.

*Results:* Of the 70 images staged only two (2.9%) were staged the same by all six observers, and 20 (28.6%) images differed by a single stage. The consultants had 17 (24.3%) images staged the same whereas the registrars had 12 (17.1%) images staged the same. The overall Kappa ( $\kappa$ ) for all six observers showed a fair agreement at  $\kappa$ -value 0.24. Again the consultants had a higher  $\kappa$ -value compared to registrars at 0.25 to 0.24 respectively. The Pearson correlation showed higher agreement of 0.54 indicating a moderate agreement. The reproducibility amongst all observers was also fair with a  $\kappa$ -value of 0.38 overall, again with the consultants higher than the registrars at 0.48 compared to 0.26.

*Conclusion:* There was only a fair overall reliability and reproducibility amongst the six observers, with the consultants consistently more reliable and with higher reproducibility than the registrars. We recommend the Langenskiöld classification be used with caution when being used for prognostication and management planning as well as when interpreting any research relying on this classification.

## Paper 6

### *The accuracy of pre-operative digital templating in uncemented total hip arthroplasty: a single-centre retrospective review*

**KR Wiese**, FW Kock, CA Blake, T Franken

**Background:** Total hip arthroplasty (THA) is considered one of the most successful surgical procedures in modern medicine. Goals include pain relief, functional improvement, and restoration of normal hip biomechanics. Pre-operative templating is a useful tool to aid surgeons in theatre in the choice and size of implant to use so that adequate restoration of hip biomechanics occurs.

The study aims to compare the implant sizes inserted during uncemented total hip arthroplasty done at a district orthopaedic unit from 2016 to 2017 with the computer-based templated sizes determined pre-operatively.

**Methods:** A descriptive retrospective study was conducted on all patients who received elective uncemented THA. Operation reports

and radiographs were reviewed. Standard anteroposterior (AP) view of the pelvis and proximal femur were taken pre-operatively and used for templating. The medical officer or consultant who was responsible for the patient carried out templating during the pre-operative ward round. The intra-operative cup and stem size was noted and compared to the pre-operative templated radiographs saved on Impax Orthopaedic Tools. The regional university granted ethics approval.

**Results:** 56 participants were included (30 females, 26 males), with a mean age of 55.5 years. In 71.4% (n=40; p<0.001) there was a difference  $\pm 1$  implant size between the templated cup size and the actual cup size used. In 78.6% (n=44; p<0.001) there was a difference  $\pm 1$  implant size between the templated stem size and the actual stem size used.

**Conclusion:** The results of the study are promising with over 70% of the participants having a cup or stem size inserted that was  $\pm 1$  implant size templated. Templating is an accurate tool to guide inexperienced surgeons with implant sizing. We hope to progress to a stage that only the required sized implants need to be ordered, resulting in lower transport and admin costs.

## Paper 9

### *Efficacy of periarticular local anaesthetic blocks in total knee arthroplasty- a move towards the simplification and standardization of peri-articular infiltration*

**M van Heukelum**, C Blake, G Gobetz, T Franken, N Ferreira, M Burger

**Background:** Peri-articular injections (PAI) in total knee arthroplasty offer affective analgesia, are cost effective, safe and easy to perform. Currently there is no prescribed technique in performing the infiltration; this is highlighted by the significant heterogeneity in the literature surrounding PAI. This study aims to investigate the effectiveness of the technique and contribute towards the simplification and standardization of PAI.

**Methods:** A double blind randomized control trial compared the effectiveness of PAI with a simple anaesthetic solution (bupivacaine and adrenalin) to a normal saline control group. Infiltration volumes were calculated at 1ml/kg and the infiltration technique followed a specific protocol.

Post-operative outcomes included Visual Analogue Scores, ambulation scores, morphine use, knee range of motion and time to discharge.

**Results:** Two comparable groups of 26 patients each were included (intervention: 80.7% female, mean age 64.73  $\pm$  8.80 years vs control: 65.38% female, mean age 67.03  $\pm$  7.60 years). No difference of VAS scores was noted at 24 and 72 hours. Mean VAS scores at 48 hours were significantly lower in the intervention group. (VAS score 3.0  $\pm$  1.60 vs 4.14  $\pm$  1.23, p=0.013). The other parameters measured strongly favoured the intervention group but did not prove to be significant.

**Conclusions:** A simplified dose per kilogram peri-articular injection protocol provides a significant reduction in VAS scores at 48h hours after total knee arthroplasty. This study contributes towards the simplification and standardization of the peri-articular infiltration technique

## Paper 11

### *Partial versus total knee replacement for isolated patello-femoral arthritis: no functional difference at a minimum 8 years follow up*

**RJ Immelman**, ND Clement, T Howard, D Macdonald, JT Patton, G Lawson, R Burnett

**Background:** The primary aim of this study was to compare the midterm knee specific functional outcome of partial compared with total knee replacement (TKR) for the management of patellofemoral osteoarthritis. The secondary aims were to compare length of stay (LOS), general physical and mental health improvement, patient satisfaction and implant survival between partial compared with TKR.

**Patients and Methods:** Fifty-four consecutive patients undergoing an Avon patellofemoral replacement were identified retrospectively from an arthroplasty register held at the study centre. Propensity score matching for age, gender, comorbidity and pre-operative function was performed to match a cohort of 54 patients undergoing a TKR for patellofemoral osteoarthritis. LOS was recorded prospectively in the database. The Oxford knee score (OKS) and the Short Form (SF-) 12 were collected for all patients pre-operative, one year and final follow up (mean 9.2 years). Patient satisfaction was assessed at one year and final follow up. Survival of the implant was assessed, which was defined by revision or intension to revise.

**Results:** There was no significant difference in the Oxford Knee Scores (p>0.60) or SF-12 scores (p>0.28) between the groups at

one year or at final follow up. At one year there was a trend towards a higher rate of satisfaction for the Avon group (88.9% versus 81.5%,  $p=0.21$ ), however at final follow up the TKR group was significantly less likely to be satisfied with their knee (95.1% versus 78.3, odds ratio 0.18,  $p=0.03$ ). Length of stay was significantly ( $p=0.008$ ) shorter for the Avon group when compared to the TKR group (difference 1.8, 95% confidence intervals 0.4 to 3.2 days). There were five revised prostheses in the Avon group and one in the TKR group. The 5 and 10 year survival for the Avon group was 94.2% (95% CI 90.6 to 97.9) and 92.3% (95% CI 87.1 to 97.5) and

for the TKR group was 100% (95% CI 95.6 to 100) and 100% (95% CI 93.8 to 100), respectively. There was no statistical difference in the survival rate between the groups (Log Rank  $p=0.10$ ).

**Conclusions:** The Avon patellofemoral replacement for the management of end stage osteoarthritis has a functional outcome equal to that of TKR and in addition is associated with a greater rate of satisfaction and a shorter length of stay. However the benefits of the Avon need to be balanced against the increased rate of revision at 10 years when compared to TKR.

## Paper 12

### *Optimising perioperative care for hip and knee arthroplasty in South Africa: a Delphi consensus study*

**MB Nortje**, U Plenge, LC Marais, KD Jordaan, R Parker,

N van der Westhuizen, JF van der Merwe, J Marais, WV Daniels,

GL Davies, T Pretorius, C Solomon, P Ryan, AM Torborg, Z Farina,

R Smith, C Cairns, H Shan

**Background:** A structured approach to perioperative patient management based on an enhanced recovery pathway protocol facilitates early recovery and reduces morbidity in high income countries. However, in low and middle income countries (LMICs), the feasibility of implementing enhanced recovery pathways and its influence on patient outcomes is scarcely investigated. To inform similar practice in LMICs for total hip and knee arthroplasty, it is necessary to identify potential factors for inclusion in such a programme, appropriate for LMICs.

**Methods:** Applying a Delphi method, 33 stakeholders (13 arthroplasty surgeons, 12 anaesthetists and 8 physiotherapists)

from 10 state hospitals representing 4 South African provinces identified and prioritised i) risk factors associated with poor outcomes, ii) perioperative interventions to improve outcomes and iii) patient and clinical outcomes necessary to benchmark practice for patients scheduled for primary elective unilateral total hip and knee arthroplasty.

**Results:** 30 of the 33 stakeholders completed the 3 months Delphi study. The first round yielded i) 36 suggestions to preoperative risk factors, ii) 14 (preoperative), 18 (intraoperative) and 23 (postoperative) suggestions to best practices for perioperative interventions to improve outcomes and iii) 25 suggestions to important postsurgical outcomes. These items were prioritised by the group in the consecutive rounds and consensus was reached for the top ten priorities for each category.

**Conclusion:** The consensus derived risk factors, perioperative interventions and important outcomes will inform the development of a structured, perioperative multidisciplinary enhanced patient care protocol for total hip and knee arthroplasty. It is anticipated that this study will provide the construct necessary for developing pragmatic enhanced care pathways aimed at improving patient outcomes after arthroplasty in LMICs.

## Paper 13

### *Unstable ankle fractures - Is there a difference between using a locked intramedullary fixation compared to anatomically contoured plating*

**DLRHS Badenhorst**, IPS Terblanche, M Burger

**Background:** Ankle fractures represents a major proportion of orthopaedic trauma workload. The gold standard treatment is open-reduction-internal-fixation with plate-and-screws but skin complications are reported to be as high as 30%. Fibular nails are a potential alternative technique for fixation of the lateral malleolus. The aim of the study was to evaluate whether the fibula nail can be used to effectively maintain reduction of an unstable Weber B and C ankle fracture and cause less soft tissue complications.

**Methods:** All ankle fractures presenting to a tertiary referral centre were randomised into two groups: i) patients receiving plate-and-screw fixation (PG,  $n=26$ ) or ii) patients receiving intramedullary nail fixation (NG,  $n=37$ ). Post-operatively, patients were followed-up at 2-weeks, 6-weeks, 3-months, 6-months and 1-year recording measurements and functional scores. (SUN HREC S13/10/202)

**Results:** General characteristics between groups were similar ( $p>0.05$ ). The PG consisted of 84.6% (52.4% unstable syndesmosis) Weber B and 7.7% (4% unstable) Weber C vs the NG which had 56.8% (52.4% unstable) Weber B and 37.8% (81.8% unstable) Weber C fractures. The posterior malleolus were involved in 76.6% of the PG and 75.7% of the NG. The scar sizes of the PG and NG were 10cm and 1.5cm whilst operating time was  $51.7 \pm 9.2$  min and  $46.8 \pm 14.3$  min, respectively. Screening time for PG and NG 0.4min and 0.6min, respectively. A single deep infection required plate removal after union in the PG. Using the Olarud-Molander scoring system, a significant difference ( $p<0.001$ ) at 6-months post-operative with the NG having increased range-of-motion was observed.

**Conclusion:** There was an improved cosmetic outcome when comparing plating and nailing. Additionally, at 6-months post-operatively the functional outcome of the NG was significantly better than the PG. The nail proved to reduce and maintain unstable ankle fractures as well as plating does with minimal risk of post-operative infection.

## Paper 14

### Lost to follow-up: Challenges to conducting orthopaedic research in South Africa

DLRHS Badenhorst, M Burger, N Ferreira

**Background:** Loss-to-follow-up presents a major concern for treating physicians and researchers. The aim of this study was to describe potential factors contributing to the loss-to-follow-up experienced in orthopaedic patients attending the sole public orthopaedic service provider within the Northern Cape Province in South Africa.

**Methods:** Patients who underwent ankle fracture surgery at Kimberly Provincial hospital were included in this study. Demographic information of all patients that were admitted for ankle fracture surgery between January 2012 and July 2013 were captured and reviewed. (ECUFS NR 50/2012)

**Results:** Two-hundred-and-sixty-eight patients (male: n=112 (42%); female: n=156 (58%)) were included in this study between January 2012 and July 2013 after admission to Kimberly Provincial Hospital

for surgical intervention. The mean age was  $42.3 \pm 13.8$  (95% CI 40.6 – 43.9, n=266) years and the mean BMI was  $28.0 \pm 6.5$  (95% CI 27.2 – 28.8, n=251) with the BMI of females being  $30.2 \pm 6.1$  (95% CI 29.3 – 31.2, n=152) compared to the  $24.6 \pm 5.7$  (95% CI 23.4 – 25.7, n=99) of male patients. Excluding the local patients residing in Kimberly (n=77) within 5km travel distance, the mean travel distance increased to 460km, ranging from 10 – 910km. Significant associations between the number of follow-up visits attended and i) travel distance (IRR 0.999 (95% CI 0.999 – 1.000), p=0.030), ii) BMI (IRR 0.980 (95% CI 0.966 – 0.994), p=0.004) and iii) HIV status (IRR 0.841 (95% CI 0.725 – 0.975), p=0.022) were observed.

**Conclusion:** Research in the South African setting is hindered by loss to follow up in the public setting. Increased travel distance, financial constraints and lifestyle habits contribute to the complexities of follow-up. A future, multi-center approach could potentially provide an improved strategy in protocol planning to accommodate for these factors to improve our patient follow-up and related research quality.

## Paper 15

### An epidemiology of paediatric cervical spine injuries in Red Cross War Memorial Children Hospital over a 10-year period

L Noconjo, A Horn

**Background:** To characterise cervical spine injuries at level one referral centre for paediatric trauma and to report on outcome of cervical spine injuries (CSI) in paediatric patients.

**Methods:** We performed a retrospective study of cervical spine injuries in Red Cross War Memorial Children's Hospital over a 10-year period. Picture Archiving and Communication System (PACS) of our institution's radiological services was searched for patients with C-spine injuries as the diagnosis is invariably radiologically confirmed. Search terms included: C-spine fracture, subluxation, dislocation, contusion, SCIWORA. Patient demographics, date and cause of injuries, management, level of injury and outcome data was obtained from hospital records. These variables were compared for children less than 8 and more than 8 years due to anatomical, biomechanical difference.

**Results:** There were 66 children identified with CSI, overall incidence was 0.1%. The mean age of the study group was 7 (4-8.8) and 65% were females. All injuries were caused by blunt trauma and passenger MVA (52%) was the most common cause. Injuries due to physical child abuse, recreational or sporting activities did not occur. Children under 8 years of age incurred more injuries than children who were more than 8 years (74.2%, age  $\leq 8$ ; 25.7%, age  $> 8$ ). Majority of injuries occurred in the upper c-spine of children  $\leq 8$  years (98%). Of the 23 (35%) children with neurologic injury, 8 (12.1%) children had complete spinal cord injury and 3(4.5%) died. SCIWORA occurred in 6 (9%) children with variable outcome. Due to instability 10.6% children were surgically managed. An injury severity score (ISS) of 25 (13-34) was associated with poor outcome. There was a mortality rate of 4.5% and all children who died were below 8 years with injuries in upper cervical spine (C1-C4).

**Conclusion:** The majority paediatric CSI occur in upper cervical spine of children younger than 8 years. The aetiology and injury pattern are similar to reported literature. Upper cervical spine injury with closed head injury was associated with poor outcome

## Paper 16

### Talus replacement case series

DMA Abramson, G Mcollom, T Hilton, M Abramson

**Background:** There are currently no internationally accepted surgical options for complex talus trauma or tumours that offer good long term outcomes. Tibiotalar or tibiocalcaneus arthrodesis, considered the gold standard, has a reported high incidence of non-union and poor patient satisfaction.

Alternative options have been explored, including the total talus replacement. Reports in the literature have been limited to two single case reports. Both cases demonstrated encouraging early results, but due to the lack of any larger studies, it is considered a novel operation.

We wish to present the medium term results of a case series of patients who have undergone a total talus replacement.

**Methods:** We performed a retrospective review of a case series of patients that underwent total talus replacement. Cases were included with a minimum of 6 months follow up. We used the American society of foot and ankle score (AOFAS) and the short form health survey (SF-36) scoring systems as our outcome measures. We also recorded complications. We used descriptive statistics to analyse our results.

**Results:** Eight cases were included with a minimum of 6 months follow up. Median follow up was 6-36 months. No cases were excluded. Indications included complex trauma in 2, post traumatic complications in 5 and an infiltrative tumour in 1. No talus

replacement was revised during the study period. Patient reported outcome measures showed good return to function and foot and ankle scores with a low complication rate.

**Conclusion:** Total talus replacement shows encouraging medium term results in a variety of indications with an acceptable rate of complications. Longevity and long term function is yet to be established.

## Paper 17

### *Prevalence of a post-operative troponin leak in patients with cardiac risk factors undergoing knee and hip arthroplasty in a South African Population*

**RD Van Zyl**, MC Burger, JD Jordaan

**Background:** Determining the prevalence of a post-operative troponin leak in patients with different cardiac risk factors undergoing hip- or knee arthroplasty and investigating differences in Troponin T levels between co-morbidities and different types of arthroplasty i.e. Total Hip Replacement (THR), Total Knee Replacement (TKR), and Neck of Femur Fracture Hip Replacement (NOFHR)

**Methods:** A prospective, cross-sectional study of patients with  $\geq 1$  cardiac risk factor, undergoing replacement surgery and treated at a Tertiary Academic Hospital in South Africa from October 2017 – April 2018 conducted.

Troponin T levels of all included patients were recorded on day one and three post-surgery using a highly sensitive cardiac Troponin T assay (cTnT-hs). A level of  $> 15\text{ng/L}$  is considered abnormal and termed a Positive Troponin leak and  $>100\text{ng/l}$  is suspected in Acute Coronary Syndrome (A.C.S.)

(SUN HREC S17/02/042)

**Results:** One-hundred-and-sixty-two patients (n=68 THR; n=55 NOFHR; n=39 TKR) were included. Sixty-eight patients (42%) recorded a positive Troponin Leak of which six cases had a suspected A.C.S. The highest prevalence was recorded in NOFHR (62%) followed by TKR (46%) and THR (24%)

**Conclusion:** Many patients undergoing arthroplasty surgery have multiple co-morbidities putting them at risk for Myocardial Injury after non-cardiac surgery (MINS). MINS is often a silent event estimated at 40% internationally which, with a 4-times raised morbidity and mortality risk, carries a poor prognosis at 30-days, 6-months and 1-year post-surgery. Post-operative Troponin testing, a cost effective measure, is imperative to diagnose MINS, subsequently increasing early detection, medical optimisation, referral and prevention strategies.

There is currently no published data on MINS prevalence in orthopaedic specific patients in South Africa. Our finding of 42% positive Troponin leaks raises awareness and we recommend routine post-operative Troponin T testing for arthroplasty units in South Africa.

## Paper 18

### *Outcomes of open reduction internal fixation of femoral neck fractures: A three-year audit at Central Academic Hospital*

**G Pienaar**, K Jordaan, M Burger

**Background:** Femoral neck fractures, resulting from low or high-energy trauma, are common in patients of all ages. Open reduction and internal fixation (ORIF) is the treatment of choice for younger patients. In elderly patients, ORIF is only considered in stable fracture patterns. The primary purpose of our audit is to evaluate the cohort of femoral neck fractures treated with an ORIF at our hospital and compare our outcomes and complications with what is available in the literature.

**Methods:** A retrospective audit was done of all adult patients with femoral neck fractures treated with an ORIF at a single academic hospital from January 2015 to December 2017. Data captured was: demographics, mechanism of injury, time to admission and

surgery, type of fixation constructs, complications and re-operation rate. Ethics Reference #: N18/03/029

**Results:** A total of 108 patients (69 males and 39 females), with a mean age of 53 years (range 19–95) were included. Of these, 45 patients (42%) sustained a high velocity injury, with 63 (58%) sustaining low velocity injuries. Average time from injury to admission was 58 hours, with average time to surgery being 81 hours. Cannulated hip screws were used in 41 patients (38%), with Dynamic Hip Screws in 65 patients (60%) and 2 (2%) cephalomedullary nails. A total of 56 patients (52%) achieved union, 17 patients (16%) complicated by failure and 35 patients (32%) were lost to follow up.

**Conclusion:** There are no published studies describing the burden of femoral neck fractures and the outcomes of treatment in South Africa. Multiple surgical fixation techniques were used to treat different age group patients and pathology and subsequently, treatment protocols and modalities varies substantially. We report a high rate of complications in our patients, but it remains comparable with international data.

## Paper 19

### *Proximal fibular resections for primary bone tumours: Functional results of a case series*

**KR Wiese**, V Boskovic, K Hosking, T Hilton

**Background:** Resection of aggressive benign or malignant tumours of the proximal fibula are difficult due the high number

of surrounding anatomical compartments and close association with many important neurovascular and functional structures. For the same reasons malignant tumours behave differently in this area. Before the 1980's results were poor. With the introduction of neo-adjuvant chemotherapy and limb salvage surgery, Malawer described a technique of local en bloc resection. This study presents the oncological and functional results of a case series using this technique.

**Methods:** A retrospective folder review of fourteen patients was done. Six patients with a large active, an aggressive benign or a low grade malignant tumour had a Malawer type I marginal resection and eight patients with a stage IIB malignant sarcoma had a Malawer type II wide intracompartmental resection sacrificing the common peroneal nerve. The follow-up at a mean of 48 months included the imaging, histology and a functional MSTS score.

**Results:** The median age of the type I resections was 42 years, giant cell tumour was the commonest tumour (50%) and the median functional MSTS score at follow-up was 29. The median age of the type II resections was 12 years, osteoblastic osteosarcoma was the commonest tumour (75%) and the median functional MSTS

score was 26. All type II resections achieved clear margins at the initial surgery and there were no recurrences or metastases in both groups. There were no wound complications and no vascular complications in spite of sacrificing the tibialis anterior artery in some type I and all type II resections and the peroneal artery in type II resections. No patient complained of knee instability. The main functional impairment was due to loss of common peroneal function which required an AFO in some patients and a tibialis tendon transfer in one patient.

**Conclusions:** Resection of benign and malignant tumours of the proximal fibula achieved good cure rates and functional results, despite the sacrifice of the common peroneal nerve.

## Paper 20

### *Wear patterns of medial and lateral compartments in the knee*

**CR Oosthuizen**

**Background:** The degenerative knee presents to the clinician at a specific stage with pain, deformity and loss of function being the dominant symptoms and signs. The stage varies in any patient cohort and thus the need to evaluate the constitutional degenerative wear pattern and stage of wear to consider the treatment modality. Various authors researching the partial knee replacement evaluated the tibia wear pattern. This was necessary to determine whether the knee suitable for Unicompartmental knee arthroplasty (UKA) presents with a focal or a pre-determined tri-compartmental progressive disease. The research concluded that the constitutional wear pattern will continue after the definitive arthroplasty as the erosion repeated itself when the fixed bearing wear surfaces were compared with the initial wear erosion. Constitutional alignment or misalignment can impact on progression of Osteoarthritis (OA) if a moderate Kellgren & Lawrence grade III wear is evident as this increases the loading force on damaged areas.

**Aims and Objectives:** To assess the wear patterns found on the tibia resection in PKA.

**Methods:** The resected tibial specimens of 1597 partial knees were evaluated when harvested from unicompartmental knee operations. The specimens were photographed by the pathologist and filed. 1366 medial and 231 lateral plateaus. The tibial plateau surface was divided in three sections and the dominant wear area assessed and charted. The medial partial knee wear patterns were then compared with the lateral wear patterns.

**Results:** The medial wear area is predominantly anterior and central (92%) with 5.7% incidence of posterior wear. The lateral wear area is predominantly central and posterior (93.1%) with 5.6% incidence of anterior wear.

**Conclusion:** The anterior-medial wear pattern is the inverse of the posterior-lateral wear pattern. Posterior wear was found with an intact ACL.

## Paper 21

### *The results of anterior cruciate ligament (ACL) reconstruction and unicompartmental knee arthroplasty (UKA)*

**CR Oosthuizen**

**Background:** A Comparison of UKA without ACL Reconstruction, UKA with ACL Reconstruction and Bicondylar UKA according to the Oxford Knee scoring method

**Methods:** The study reviewed a total of 1629 UKA cases over 217 months (2000-2018).

UKA with ACL Reconstruction accounted for 1.7% (n=28) over a period of 141 months and Bicondylar UKA with/without ACL Reconstruction accounted for 0.37% (n=6) over 35 months.

**Results:** 1595 UKA cases with average age of 65 at the time of the operation. Majority of 51.7% females (n=825) at average age

65 and 48.3% males (n=770) at average age of 65. The average Oxford knee score increased from 21 at Pre-Operation to 40 after 4 months Post-Operative. 28 ACL Reconstruction cases with average age of 56 at the time of the operation. Majority 85.7% males (n=24) at average age 56 and 14.3% females (n=4) at average age of 55. The average Oxford knee score increased from 28 at Pre-Operation to 41 after 4 months Post-Operative. 4 Bicondylar UKA cases with ACL reconstruction with average age of 53 at the time of the operation, consisted of only males. 2 Bicondylar UKA cases without ACL reconstruction with average age of 58 at the time of the operation also consisted of only males. The average Oxford knee score increased from 26 at Pre-Operation to 40 after 4 months Post-Operative.

**Conclusion:** The Oxford knee scoring for ACL reconstruction as well as Bicondylar arthroplasty with/without ACL reconstruction had similar improvement from Pre-Operation to Post-Operative than the UKA as indicated above.

## Paper 22

### Validation of KOGS (Knee Osteoarthritis Grading System)

CR Oosthuizen

**Background:** The Knee Osteoarthritis Grading System (KOGS) is a newly developed x-ray based tool to evaluate the knee for specific arthroplasty surgery.

The presented x-ray assessment is to improve the decision when arthroplasty is considered and distinguish between the need for Partial Knee Arthroplasty (PKA) or Total Knee Arthroplasty (TKA).

**Objectives:** To classify and differentiate knee degeneration suitable for arthroplasty.

To determine the efficacy of the newly developed x-ray based tool.

**Methods:** The efficacy of KOGS was validated by independent practitioners.

A cohort of complete pre-operative X-Ray sequences of post-surgical knees was compiled. Cases where desired sequences of X-rays were not available were not included. X-ray sequence method based on standard pre-operative X-rays (6 views): AP and Lateral knee views and 30° Skyline patella view, 15° (medial OA) and 45° (lateral OA) Rosenberg/Lyon views and Stress views in 20° of flexion. The X-ray sequences were produced as routine requirement at a single radiological facility with no involvement by clinician. The set of X-rays per case were anonymised and presented to selected Orthopaedic Surgeons to assess (evaluate).

**Results:** The evaluator's KOGS assessment is compared to the actual arthroplasty performed by the clinician.

**Conclusion:** The comparison establishes the validity of KOGS and whether KOGS as a grading system can suggest the suitable arthroplasty.

## Paper 23

### Management of acetabular bone loss following infected osteosynthesis

I Swart, J van der Merwe

**Background:** Deep infection following ORIF of an acetabular fracture is a rare but devastating complication.

Aggressive debridement of dead bone and removal of infected hardware is the best treatment option and can lead to extensive peri-articular bone loss.

**Methods:** A retrospective descriptive study was done to describe five such patients, successfully treated with a two-stage procedure.

The final reconstruction made use of the TMARS (Trabecular Metal Acetabular Revision System) (Zimmer Biomed) for the acetabular reconstruction part of the total hip replacement.

**Results:** There were 3 males and 2 females treated from 2011 – 2016. All five patients presented with extensive posterior segmental acetabular defects (Paprosky type 3A) and required the use of Augment Buttress Plates screwed onto the Ilium and TMT revision shell. Follow up period is 6 months to 6 years.

Preoperative Harris Hip score showed an average of 39.1 compared to 74.3 at the follow up.

No further clinical, biochemistry or x ray evidence was found to indicate recurrent infection or loosening.

**Conclusion:** Although this is a small series of patients, it is unique in the literature and describes a successful treatment option for such a complex problem.

## Paper 24

### The reuse of circular external fixator components: an assessment of safety and potential savings

SS Swanepoel, M Held, M Laubscher

**Background:** To determine the cost saving and mechanical failure associated with the reuse of circular external fixation components.

**Methods:** A retrospective review of a prospectively collected database was undertaken to identify all adult patients treated with ring fixators between January and December 2017. The indications for and average duration of external fixation was determined for each patient. The cost of each frame was calculated from the company invoice for the new components used. Cost saving was calculated as the difference between the price for a complete new frame and the amount invoiced for the new components only in

a re-used frame. We also determined mechanical failure events associated with the reuse of these components.

**Results:** A total of 34 lower extremity circular frames were applied during the study period. The average duration of external fixation was 36 weeks. The cost of an all new component external fixator frame was R56 000 during the study period. Using re-used components led to a significant cost saving of R34 000 per case. No mechanical failure of any of the re-used components occurred during this study.

**Conclusion:** The majority of circular external fixators are used for an extended period of time. Given the considerable expense associated with new external fixation frame components, the practice of reusing external fixators components is safe and resulted in significant cost saving to our institution and should be supported.

## Paper 25

### *Water wise hand preparation: The true impact of our practice*

**MSW Potgieter**, M Burger, A Ikram, A Faisal

**Background:** The Western Cape is experiencing the worst drought in decades. Considering the low dam levels and little rain fall, every possible method of water saving must be applied. We investigated water usage during scrubbing for surgical procedures and possible interventions to reduce water consumption.

**Aim:** Determine water consumption during scrubbing procedures and the effect of easy-to-implement, cost effective yet efficient ways to reduce water usage during scrubbing. Secondary aims include: gaining insight into the surgeons' knowledge of water use/saving methods and their experience of water saving strategies.

**Methods:** a two-phase observational study was performed on Orthopaedic theatre personnel scrubbing for theatre cases at our institution. Phase one evaluated standard practice to establish a control group. Phase two implemented three water reducing

strategies. Group A) adjusted tap levers to improve tap control; Group B) an assistant to open and close tap during preparation; and Group C) alcohol-only-preparation. Total water usage and time at basin was recorded for each scrub. Participants completed a questionnaire to establish their experience of the various preparation techniques. Approval was obtained from our Hospital and Ethical Board.

**Results:** The control group used a mean 5,64 L/scrub (N=36; SD=1.79) at a mean flow rate of 2.19ltr/min(SD=0.89). Significantly lower water usage per scrub(P=0.00015) and lower flow rates (P=0.000158) were recorded for Group A(N=12;1.93ltrs@0.73l/min) and group B(N=13;2.29ltr@1.36l/min). The lowest total water consumption recorded in Group C (N=18; < 2.9ltr per case). Eight(8/10) participants claimed to be aware of WHO guidelines for hand preparation in water scarce environments, yet only one(1/10) routinely used an alcohol-only hand preparation technique

**Conclusion:** Water use for surgical hand preparation can be significantly reduced by implementing simple cost effective measures. This study strongly recommends intermittent tap closure or alcohol based scrubs for hand preparation.

## Paper 26

### *The relationship of the radial line to the capitellum in normal paediatric elbows*

**F Omojowo**, A Robertson, D Simmons

**Background:** The radiocapitellar line (RCL) is a vital tool routinely used in the evaluation of the elbow, however the line has never been validated in young children.

**Aim:** To establish the relationship of the radial line to the capitellum in normal paediatric elbows and to determine if the RCL can be reliably applied in the paediatric population.

**Methods:** The radial line was drawn through the neck and shaft of the radius on AP and lateral x-rays of normal paediatric elbows. The x-rays were assessed in two age groups; Group 1 (two to six years) and Group 2 ( seven to fourteen years). The capitellum

was divided into the middle third, outer two-thirds and outside the capitellum. The part of the capitellum intersected by the RCL was documented.

**Results:** X-rays of 122 patients were assessed with 61 in Group 1 and 61 in Group 2 .Of the total population, 277 of 488 RCLs (57%) bisected the middle third of the capitellum, with no statistical difference in the number of RCLs bisecting the middle third in both age groups ( $p=1.00$ ). The radial neck line on the lateral view showed the most consistency. In Group 1, the radial neck line on the lateral x-ray was the most accurate with 77% bisecting the middle third. In Group 2, the radial neck line was the most accurate on lateral neck x-ray with 98.4% bisecting the middle third.

**Conclusion:** There is no difference in the accuracy of lines between the two age subgroups with the radial neck line being more accurate than the radial shaft line. The results suggest that the line is reliable in children but both the AP and lateral view must be assessed.

## Paper 27

### *The outcome of first metatarsophalangeal joint arthrodesis using a locking plate: A retrospective clinical audit at a private orthopaedic practice in Pretoria*

**JG Meijer**, P Greyling, C Gräbe

**Background:** Arthrodesis of the first metatarsophalangeal joint is a relatively common and frequently performed procedure in the practice of foot and ankle surgery and has a multitude of indications. The preferred surgical technique has constantly changed in the past and is currently still evolving. One of the surgical techniques described to fuse the first metatarsophalangeal joint includes the use of a dorsal locking plate. The aim of this study was to assess the outcome of arthrodesis of the first metatarsophalangeal joint using a dorsal locking plate system.

**Methods:** We performed a retrospective clinical audit at a private orthopaedic practice in Pretoria. All patients who had a first

metatarsophalangeal joint arthrodesis with an Acumed® locking plate system between 2010 and 2016 were identified. Hallux valgus and dorsiflexion angles were measured on standing antero-posterior and lateral x-rays of the foot before surgery and compared to measurements taken on x-rays done 6 weeks after surgery. X-rays taken 6 months after surgery were assessed for any radiological evidence of non-union. An American Orthopaedic Foot and Ankle Society (AOFAS) score was calculated for each patient before surgery and 1 year after surgery.

**Results:** We identified 115 patients (133 feet) who underwent arthrodesis of the first metatarsophalangeal joint with a locking plate. An observed rate of non-union of less than 2% at 6 months after surgery was recorded. The hallux valgus and dorsiflexion angles as well as the AOFAS score also showed statistically significant improvement after this procedure.

**Conclusion:** The results of this retrospective study suggest that an overall positive outcome can be expected when fusing the first metatarsophalangeal joint with the use of a locking plate system.

## Paper 31

### *The use of tourniquets during total knee replacements. A review of the literature*

**D van der Jagt, R Immelman**

**Background:** The use of tourniquets during total knee replacements remains controversial. We reviewed the literature to determine whether it is advantageous or not to use a tourniquet during a knee replacement.

**Methods:** We searched the Pubmed, Medline and Cochrane databases for appropriate articles. The PRISMA guidelines were followed to ensure only high quality studies were included.

**Results:** We determined that there was no difference in transfusion

rates if a tourniquet was used or not. There is a higher rate of deep venous thrombosis with the use of tourniquets. Tourniquet use may lead to a very transient muscle damage which recovers within hours. KOOS scores and ROM were significantly better for 8 weeks post-operatively when tourniquets were not used, and patients where tourniquets were used required more analgesics. This may benefit programs with rapid discharge protocols. Several studies questioned the accepted benefit of better visualization and improved cement interdigitation when a tourniquet is used.

**Conclusion:** We concluded that the current literature does not favour the use or not of tourniquets in TKA's. The use of tourniquets is safe, but there does seem to be some short-term benefits to not using tourniquets in TKA's.

## Paper 32

### *Intramedullary nailing of tibial non-unions not previously treated with a nail using the suprapatellar approach*

**NHS Botma, M Held, S Graham, M Laubscher**

**Background:** The incidence of tibial non-unions had been reported to be between 4-48% following tibial shaft fractures. Various treatment options are available for the treatment of non-unions. For non-unions with a tibial nail in situ, an exchange nail is the treatment of choice if not septic. For non-unions following other treatment modalities, the current treatment trend includes an application of a ring fixator with or without bone grafting and a fibula osteotomy. Although very good results have been achieved with the application of ring fixators, it is not always well tolerated by the patient. The suprapatellar approach is a recent variation of the traditional infra-patellar approach for the insertion of a tibial nail. It allows insertion of the nail with the leg held in extension.

This enables easier correction of malalignment in the sagittal and coronal planes.

**Methods:** We retrospectively reviewed all cases of non-union of the tibial shaft treated between May 2016 and January 2018. Cases were included that were managed with a suprapatellar tibial nail, not previously managed with a nail and without active sepsis at time of intervention. Cases were followed up to assess rate and time to union and the incidence of complications.

**Results:** Twelve cases were included. No cases were lost to follow up. We achieved a high rate of union. Two patients developed complications, although the treatment aim (union) was still achieved.

All cases were performed close, without opening of the non-union site.

**Conclusion:** A tibial nail, inserted using the suprapatellar approach, is an acceptable management option for tibial non-unions, not previously managed with a nail.

## Paper 34

### *Incidence of spinal deformity, level of pain and physical status in adults with cerebral palsy and spastic diplegia*

**E Britz, RP Lamberts, SI Dix-Peek, AG Fieggen, NG Langerak**

**Background:** The aim of this study was to determine the incidence of spinal deformities (scoliosis, hyperkyphosis, hyperlordosis and spondylolisthesis), pain (location, frequency and influence on daily life) and the physical status of the lower extremities in adults with spastic diplegic Cerebral Palsy (CP), who had multiple orthopaedic surgeries, with the first surgery more than 15 years before.

**Methods:** Thirty adults (18 females) with spastic diplegic CP were recruited for this study (HREC no: N10/05/181). All participants were assessed by an orthopaedic surgeon (SD) and a physiotherapist (NL). In addition to the consult and physical exam, spinal x-rays were taken and participants completed the Oswestry Disability Index (ODI) questionnaire.

**Results:** The median time after the first orthopaedic intervention was 27 years (IQR: 21-33years). X-rays revealed that 31% (28% mild; 3% severe) of the participants had a scoliosis, 7% had a thoracic hyperkyphosis, 17% had a lumbar hyperlordosis, while in 3% of the patients a spondylolisthesis was found. Three-quarters of the patients reported back pain, however, based on the ODI, 77% indicated that this led to only 'minimal disability', while 6% reported 'moderate disability' and 3% 'severe disability'. The physical examination showed limited range of motion in mainly hip and knee extension and dorsal flexion of the foot. Strength was most commonly reduced in hip abduction (in 60% of participants), hip and knee flexion (43% and 48% respectively). Increased muscle tone was mainly seen in knee extension (83%), while selectivity overall was pretty good.

**Conclusion:** A relatively high number of adults with CP have spinal deformities with mild scoliosis being the most common. Although this and the fact that most adults reported some level of back pain, did not lead to moderate or severe disability in most participants.

## Paper 35

### “Out with the old and in with the new” Paediatric atlanto-axial fusion - evolution of technique

AK Swan, R Dunn

**Background:** A number of techniques are available for stabilization of the occipito-atlanto-axial spine from traditional uninstrumented fusions requiring halo immobilization to instrumented techniques. In the paediatric group surgeons have avoided instrumentation due to safety concerns.

**Aims:** To review our experience of paediatric occipito-atlanto-axial fusions in terms of indications, surgical technique and outcomes.

**Methods:** A retrospective review of a single surgeons' prospectively maintained database identified 43 consecutively managed paediatric patients undergoing atlanto-axial fusion with some extended to the occiput.

Baseline demographic data, underlying pathology, indications for surgery, surgical technique, surgical parameters and intra-

operative complications were collated. Pre- and post-operative radiology was used to assess implant placement and union. Case notes were reviewed for any post-operative complications.

**Results:** The most common indications for surgery were trauma (16 patients), os odontoidium (11 patients), and atlantoaxial rotatory subluxation (6 patients). Of the 43 patients, 15 with a mean age of 7.5 years (range 3.8-13.8 years) were managed with uninstrumented fusion and halo immobilization. Twenty-eight patients with a mean age of 9.9 years (range 2.2-17.8 years) were managed with rigid internal fixation using a combination of Harms technique, occipital skull plate, C1 lateral mass screws, C2 pedicle screws or C2 translaminar screws. The implant group demonstrated the ability to reduce the atlanto-axial joint and C0-C1 deformity when required.

In both groups there was one stable fibrous fibrous non-union and one non-union.

**Conclusions:** Uninstrumented fusion remains an option, but the extensive external immobilization can be safely obviated with spinal instrumentation, allowing immediate mobilization and low non-union rate. Despite the paediatric anatomy, the C1 and C2 screws can be safely and predictably placed.

## Paper 36

### Low dislocation rates achieved with dual mobility cup as treatment for neck of femur fractures

LJ Erasmus, FJ van der Merwe, FF Fourie

**Background:** Total hip replacement (THA) for intracapsular neck of femur fractures (NOF) have a 9% dislocation rate, and a five times higher risk for dislocation compared to patients with osteoarthritis. Using a dual mobility cup (DMC) has been shown effective in negating this problem. The study aimed to determine the dislocation rate of the DMC for this patient group.

**Methods:** A retrospective study was done on 124 patients treated with DMC-THA for an intracapsular NOF from 2006 until 2016. A

minimum one year follow up period was required for inclusion into the study. The number of dislocations were noted. In cases where dislocation occurred, additional data was collected to determine the cause of dislocation.

**Results:** 113 patients with a mean age of 63 years were included (64 females and 49 males). All patients were operated via the posterior approach. In total there were there were 2 posterior dislocations (1,77%). Both patients had additional patient as well as surgical risk factors for dislocation.

**Conclusion:** Low dislocation rates (1,777%) can be achieved using DMC-THA in the management of intracapsular NOF fractures. This compares favourably to conventional THA with a dislocation rate of 9%.

## Paper 37

### Patient factors affecting outcome following Morton's neuroma excision: a prospective study

V Bucknall, D Rutherford, D Macdonald, H Shalaby, J McKinley, SJ Breusch

**Background:** Patient reported outcomes and satisfaction scores following excision of interdigital Morton's neuroma have been recently established. However, little is known regarding what patient factors affect these outcomes. This is the first and largest prospective study to determine which patient factors influence surgical outcome following Morton's neuroma excision.

**Methods:** Over a seven-year period, 99 consecutive patients (112 feet) undergoing surgical excision of Morton's neuroma were prospectively studied. 78 patients were female with a mean age at operation of 56 years. Patient recorded outcomes and satisfaction were measured using the Manchester-Oxford Foot Questionnaire (MOXFQ), Short Form-12 (SF12) and a supplementary patient

satisfaction survey three months pre and six months post-operatively. Patient demographics were recorded in addition to comorbidities, deprivation, associated neuroma excision and other forefoot surgery.

**Results:** Obesity, deprivation and revision surgery proved to statistically worsen MOXFQ outcomes post-operatively ( $p=0.005$ ,  $p=0.002$  and  $p=0.004$  respectively). Deprivation significantly worsened the mental component of the SF12 ( $p=0.043$ ) and depression the physical component ( $p=0.026$ ). No difference in outcome was identified for age, sex, time from diagnosis to surgery, multiple neuroma excision and other forefoot surgeries. 23.5% of deprived patients were dissatisfied with their surgery compared to 7% of the remaining cohort.

**Conclusions:** Patient reported outcomes following resection of symptomatic Morton's neuroma are shown to be less favourable in those patients who display characteristics of obesity, depression, deprivation and in those who undertake revision neuroma resection. Surgery can be safely delayed, as time to surgery from diagnosis bears no impact on clinical outcome.

## Paper 43

### *Septic sequelae in total knee replacements after anterior cruciate ligament reconstructions: a case series and a review of the literature*

**D van der Jagt**, K Sikhauli, R Kgabo, KR van der Jagt, JRT Pietrzak, LMokete

**Background:** We report a series of cases of septic knee replacements after previous anterior cruciate reconstruction surgery. The purpose of this study was to identify common factors leading to the septic sequelae and suggest methods to prevent them.

**Methods:** We reviewed the clinical records of the patients.

**Results:** The interval between index ACL surgery and the TKA ranged from 10 to 32 years. There was no correlation between the method of ACL reconstruction and the subsequent septic sequelae at the time of the TKA. In all cases there were no positive haematological markers suggestive of underlying infection prior to the TKA. There was no consistency with regards to the infective bacteriology. A review of the literature was done revealing a paucity of reports on the subject. This though revealed that there is a significantly higher incidence of septic sequelae with knee replacements after a previous ACL reconstruction. We also report on three cases who had had a previous ACL reconstruction, where targeted investigations prior to a TKA were done.

**Conclusion:** Findings from the septic knee replacements together with those from the targeted investigations have led to the development of protocols to reduce the incidence of septic TKA's after previous ACL reconstructions.

## Paper 44

### *Surgeon operated spinal cord monitoring in spinal deformity surgery: a review of transcranial motor evoked potentials monitoring*

**RS Magampa**, R Dunn

**Background:** Spinal deformity surgery carries a risk of neurological injury. Neurophysiological monitoring allows early identification of intraoperative cord injury and early intervention.

Although multimodal monitoring is ideal, resource constraints make surgeon operated monitoring a useful compromise. We present our experience of transcranial motor evoked potential (TcMEP) monitoring in spinal deformity surgery.

**Methods:** A retrospective review of a single surgeon series of 305 consecutive cases between 2010 and 2017 where TcMEP monitoring was utilised. A simple control was used by comparing upper and lower limbs. A positive alert was defined as a 50% or more loss of amplitude with maintained upper limb signals.

**Results:** Of the 305 cases, we were unable to achieve traces in 6 and proceeded with surgery without.

52 (17%) cases had globally decreased amplitudes due to anaesthetic and physiological factors (hypotension, hypothermia, anaesthetic agents) but maintained throughout the procedure. There were 24 (7.9%) alerts where 20 had complete incongruent trace signal loss, and 4 had diminished signal present. The alert group surgical indications were for progressive severe scoliosis -17, myelopathy -3, chin on chest deformity -2, rigid scoliosis and instability. After the alert the suspected offending action (i.e. instrumentation and deformity correction) was reversed and trace amplitudes improved and or returned to base line. Two patients had recurrent signal loss on re-insertion of removed rods and were left with screws in situ but uncorrected, i.e. no rod. They woke with mild transient lower limb neurological deficit. They were taken back to theatre 2 weeks later where moderate correction was performed without incident. No patient with normal intra-operative traces had post-operative neurological deficit.

**Conclusion:** TcMEP has a 100% negative predictive value. TcMEP intra-operative monitoring allows early identification of physiological cord distress and immediate intervention to minimise clinical sequelae of neurological deficit.

## Paper 45

### *Anatomical study of the intramedullary canal of the distal fibula: implications for treating fractures*

**E Joubert**, H Muller, IPS Terblanche, RP Lamberts

**Background:** Detailed anatomical descriptions of the ankle joint and more specifically the distal fibula is lacking. Insight into this anatomy can help to further improve the treatment of ankle fractures and design of ankle fixation methods and devices especially intramedullary nails for the fibula. Therefore the aim of this study was to determine the anatomical variability in the intramedullary measurements of the distal part of the fibula.

**Methods:** A total of 158 patients (113 male) who received a Computed Tomography (CT) scan of their lower limbs at Tygerberg

Hospital were included in the study (HREC no. S13/10/224). The anatomical profile of the distal 50mm of the lateral malleolus was studied. Measurements of the intramedullary diameters in the antero-posterior and medial-lateral plane were taken. The thickness of the anterior, posterior, medial, and lateral cortex were also captured.

**Results:** Two hundred and ninety-two ankle joint computed tomography (CT) scans were studied. No anatomical differences were found between the right and left fibula measurements. Average thickness medially (1.1 to 2.0 mm), laterally (1.1 to 2.0 mm) and posteriorly (1.0 - 2.0 mm) tended to become more with moving more distally. The average medial-lateral intramedullary diameter ranged from 6.2 to 15.5 mm, while the antero-posterior intramedullary diameter ranged from 11.0 to 22.8 mm. No correlations were found between the measurements and the age or gender of the patients.

**Conclusion:** No differences in cortical thickness and intramedullary diameters were found between gender, side and age. The reported anatomical variation provides important clinical insight. The distal

fibula is well suited to accept the intramedullary fibula nails that are commercially available. These results can assist medical companies to further improve fibula intramedullary fixation devices.

## Paper 46

### *Treating unstable Weber C ankle fractures in young adults with a locked intramedullary fibula nail*

**E Joubert**, IPS Terblanche, RP Lamberts

**Background:** The accepted gold standard treatment of unstable Weber C ankle fractures in adults is an open reduction and internal fixation by means of plate and screw fixation. However, this approach has also been associated with a 31% incidence of significant hardware-related pain, which will impair most physically active young adults. Therefore, the aim of this study was to determine if unstable Weber C ankle fractures in young adults can also be treated with a locked intramedullary fibula nail.

**Methods:** Fourteen patients ( $34 \pm 19$  yrs) were treated with a plate and screw fixation (Synthes LC-DCP), while twenty patients ( $29 \pm 10$  years) were treated with an intramedullary fibula nail (Acumed) (HREC No. S12/11/270). As part of the clinical follow-up

visits, X-rays were taken to assess the adequacy of reduction of the fractures, while the functional assessment of the ankle was done using the Olerud and Molander functional score.

**Results:** At twelve weeks post-operatively, similar reduction rates were found in the plating and nailing group. Functional assessment scores in the nailing group {85 (70-93)} were significantly better than in the plating group {70 (55-75)} ( $p = 0.01$ ). In line with this, lower pain scores ( $p=0.04$ ), earlier return to running ( $p=0.03$ ) as well as earlier return to activities of daily living ( $p<0.01$ ), were seen in the nailing group.

**Conclusion:** Treating unstable Weber C ankle fractures in young adults with an intramedullary fibula nail seems to be a viable alternative. The finding of this study even suggests that better functionality might be achieved earlier with the intramedullary fibula nail. Future research needs to establish the long-term effect of this treatment regime and establish the complication rate of both fixation methods.

## Paper 47

### *Results on assessment of elbow functional outcome after closed reduction and percutaneous pinning of Gartland Grade III supracondylar humerus fractures in children*

**A Rutarama**, GB Firth

**Background:** The purpose of this study was to assess elbow functional outcome of closed reduction and percutaneous pinning of Gartland Grade III supracondylar humerus fractures in children.

**Methods:** Prospective cohort study with patient follow up period of 24 weeks. All patients between 5-14 years with isolated displaced supracondylar humerus fracture who presented to CMJAH and CHBAH between the 31st April 2016 to the 31st July 2016 were included. Flexion, extension, pronation and supination of the affected elbow was measured at three, six, 12 and 24 weeks after CRPP using a goniometer. Similar measurements on unaffected elbow were recorded to be used as a control. Paediatric outcome data collection instrument (PODCI) was also recorded at the end of 24 weeks as an outcome instrument.

**Results:** Thirty eight children were included in the study at final follow up. Elbow flexion, extension, pronation and supination significantly improved ( $p<0.0001$ ) by 24 weeks. At 24 weeks however, the mean elbow extension was significantly reduced in comparison with the controls ( $p<0.0094$ ). Patients less than seven years recovered all ROM including extension more rapidly ( $p<0.0011$ ) than patients older than seven years. 80% of children achieved satisfactory PODCI results at 24 weeks of follow up. Nerve palsy (18.4%) and severe soft tissue injuries (7.9) were the main contributory factors to poor elbow functional outcomes which largely contributed to the 20% of the children who had unsatisfactory PODCI results.

**Conclusion:** Children with seven years and younger gained full ROM and excellent functional outcome at 24 weeks after CRPP. PODCI tool demonstrated that functional outcome doesn't necessarily equate to good clinical outcome. Soft tissue injuries translates into poor functional and PODCI outcomes. Protocol driven rehabilitation may be of value to older children with severe injuries.

## Paper 50

### *Open or arthroscopic lateral clavicle resection for the treatment of acromioclavicular joint arthritis? A systematic review and meta-analysis of prospective level I and II studies*

**E Hohmann**, K Tetsworth, V Glatt

**Background:** The purpose of this study was to perform a meta-analysis comparing open and arthroscopic surgical techniques for distal clavicle resection.

**Methods:** A systematic review of Medline, Embase, Scopus, and Google Scholar identified relevant publications in the English and German literature between 1997 and 2017. All included studies were level I to IV, describing both treatments, with a minimum of 12 months follow-up, had at least one validated outcome score and documented patient recruitment, study design, demographic details, and surgical technique. Studies were excluded if they were only abstracts or conference proceedings, involved revision procedures, or the loss to follow-up exceeded 20%. Publication bias and risk of bias was assessed using the Cochrane Collaboration tools, and heterogeneity was assessed using the  $I^2$  statistic.

**Results:** Four studies (n=319 patients) met the criteria for inclusion. The pooled estimate for clinical outcomes (Constant, ASES) demonstrated no significant differences (SMD 0.323,  $I^2= 0\%$ ,  $p=0.065$ ) between open and arthroscopic resection, although the analysis favored open resection. The pooled estimate for clinical outcomes (SST) also demonstrated no significant differences (SMD 0.744,  $I^2= 49.82\%$ ,  $p=0.144$ ) between open and arthroscopic resection, but the analysis again favored open resection. The

pooled estimate for VAS assessment of pain demonstrated no differences (SMD 0.217,  $I^2= 58.96\%$ ;  $p=0.404$ ) between open and arthroscopic resection.

**Conclusion:** The results of this study suggest that similar functional and clinical outcomes can be achieved with either open or arthroscopic distal clavicle resection. The observed trend that open resection may have a more favorable outcome warrants further investigation.

## Paper 51

### *Expert consensus statement on degenerative meniscal lesions using the modified Delphi technique*

**E Hohmann**, K Shea, B Arciero, R LaPrade, M Miller, B Mandelbaum, J Farr, A Bedi, B Cole, A Imhoff, N Sgaglione, S Rodeo, B Gelbhard, J Monllau, F Noyes, D Shelbourne, J Feller, S Yoshiya, D Parker, A Gomoll, B Bach, V Glatt, K Tetswor

**Background:** The treatment of degenerative meniscal lesions has recently attracted substantial media attention. Despite the lack of strong evidence to support operative management of these lesions, both medical journals and the lay press now generally recommend exclusively non-operative treatment. The purpose of this study was to use the modified Delphi Technique to produce a consensus statement on the diagnosis and treatment of degenerative meniscus lesions.

**Methods:** Twenty international leading knee surgeon were asked to answer 10 open ended questions to define degenerative meniscus lesions, suggest treatment, specify the role of surgery

and the anticipated outcomes of both conservative and operative interventions. The responses were further defined in round 2 and specific Likert style questions were used on the responses of the two previous rounds to reach consensus.

**Results:** Consensus was achieved for the following items: tears are a physiological part of aging; the onset is insidious; they occur mainly in zone 2 and 3. They are not always symptomatic and the onset is rather gradual. Weight-bearing radiographs are recommended. The initial treatment should always be conservative but true mechanical symptoms may benefit from early arthroscopy. In general biologics and steroids are not helpful. Chondral defects should not be ignored but microfracturing is not a good option. The outcomes with surgery vary but are poor with obesity and substantial malalignment. The majority of the panel agrees that the current evidence is poor and should be viewed cautiously. Surgery may not be cost-effective but must be compared to the outcomes of conservative treatment.

**Conclusions:** The results of this Delphi consensus statement suggest that there is consensus for diagnosis and treatment of degenerative meniscus lesions.

## Paper 52

### *Fellowship exit examination in orthopaedic surgery in the Commonwealth countries of Australia, United Kingdom, South Africa and Canada. Are they comparable and equivalent?*

**E Hohmann**, K Tetsworth, V Glatt

**Background:** International migration of health care professionals has increased substantially in recent decades. In order to practice medicine in the recipient country, International Medical Graduates (IMG) are required to fulfil the requirements of their new countries medical registration authorities. The purpose of this project was to compare the final fellowship exit examination in Orthopaedic Surgery for the United Kingdom, Australia, Canada, and South Africa.

**Methods:** The curriculum of the Australian Orthopaedic Association (SET) was selected as a baseline reference. The competencies and technical modules specified in the training syllabus, as well as the specifics of the final fellowship examination as outlined in SET, were then compared between countries.

**Results:** Of the nine competencies outlined in SET, only the curriculum of the UK and South Africa were compatible with the Australian syllabus, and covered 97.7% and 86% respectively of all competencies and sub-items; Canada mentioned 79.1% of all items. The final fellowship examinations of Australia, South Africa and the UK were all highly similar in format and content. The examination in Canada was substantially different, and had two written sessions but combined the oral and clinical component into a structured OSCE using standardized patients and the component included unmanned stations. There were no significant differences for completion certificate of training and/or board certification observed between these countries.

**Conclusions:** The results of this study strongly suggest that the final fellowship examination in Orthopaedic Surgery in Australia, South Africa and the United Kingdom are compatible. Between country reciprocal recognition of these fellowship examinations should not only be considered by the relevant Colleges, but should also be regulated by the individual countries health practitioner registration boards and governing bodies.

## Paper 53

### *The hamstring/quadriceps ratio is an indicator of function in ACL-deficient but not in ACL-reconstructed knees*

E Hohmann, K Tetsworth, V Glatt

**Background:** The purpose of this study was to investigate isokinetic, eccentric and isometric hamstring/quadriceps (HQ) ratios in patients before and after ACL reconstruction (ACLR) using bone-patella-tendon grafts and to establish the relationships between HQ ratio and knee function.

**Methods:** Forty-four patients (mean age of 26.6 years) underwent isokinetic testing of quadriceps and hamstring muscles before and after ACLR and HQ ratios were calculated. Lysholm, IKDC and Cincinnati Scores were used to assess function. Isokinetic concentric and eccentric peak torque (Nm/kg) was measured at three different speeds: 60, 120 and 180 deg/sec. Isometric strength was tested at 30 and 60 degrees of knee flexion.

**Results:** For the isometric tests, the HQ ratio between the involved and non-involved limb was not different for the ACLD knee ( $p=0.28$ ) at 30 degree knee flexion but significant at the 60 degree flexion angle ( $p=0.02$ ) and for the ACLR knees at 30 and 60 degrees ( $p=0.02$ ). For the isokinetic tests, the ratio between involved and non-involved limb was significant for ACL-deficient knees at both 60 ( $p=0.039$ ) and 120 deg/sec ( $p=0.05$ ). There were significant differences between limbs for all speeds in ACLR knees ( $p=0.0003-0.01$ ). For the eccentric tests, the HQ ratio between the involved and non-involved limbs were not significant for both the ACLD ( $p=0.19$ ) and ACLR knees ( $p=0.29$ ) at the speed of 60 deg/sec. At 120 and 180 deg/sec there were significant differences between limbs for both the ACLD ( $p=0.02$ ) and ACLR knees ( $p=0.003$ ). Linear regression did not reveal significant relationships between Cincinnati, Lysholm, and IKDC scores and HQ ratios in the ACLD ( $R^2=0.35$ ,  $p=0.58$ ;  $R^2=0.34$ ,  $p=0.63$ ;  $R^2=0.38$ ,  $p=0.49$ ). In contrast, there were significant correlations between the Lysholm and IKDC scores and HQ ratios in the ACLR knees ( $R^2=0.84$ ,  $p=0.002$ ;  $R^2=0.86$ ,  $p=0.001$ ).

**Conclusions:** The findings of this study suggest that the HQ ratio in ACLD patients was not a predictor but an indicator of patient perceived knee function following ACLR.

## Paper 54

### *Case-match controlled comparison of minimally invasive plate osteosynthesis and open reduction internal fixation for the stabilization of humeral shaft fractures*

E Hohmann, K Tetsworth, V Glatt

**Aims and Objective:** To compare minimally invasive plate osteosynthesis (MIPO) to standard open reduction and internal fixation (ORIF) for humeral shaft fractures, to determine which technique minimized complications while optimizing clinical outcomes.

**Design:** Case-match controlled cohort.

**Setting:** Metropolitan tertiary referral public hospital and trauma centre.

**Patients/participants:** All patients with humeral shaft fractures between April 2010 and September 2015 were identified retrospectively, and of these 31 were treated by MIPO and 54 by ORIF. A case-matched cohort was assembled according to fracture

pattern, gender, age, and comorbidities, with a total of 56 patients (28 patients in each group).

**Outcome measurements:** The complication rate was the primary outcome measure (radial nerve injury, non-union, infection, prominent implants, and re-operation). Radiographic alignment and the Disabilities of the Arm, Shoulder and Hand (DASH) Score were secondary outcome measures.

**Results:** The cumulative complication rate was 3.6% following MIPO, and 42.9% following ORIF ( $P=0.0004$ ). The MIPO group reported an average DASH Score of 17.0, with a mean residual deformity of 1.8 degrees in the coronal plane, and 3.0 degrees in the sagittal plane. The ORIF group reported an average DASH Score of 24.9, with a mean residual deformity of 1.0 degrees in the coronal plane, and 1.0 degree in the sagittal plane.

**Conclusions:** Minimally invasive plating of the humeral shaft achieves nearly equivalent radiographic alignment, while the overall complication rate following ORIF was 12 times greater. Compared to ORIF, in this cohort MIPO achieved highly comparable clinical results with a dramatically lower risk of post-operative complications.

## Paper 55

### *Arthroscopic partial meniscectomy versus physical therapy for degenerative meniscus lesions. How robust is the current evidence? A critical systematic review and qualitative synthesis*

E Hohmann, K Tetsworth, V Glatt, M Cote

**Background:** The purpose of this systematic review was to investigate study quality and risk of bias for randomised trials

comparing partial meniscectomy versus physical therapy in middle-aged patients with degenerative meniscus tears.

**Methods:** A systematic review of Medline, Embase, Scopus, and Google Scholar was performed from 1990 through 2017. The inclusion criteria were: at least one validated outcome score, and middle-aged patients (40 years and older) with a degenerative meniscus tear. Studies with a sham arm, acute and concomitant injuries were excluded. Risk of bias was assessed with the Cochrane Risk of Bias Tool. The quality of studies was assessed with the Cochrane GRADE tool and quality assessment tool (EPHPP).

Publication bias was assessed by funnel plot and Egger's test. The  $I^2$  statistics was calculated a measure of statistical heterogeneity.

**Results:** Six studies were included and all were assessed as having a high risk of bias. There was no publication bias ( $p=0.23$ ). All studies were downgraded (low,  $n=5$ ; very low,  $n=1$ ). EPHPP assessed one study as strong, two as moderate, and three as weak. The overall results demonstrated moderate to low quality of the included studies. The  $I^2$  statistic was 96.2%, demonstrating substantial heterogeneity between studies.

**Conclusion:** The results of this systematic review strongly suggest there is currently no compelling evidence to support arthroscopic

partial meniscectomy versus physical therapy. The studies evaluated here exhibited a high risk of bias, and the weak to moderate quality of the available studies, the small sample sizes, and the diverse study characteristics do not allow any meaningful conclusions to be drawn. Therefore, the validity of the results and conclusions of prior systematic reviews and meta-analyses must be viewed with extreme caution. The quality of the available published literature is not robust enough at this time to support allegations of superiority for either alternative, and both arthroscopic partial meniscectomy or physical therapy could be considered reasonable treatment options for this condition.

## Paper 56

### Multiligament knee injuries in Cape Town - medium term outcomes of delayed ligament reconstruction and conservative management

**M Held, T Makubeta, H Hobbs, R von Bormann**

**Background:** The current recommendations for the management of multiligament knee injuries (MLKI) are early, single stage ligament reconstruction with auto – or allograft, but this is not always possible in a low-resource setting. This study aimed to describe the management and evaluate the outcomes of multiligament knee injuries at Groote Schuur Hospital in Cape Town, South Africa.

**Methods:** A prospectively collected database was interrogated which included all MLKIs in patients managed at the Knee Unit at Groote Schuur Hospital in Cape Town during a 12-month period, starting January 2017. Patients' folders, MRI scans, and operative notes were reviewed. Demographic data, information on ligamentous and associated injuries, as well as outcomes in form of range of motion and laxity were analysed.

**Results:** 35 MLKIs of 33 patients (19 male, 58%) with a median age of 35 years (IQR 15) were included. 22 patients were involved in a motor vehicle accident. Six patients presented with ipsilateral fractures, five patients had periarticular open wounds, 7 had an associated popliteal artery injury. A total of 28 knees were reconstructed, 16 acutely and 12 after a median delay of 12 weeks (IQR 8.5) for various reasons. In seven patients an initial planned delayed reconstruction was not done due to acceptable function and stability confirmed with stress radiographs. Overall, there was no difference in range of motion, or laxity in acute or delayed reconstructions at a median follow-up of 6 months (IQR 3.3).

**Conclusion:** Timing, approaches and graft choices for ligament surgery in MLKIs varied widely. A planned knee ligament reconstruction was delayed in more than half of cases of which 40% (20% of all MLKI) were treated non-operatively with acceptable results. A more conservative approach for MLKIs could therefore be justified in our setting but needs to be tested in a larger prospective trial.

## Paper 57

### A surgical informed consent knowledge study (SICKS) of surgical staff in Pretoria tertiary centres

**MO Mudau, A Vlok**

**Background:** Informed consent is a prerequisite for all surgical and some medical procedures. It is defined as the process whereby the practitioner informs a patient about the details of a procedure considering preconditions of the patient. Consent form only serves as an evidence that such conversation has taken place.

**Methods:** A survey was done amongst doctors and professional nurses working in orthopaedic, general and neurosurgery. As self-administered questionnaire was used for the research, as validated by our institutional committees. The questionnaire included information about participant's hospital of employment, designation, years of experience and if participant ever signed or witnessed a surgical informed consent. Participants were asked to list five elements of surgical informed consent, choose legal age for

signing medical and surgical consent as stipulated in national health act 61 of 2003, how they deal with language and time perceived as adequate for obtaining a consent. Academic meetings were used to conduct a research on doctors and handover meetings were used to conduct research on professional nurses. Inclusion criteria was all doctors and professional nurses working in these 3 surgical departments. Exclusion criteria was refusal to participate.

**Results:** Eighty participants were involved, including professional nurses and medical doctors of all grades in orthopaedic, general and neurosurgery. Seventy four percent of participants were medical doctors and twenty six percent were professional nurses. Seventy percent mentioned less than three elements of consent, majority mentioned information (76%). Sixty percent of participants didn't know the correct age to sign a medical consent and 89% of participants didn't know the legal age to sign a surgical consent.

**Conclusion:** Medical professionals are not informed with regards to the medical laws of this country. More medical law education is needed at the post graduate level to empower specialists trainees and protect the patients.

## Paper 58

### *Attitudes of South African orthopaedic surgery registrars to the research based Masters of Medicine degree (MMed): Is a paradigm shift needed?*

**A Sekeitto**, M Bhamjee, N Patel, MT Ramokgopa

**Background:** The Health Professions Council of South Africa in 2010 incorporated the completion of a research project as a requirement for medical specialist registration.

**Objective:** To explore the attitudes and requirements of orthopaedic surgery trainees regarding the compulsory research component of their specialist training.

**Patients and Methods:** Human Research Ethics clearance was obtained prior to study commencement. A descriptive questionnaire based study that assesses registrar demographics, prior involvement in research, present research participation and reasons for performing research, perceptions regarding the importance of research, deterrents to research, and suggested resolutions to obstacles to research was distributed to orthopaedic surgery registrars. All responses were confidential and voluntary. Descriptive statistics were generated with MS Excel.

**Results.** Six of the eight orthopaedic surgery training centres in South Africa (SA) were sampled, and 46.4 % (91/196) of orthopaedic registrars completed the questionnaire. Respondents identified insufficient time (80/91, 88%), deficient basic research methodology training (31/91, 34%), supervision inadequacy (31/91, 34%), lack of ongoing research within their departments (30/91, 33%), and inadequate financial resources (27/91, 30%) as significant obstacles to research. Half of all respondents (50.3%, 46/91) indicated that they only performed research as a requirement of registration. The majority of respondents (91.2%, 83/91) proposed a dedicated research rotation to facilitate the completion of the research component of specialist training. Additional proposals included the mandatory completion of a postgraduate research methodology course (62/91, 68%), research supervisors with an MMed or higher postgraduate degree (59/91, 65%), and greater undergraduate research exposure (36/91, 40%).

**Conclusion.** Registrars identified a lack of time, inadequate training in research and insufficient research supervision as the greatest obstacles to research. Dedicated time for research, adequate training in research and upskilling of research supervisors are recommended as potential solutions to the problems encountered.

## Paper 59

### *Burden and profile of spinal pathology at a major tertiary hospital in the Western Cape, South Africa*

**S Misseer**, T Mann, JH Davis

**Background:** Spinal pathology in the Western Cape is managed at three tertiary level hospitals, including Tygerberg Hospital. The Tygerberg Hospital Orthopaedic Spinal Unit is responsible for the management of spinal pathology for the 3.4 million people in the hospital's catchment area. However, the Unit's overall burden of disease and associated resource use is currently unclear.

**Aim:** The first aim was to investigate the overall burden and clinical profile of spinal pathology presenting to the Tygerberg Hospital Spine Unit over a one-year period. The second aim was to determine resource use associated with spine pathology admissions.

**Methods:** Overall burden was investigated by performing a retrospective review of all patients admitted to the Spine Unit between 1<sup>st</sup> October 2016 and 30<sup>th</sup> September 2017. Demographic and clinical data was collected and patients were assigned to one of five spinal pathology sub-groups. Resource use was determined by length of hospital stay, waiting times and advanced

imaging and theatre usage. The study was approved by the Human Research Ethics Committee of Stellenbosch University and by the management of Tygerberg Hospital. HREC #: N17/10/105

**Results:** Overall burden was comprised of 349 individual patients and 376 admissions, including readmissions. Trauma (51%) and infection (24%) accounted for the majority of admitted pathology with degenerative (10%), deformity (7%) and malignancy (7%) representing fewer admissions. Motor vehicle accidents (MVA's) were the primary mechanism of injury accounting for 48% of spine trauma. Tuberculosis (TB) was the causative organism in 87% of spinal infections with 44% HIV co-infection. Hospital resource use was considerable with 92% of spine patients requiring advanced imaging, a median operating time of 3h 36min and a median hospital stay of 19 days. Infection and malignancy sub-groups had the longest waiting times for advanced imaging and theatre with a median wait of 14-16 days, accounting for approximately 62% of the typical total hospital stay.

**Conclusions:** The Spine Unit experienced a substantial patient burden requiring significant hospital resources. Reduced in-patient waiting times and upskilling of orthopaedic services at secondary hospitals represent key areas for health system strengthening. However, multi-sectoral strategies would be required to effectively address our high burden of largely preventable spinal pathology.

## Paper 60

### *One versus two adjacent interdigital neuroma excision - a patient outcome study*

**KB Mogami**, NP Saragas, PNF Ferrao, A Strydom

**Background:** Interdigital neuroma is a benign condition of the

interdigital plantar nerve. Clinically, patients present with pain in the forefoot, typically radiating into the toes and aggravated by wearing tight shoes. Diagnosis is mainly clinical, however there is some utility for investigations such as magnetic resonance and ultrasonography in unclear or recurrent cases. Surgery is reserved for patients with intractable symptoms despite conservative therapy.

**Aim:** To report on patient satisfaction on two cohorts of patients who underwent surgical neuroma excision, those with a single webspace neuroma compared to those with adjacent web space neuromas.

**Methods:** We retrospectively reviewed the data of patients treated operatively between 2003 and 2016. We interviewed and administered the Self Reported Foot and Ankle Scores questionnaire by telephone. Patient scores were then analyzed categorically and variation between groups analyzed.

**Results:** Sixty-two patients were available for questionnaire administration. 31 patients had a single interdigital neuroma while another 31 had adjacent interdigital neuromas. Twenty-seven of

the 31 (90%) patients with a single neuroma had good or excellent results while 23 (74.2%) of those with adjacent neuromas had similar outcomes. One patient with a single neuroma had a poor score while four with adjacent neuromas had poor scores. The average score for patients with a single interdigital neuroma was 41 (excellent) while the average for those with adjacent neuromas was 37 (good) ( $p=0.473$ ). The majority of patients in both groups would undergo the surgery again.

**Conclusion:** Based on our results, we have found no significant difference in outcomes of patients who undergo surgery for either a single or adjacent interdigital neuromas. General patient satisfaction is good and/or excellent.

## Paper 62

### *The reliability of physical examination per anatomic area to detect vascular injury in penetrating trauma to extremities*

**JA le Roux, MC Burger, N Ferreira, G du Preez**

**Background:** The purpose of this study was to determine the specificity and sensitivity of physical examination alone in detecting arterial injury in penetrating injuries to extremities (PTE), versus CT Angiography (CTA). Secondary aims were to determine whether the result is similar across all anatomic regions, and with different types of penetrating trauma.

**Methods:** A retrospective review included 353 extremity CTA's performed between 1-June-2016 to 30-June-2017. Presence of arterial injuries were noted, together with the specific anatomic area injured: upper arm, cubital fossa, forearm, thigh, popliteal fossa, lower leg, or multiple zones. Medical notes were reviewed to screen whether pulse deficit/hard signs of arterial bleeding were reported upon admission. (HREC #S16/07/119)

**Results:** A total of 352 CT angiograms were included: 326 (92.4%) male, 27 (7.6%) female. Of these, 220 were lower limbs and 133 upper limbs. The mean age of included patients were 28.9 years (range: 11 - 68 years).

The sensitivity of physical examination in detecting an arterial injury when considering all patients, compared to the gold standard CTA, was 92.1% (95% CI 84.5 - 96.8%) with the specificity 93.5% (89.9 - 96.2%). The thigh had the highest specificity of 96.38% (91.75-98.81%), followed by lower leg: 91.75% (78.09-98.3%), upper arm: 89.23% (79.06-95.56%) and forearm: 77.78% (39.99-97.19%). When considering gunshots the specificity was 91.49% (79.62-97.63%) whilst for stab wounds the specificity was 86.79% (74.66-94.52%). The numbers for the other subgroups were too small to interpret.

**Conclusion:** This study is in agreement with the literature which indicates that physical examination has a high specificity in detecting arterial injury in the setting of penetrating trauma of the extremities (PTE). It does however show that the specificity is not equal for all anatomic regions or mechanisms of injury. This new finding should be considered individually for patients presenting PTE.

## Paper 63

### *Do we have a common approach to common orthopaedic trauma problems? A survey of senior orthopaedic registrars and surgeons*

**SJ van Deventer, JRT Pietrzak, I Egbunike, A Robertson**

**Background:** Although surgical management of Orthopaedic trauma in South Africa is common, much controversy still exists surrounding optimal management of a number of surgical entities. Each year, an academic meeting is held with senior registrars and consultants from each university in South Africa. The aim of this study was to determine the extent of agreement of treatment of common Orthopaedic trauma in training institutions in South Africa.

**Methods:** An anonymous questionnaire was completed by 47 of 55 attendees (85.45%) of the 2018 South African Registrar Congress. The questionnaire included four randomly selected clinical scenarios: ankle syndesmotom injury, an intertrochanteric femur fracture, an extra articular distal radius fragility fracture and a neck of femur fracture. The responses were assessed

**Results:** The reduction technique for isolated syndesmotom injuries showed the most disagreement with 25 respondents (53.2%) choosing closed reduction while 22 (46.85) deciding to perform an open reduction.

Intertrochanteric femur fractures would be stabilized with a Cephalomedullary nail (CMN) in 85% of respondents. A short CMN was selected by 57.4% if the patient was 50 years old as opposed to 78.7% if the patient was >80 years. 18 (38%) of respondents would manage an extra-articular distal radius fracture in a 50 year old female non-operatively whereas 29 (62%) would perform a volar ORIF. In a displaced neck of femur fracture in a 50 year old, 30 (64%) would do a reduction and cannulated screw fixation, while 17 (36%) would immediately do a Total Hip Arthroplasty (THA). Disagreement in treatment was seen according to the university attended ( $p<0.005$ ).

**Conclusion:** There is a lack of consensus among attendees of the SAOA registrar congress with regards to certain treatment aspects of 4 common orthopaedic trauma conditions.

## Paper 67

### *A survey of the management of ankle fractures in South Africa*

MI Workman, GS Wever, G McCollum

**Background:** Inadequate treatment of ankle fractures can lead to poor outcomes and further reconstructive surgery. The presence of a posterior malleolus fracture is associated with poorer functional outcomes compared to simpler malleolar fractures. Traditional teaching, based on historic literature, states that if a posterior malleolus fracture involves less than 25% of the distal tibia, it can be managed without fixation. Current literature has shown that fixation should not be based on the size of the posterior fragment but rather on the fracture pattern, instability and awareness that reduction and fixation is biomechanically advantageous. Fixation may also stabilise the syndesmosis. We hypothesised that current management of ankle fractures with posterior malleolus involvement in South Africa is not evidence based and suboptimal.

**Aim:** We sought to assess the training, experience and decision-making of surgeons and trainees who are involved in the management of ankle fractures. Another aim was to develop

evidence-based algorithms for the management of posterior malleolus and complex ankle fractures.

**Methods:** An email survey consisting of questions related to the management of ankle fractures was sent to specialists, registrars and medical officers who voluntarily completed an online survey regarding ankle fractures with respect to experience, training and decision making.

**Results:** 103 out of 456 emails sent drew responses to the survey. 30% of these were from consultants, 52% from registrars and 18% from medical officers. 40% of responders believe that posterior malleolus fractures can be managed non-operatively if less than 20% of the tibial plafond is involved. Only 10% would CT scan a posterior malleolus prior to operating. 30% of the responders are not familiar or comfortable with the posterior-lateral approach used for fixation of the posterior malleolus directly.

**Conclusion:** Understanding of ankle fractures has progressed. Posterior malleolus fractures are not benign and have poorer outcomes compared to bi-malleolar or lateral malleolus ankle fractures. We have shown that a significant proportion of responders to the survey are not following best practice and current literature.

## Paper 71

### *Type 5 acromioclavicular dislocations: surgical management in acute cases*

NP Bhagwan

**Background:** To evaluate the clinical and radiological outcomes after surgical treatment of acute high grade AC joint injuries using an endobutton technique.

**Methods:** Retrospective case study following 33 patients treated between 2011 and 2016. All patients were reviewed for at least

12 months. The Constant score, Acromioclavicular instability score and Subjective shoulder value were assessed at the final clinical follow up. Radiographs were also available.

**Results:** Most patients remained very satisfied or satisfied with the procedure outcome. All scores improved significantly when compared with baseline. There was one major complication and 5 minor complications.

**Conclusion:** Arthroscopic stabilisation of high grade dislocations is a safe and effective method leading to good and excellent clinical and radiological results after a follow-up of at least one year.

## Paper 75

### *The prevalence of self-reported depression rates in Total Hip Arthroplasty (THA) at an academic hospital and the subsequent impact on functioning and satisfaction rates*

JRT Pietrzak, A Asare-Bediako, E van Greunen, K Sikhauli, L Mokete, DR van der Jagt

**Background:** Postoperative outcomes and satisfaction rates are affected by depression. The aim of our study was to determine the prevalence of self-reported depression in patients undergoing Total Hip Arthroplasty (THA) in a Johannesburg academic hospital. A secondary objective was to determine the impact of depression on patient functional outcomes and satisfaction rates after THA.

**Material and Methods:** We retrospectively reviewed 195 patients undergoing THA from 2015-2016 at a single academic institution. 157 (80.5%) of patients were followed up at a minimum of 2 years. Patients pre-operative depression and functional status was compared with that at 2 years follow-up. Satisfaction rates and 30- and 90-day readmission rates were correlated with pre-operative depression.

**Results:** Overall, according to the Zung Self-Rating Depression Scale 82 patients (42%) were classified as moderately depressed and 37 (18.97%) were severely depressed. Females, HIV-infected and morbidly obese patients were more likely to be depressed. No patients were on anti-depressive medication. The mean pre-operative Harris Hip Score (HHS) was 35.95 (24-66) and Oxford Hip Score (OHS) 17.11 (0-48). The 30-day readmission rate was 2% and all these patients were pre-operatively severely depressed.

At a minimum of 2 years, the post-operative HHS was 81.1. Overall, there was an improvement in Zung Self-Rating Depression Scale and PHQ-9 scores. This improvement may reflect a lower pain load post-operatively. The least improvement was in the severely depressed group ( $p < 0.05$ ). The overall satisfaction rate was 89.7% with the only 70.27% of the severely depressed group satisfied post-operatively. Age ( $>70$ ) and BMI  $>40$  also correlated with dissatisfaction ( $p < 0.05$ ).

**Conclusion:** There is a high prevalence of depression in THA. Incorporation of psychological management strategies may improve satisfaction rates and functional outcomes post-THA. Pain relief may also lead to decreased depression scores.

## Paper 76

### *Discharge within 24 hours post Total Hip Arthroplasty with a minimally-invasive direct anterior hip approach is safe and effective*

JRT Pietrzak, J Botha

**Background:** The introduction of joint care programs and fast-track protocols have reduced the length of stay (LOS) for total hip arthroplasty (THA) worldwide. Length of stay after THA has become a surrogate marker of the effectiveness and quality of peri-operative surgical care. The aim of this study was to determine the prevalence of discharge within 24 hours post-THA. We also examined the early operative outcomes for these patients regarding the amount of perioperative and postoperative complications, re-admissions and reoperations.

**Methods:** A retrospective single-surgeon review of 205 patients undergoing unilateral minimally-invasive Direct Anterior Approach (DAA) THA was performed. All patients were included in a fast-track surgery protocol between January 2016 and December 2017. No

patients were excluded irrespective of age, medical co-morbidities, BMI, pre-operative diagnosis and pre-operative functioning. The complication rate was 6.8% and was not related to discharge within 24 hours.

**Results:** 53% of all patients were discharged within 24 hours post-THA. The average length of stay was 1.83 days (1-18 days). Only 4 patients (1.98%) required a post-operative blood transfusion. Males were more likely than females to be discharged after an overnight stay only ( $p < 0.005$ ). Age less than 70 years and body mass index (BMI) less than 30 were also more likely to be discharged early. The peri-operative complication rate was 6.8%. The 30-day readmission rate and 90-day readmission rate was 3.4% and 1% respectively. Complication and readmission rates were independent of early discharge ( $p = 1.00$ ). There were 3 (1,5%) early reoperations.

**Conclusion:** A fast-track program for most patients undergoing THA can safely result in a length of stay of 24 hours with few complications, re-admissions and reoperations.

## Paper 78

### *Reduction in air contamination levels during Total Joint Arthroplasty with a continuous ultraviolet filtration system (UVC)*

JRT Pietrzak, M Tlhabane, S van Deventer, K Sikhauli, L Mokete, DR van der Jagt

**Background:** Air contamination in the operating theatre has been associated with surgical site infections (SSI). A linear relationship exists between a high air particle count and subsequent contamination of the surgical site. The aim of this study was to determine whether air contamination in an orthopaedic operating theatre could be reduced by ultraviolet air filtration.

**Methods:** Air contamination levels were assessed in 2 laminar flow theatres in a Johannesburg academic hospital. 190 air particle readings were obtained in 19 randomly selected control procedures {10 primary Total Hip Replacements (THA), 9 primary Total Knee Replacements (TKA)} and in 19 randomly selected procedures

(12 THA, 7 TKA) in which continuous ultraviolet filtration air treatment (UVC) (Aerobiotix, USA) was performed. This system includes HEPA (high-efficiency particulate air) filtration and ultraviolet radiation of theatre air during procedures. In each group, readings of 0.3 $\mu$ m, 1.0 $\mu$ m and 5 $\mu$ m particles were obtained for a total of 380 readings. All readings were performed with a laser particle sensor in the region of the instrument table, surgical field, anaesthetic trolley and main door.

**Results:** There was a 46.8% reduction in overall air contamination from a mean of 5106 particles/m<sup>3</sup> to 2701 particles/m<sup>3</sup> with UVC air filtration ( $p = 0.043$ ). The reduction of 0.3 $\mu$ m, 1 $\mu$ m and 5 $\mu$ m was 57.9%, 47.9% and 30.8% respectively. Particulate counts were decreased throughout the theatre. Bovie smoke was correlated with higher particle readings. There were no incidences of SSI or 30-day readmissions in all 38 cases.

**Conclusion:** Air contamination in the operating theatre can be effectively reduced by ultraviolet filtration, and may be considered as an adjuvant method to potentially reduce the risk of SSI.

## Paper 80

### *Proposal and validation of a novel, descriptive classification system for hip pathology in HIV-infected patients*

JRT Pietrzak, TC Nell, R Rajcoomar, K Sikhauli, R Kgabo, L Mokete, DR van der Jagt

**Background:** Improved life expectancy in patients with human immunodeficiency virus (HIV) results in an increased possibility of developing chronic degenerative and HIV-associated joint disease. Subsequently, more patients will present with hip-related problems. The aim of this paper was to propose and validate a descriptive hip-specific radiological classification system for HIV-associated hip pathology.

**Methods:** We retrospectively reviewed pelvic and lateral hip radiographs of 69 consecutive HIV-infected patients and 108 hips

with hip pathology necessitating consultation at an Arthroplasty Unit in a Johannesburg academic hospital. Each hip was classified as Type 1 if avascular necrosis of the femoral head was evident; Type 2 if a neck of femur (NOF) fracture was present and Type 3 if the pathology was unrelated to HIV (osteodegenerative or inflammatory arthritic changes). Type 1 hips were subclassified according to the acetabular changes and subsequent change in position of the centre of rotation (COR) of the necrotic femoral head. Consequently, Type 1A had normally contained femoral heads, Type 1B had proximal or dome erosion of the acetabulum, Type 1C had supero-lateral migration of the COR and Type 1D had medial migration of the COR and acetabuli protrusion. Inter- and intra-observer reliability was evaluated by 6 independent reviewers.

**Results:** 72 hips (67%) were Type 1 (with evidence of AVN). The majority, 34 patients (47%), were Type 1A (well contained) while 12 (16.6%) showed proximal migration and superior acetabular

erosion (Type 1B) and 15 (20.8%) had acetabuli protrusion (Type 1D). There were 24 (22.2%) who were Type 2 with 16 with Tonnis 2 and 3 OA and 6 with radiological inflammatory arthritis. There were 12 (11%) with NOF fracture (Type 3) of which 5 had coxa vara. There was osteopaenia in 50 (72.4%). There was both excellent inter- and intra-observer reliability (kappa-value 0.95).

**Conclusion:** We propose and have validated a descriptive classification system for HIV-associated hip pathology in patients awaiting THA.

## Paper 82

### *The seroprevalence of HIV in patients undergoing Total Joint Arthroplasty in a single South African academic institution*

**JRT Pietrzak**, Z Maharaj, K Sikhauli, N Khoza, S Jooma, L Mokete, DR van der Jagt

**Background:** The prevalence of immunocompromised patients undergoing Total Joint Arthroplasty (TJA) is increasing worldwide as a consequence of advances in treatment. HIV is presenting in an older population group and concerns of higher rates of infection, early failures and dangers posed to healthcare workers exist.

**Methods:** The aim of this study was to determine the seroprevalence of HIV in non-haemophilic patients undergoing Total Hip Arthroplasty (THA) and Total Knee Arthroplasty (TKA) at a single sub-saharan urban academic institution. The prevalence of patients undergoing TJA (THA and TKA) was prospectively evaluated. All patients undergoing TJA from January 2016 – March 2018 were counseled

and offered HIV testing pre-operatively. The CD4+ count and viral load was measured for all HIV-infected patients.

**Results:** 38 patients (15.8%) of 252 patients undergoing THA were HIV-infected. The seroprevalence of 224 patients undergoing TKA was 4.46%. Only 1(0.21%) of the 476 patients undergoing TJA was newly diagnosed for HIV-infection. All other patients were already on anti-retroviral therapy. The average CD4+ counts for THA and TKA was 286 (56-854) and 326 (185-1000) respectively. Of the HIV-infected patients presenting for THA, 27 (71%) had evidence of avascular necrosis (AVN) and 4 (10.5%) with a neck of femur fracture. No HIV-infected patients presenting for TKA had evidence of AVN of the knee.

**Conclusion:** The seroprevalence of HIV in patients undergoing THA is higher than those undergoing TKA and the reported average in the general population. This may reflect the high association between both HIV and HAART and AVN of the hip. Our findings predict a significant burden on arthroplasty services in the future. Routine testing may, however, allow earlier initiation of ARV therapy

## Paper 83

### *Are total joint arthroplasty surgeons water-wise? Simple water conservation techniques result in significant water saving*

**JRT Pietrzak**, TS Masango, S van Deventer, K Sikhauli, DR van der Jagt, L Mokete

**Background:** South Africa is a water scarce country and the Western Cape is currently in the throes of a drought. The aim of this study was to determine the water consumption for primary Total Joint Arthroplasty (TJA). Thereafter, we determined if it was possible to reduce water consumption with simple and practical water conserving interventions.

**Methods:** We conducted a prospective analysis of total water consumption in 15 consecutive TJAs (9 THA, 6 TKA). This included water used for pre-operative scrubbing, intra-operative surgical site irrigation and post-operative instrument cleaning. We subsequently introduced simple water saving techniques for the next 15 TJAs (8 THA, 7 TKA). This consisted of the fitting of water flow regulators

into taps used for pre-operative scrubbing, a timer limiting pre-operative scrubbing to 5 minutes for the first case of the day and 2 minutes for subsequent cases and a tap on/off scrubbing technique in which the taps were switched off in between rinsing.

**Results:** An average of 282.36 litres/case (226l -307l) was used per case without any water conservation measures. Pre-operative scrubbing by the surgeons was responsible for 91% of water consumption. The pre-operative scrubbing time was inconsistent and was shortest amongst consultants (average time: 235 secs) and longest in junior registrars (average time: 323 secs). The introduction of flow regulators decreased water flow from taps from 15.3 l/min to 4.8 l/min. Water conservation techniques decreased the average water use to 72.7 l/case (68.4l – 74.4l) which is a 793% decrease in water use. There were no incidences of surgical site infections or 30- or 60-day readmissions in both groups.

**Conclusion:** Immediate water savings measures are possible with simple easily adoptable conservation techniques with the main focus being on pre-operative surgical scrubbing. Significant environmental and economic benefits can be derived from this water-wise approach without compromising patient care

## Paper 84

### *Publication rates of podium presentations at the annual South African Orthopaedic Association Congress from 2010 to 2015*

**C Hitge**, JRT Pietrzak, BM de Buys, L Mokete, DR van der Jagt

**Background:** Presentation of research at annual national orthopaedic congresses provides an opportunity for the

communication of current and relevant knowledge. The publication rate of presentations may provide a barometer of the quality of research work and the reputation of a scientific meeting. The aim of this study was to determine the publication rate of abstracts presented as podium presentations at the South African Orthopaedic Congress (SAOC) from 2010 to 2015. A comparison with other national orthopaedic meetings including the United Kingdom, Ireland, Australia, Germany, Turkey, Singapore and Brazil was also performed.

**Methods:** All abstracts accepted as podium presentations were scrutinized by 2 independent observers. Google Scholar, PubMed, EMBASE was used to search for titles and authors for all published manuscripts. Sub-analyses included publication rates of types of research and sub-speciality. Data including the journal the paper was published in, time to publication and level of evidence was recorded.

**Results:** A total of 445 abstracts were accepted for presentation from 2010 to 2015. A total of 60 (13.4%) were published in peer-reviewed journals. The mean time from presentation to publication

was 27 months. Arthroplasty (33.3%) and Trauma (30%) were responsible for the most number of publications. The South African Orthopaedic Journal (51.67%) and the Injury Journal (6.7%) were the most common journals published in. The publication rates from other countries was 26,6% to 58.1%.

**Conclusion:** A low conversion rate from podium presentation to publication existed in work presented at the SAOC between 2010 to 2015. This recognition may subsequently promote higher quality research or stimulate identification of barriers to publication amongst South African orthopaedic surgeons.

## Paper 85

### Total knee arthroplasty in a low-income country

**SM Graham**, C Moffat, N Lubega, N Mkandawire, D Burgess, WJ Harrison

**Background:** We describe our 10-year experience with total knee arthroplasty in patients who are included in the Malawi National Joint Registry.

**Methods:** A total of 127 patients underwent 153 total knee arthroplasties (TKAs) between 2005 and 2015. The mean duration of follow-up was 4 years and 3 months (range, 6 months to 10 years and 6 months). The study group included 98 women and 29 men with a mean age of 65.3 years (range, 24 to 84 years). Nine patients were human immunodeficiency virus (HIV)-positive.

**Results:** The primary indication for surgery was osteoarthritis (150 knees), and the mean preoperative and postoperative Oxford Knee Scores were 16.81 (range, 4 to 36) and 45.61 (range, 29 to 48), respectively. Four knees (2.6%) were revised because of early periprosthetic joint infection (1 knee), aseptic loosening (1 knee), and late periprosthetic joint infection (2 knees). There were no perioperative deaths. In the group of 9 patients who were HIV-positive, there were no early or late complications and the mean Oxford Knee Score was 47 (range, 42 to 48) at the time of the latest follow-up.

**Conclusions:** This study demonstrated good short-term results following 153 primary TKAs performed in a low-income country.

## Paper 87

### Orthopaedic research in low-income countries: a bibliometric analysis of the current literature

**K Berry**, C Brennan, SM Graham, M Laubscher, S Maqungo, N Ferreira, WJ Harrison

**Background:** More than 90% of global mortality from trauma and injuries occurs in low- and middle-income countries. However, only a small amount of published, peer-reviewed orthopaedic research appears to originate from these settings. The aim of this study is to quantify the amount of orthopaedic literature published from low- and lower-middle income countries.

**Methods:** The Web of Science database was utilised to identify all indexed orthopaedic journals. All articles published in the 76 journals over the last 10 years were reviewed, to determine their

geographic origin. Those articles that had been published from low- and lower-middle-income countries were identified and included in the analysis.

**Results:** A total of 131,454 articles were published across 76 orthopaedic journals over the last 10 years. Of these, 132 (0.1%) were published from low-income countries and 3515 (2.7%) were published from lower-middle-income countries. The study suggests that 85.7% ( $n=112,716$ ) of published orthopaedic research is being carried out in a high-income setting.

**Conclusions:** There is a stark mismatch between the publication of scientific reports on orthopaedic research and the geographical areas of greatest clinical need. These results show that there is a need for more orthopaedic research to be carried out in low- and lower-middle-income countries, potentially in collaboration with high-income partners to increase the output.

## Paper 88

### Retention versus removal of the posterior cruciate ligament in total knee arthroplasty

**J Wessels**, R Greeff, CT Frey

**Background:** There is no consensus as to whether to use the posterior cruciate ligament retaining or sacrificing designs in total knee arthroplasty. The objective of the study was to establish any clinical or functional difference in these two designs.

**Methods:** In this single surgeon case series we compared one implant that is available in two designs cruciate retaining (CR) and posterior stabilised (PS). We compared two cohort groups with each 20 consecutive primary TKA done at our institution. All the patients are from one hospital and matched for age, gender and primary diagnosis. We excluded patients that had previous knee surgery and an absent posterior cruciate (PCL). We followed up the patients for at 6 months. As outcome measures we used American Knee Society Score (KSS), range of movement, stability and subjective improved function of the patient.

**Results:** The outcome scores were comparable. There were no statistically significant differences in the knee scores and range of motion of the 2 groups. In all cases the knee scores improved from poor (average 38 points) to good (average 87 points). All knees were stable. Five patients had partial intra-operative iatrogenic damage of the PCL.

**Conclusion:** From the literature it is difficult to find any concrete difference in the clinical outcome when these 2 different knee replacement designs are compared. Even though the follow up in our cohorts were short our results between the two groups were similar. We however found there was a learning curve and initially not all the posterior ligaments in the PS group were retained successfully. These patients didn't have adverse clinical outcome.

## Paper 89

### Early hip dislocation after primary total hip arthroplasty

**J Wessels, F Garcez, CT Frey**

**Background:** Adverse events after primary arthroplasty surgery are worrying. Mal-positioning of the acetabular components is a factor in early postoperative dislocation after total hip arthroplasty (THA). We used the "safe zone" as described by Levinnek as post surgery quality control.

**Methods:** We analysed 395 consecutive primary TKA done at our institution. We included confounding factors that we assumed as additional risk for early post operative dislocation: age, gender, body mass index, co-morbidities, American Society of Anaesthesiologists (ASA) physical status classification and dementia. All dislocation up to 6 months after surgery were included. We excluded patients that had previous hip surgery, revision hips, dysplastic hips and patients that were referred to us with dislocations. Forty-nine were excluded due to incomplete data. Institutional ethical approval was obtained.

**Results:** Out of the 346 primary hips we had eight early dislocation. Six underwent closed reduction - one patient twice. Two required revision surgery. Of the 8 dislocations 7 were male one female. Average age was 66 years (range 54 to 81). Three patients has an anterior-lateral approach and a 5 posterior approach to the hip. BMI ranged from 23 to 39 with an average of 29. Admission diagnosis for surgery was in 4 cases degenerative arthritis, 2 osteonecrosis of the femoral head, 1 inflammatory arthritis and one neck of femur fracture. Physical status classification according to ASA, five patients had a score of 2, two a score of 3 and one patient had a score of 4. Average cup inclination was 37 degree (range 4 to 52 degree) and average cup ante version 18,5 degree (range 11 to 20 degree).

**Conclusion:** Early hip dislocations are an unpleasant adverse event for the patient as for the surgeon. Cup positioning is combined with the version of the stem and not a good predictor for dislocation. In addition we found that Levinnek's safe zone is too wide. We found chronic personality changes and impaired reasoning as a predisposing factor.

## Paper 90

### Uni-compartmental knee arthroplasty feasibility at a state hospital

**J Wessels, E Thwala, CT Frey, R Greeff**

**Background:** Uni-compartmental knee arthroplasty (UKA) has become more popular in recent years. One of the reasons is that the indications for surgery have changed. The new indication criteria moved away from the fact that a UKA could only be done for anterior-medial wear in an otherwise normal knee. The advantages of a UKA are better proprioception and feel, better range of movement that is not hampered by a post, less "noise" and bone preserving surgery that a UKA could be revised to a primary total knee replacement.

**Methods:** We were wondering why we were not doing more UKA. We used the Oxford criteria as well as the criteria published by Dr Oosthuizen for UKA and retrospectively analysed 150 consecutive knees done at our institution if they were feasible for UKA. Ethics approval was obtained.

**Results:** None of our patients was at the time of surgery suitable for a UKA. We analysed the knees of 52 male and 98 female patients. Mean age was 62 years (range 52 to 78). The BMI was increased in all patients, especially females. All but 3 had co-morbidities. The American Society of Anesthesiologists (ASA) physical status classification was 2 and 3 in most cases. The average BMI was increased to 37,2 for female patients and 34,2 for male patients. The average American Knee Society Score was 38 pre operative. The average Oxford Knee Score was 11,6 (range 7 to 24). Twenty eight patient fulfilled partially some criteria but not all. Most common exclusion criteria were advanced tri-compartmental arthritis, increased BMI and instability.

**Conclusion:** At the time of surgery we did not find patients that would have been feasible for a uni-compartmental knee arthroplasty at our institution. The reason is most likely our rather long waiting list. At first presentation the patient might very well be a candidate for uni-compartmental knee arthroplasty. Unfortunately by the time of surgery the disease has rapid progressed.

## Paper 92

### Survival and functional outcome of roof graft for severe acetabular dysplasia with cemented socket fixation: 12 to 22 year follow up

**RJ Immelman, ND Clement, D MacDonald, SJ Breusch, CR Howie**

**Background:** The long-term survival and functional outcome of autologous structural grafts to reconstruct acetabular defects

in patients with developmental dysplasia in combination with a cemented socket as part of a total hip arthroplasty (THA) is not known.

**Purpose:** The primary aim of the study was to describe the survival of a cemented socket with autologous roof graft at a minimum of 12 years follow up. The secondary aims were to assess functional outcome, patient satisfaction, radiographic loosening and outcome of revision surgery (was the roof graft incorporated).

**Patients and methods:** We reviewed 62 patients (74 hips) who had undergone cemented THA with an autologous acetabular roofgraft with a median follow-up of 16.6 (range 12-23) years. Mean age at surgery was 45 years (range, 19–71 years). Patients note and radiographs were reviewed retrospectively for revision and lysis (Delee and Charnley). Functional outcome was assessed using the Oxford hip score (OHS), Short form (SF-) 12 and Forgotten joint score (FJS).

**Results:** Six hips were revised for aseptic loosening of the socket. All roof grafts had fully incorporated at time of revision. One patient

at time of revision had marked lysis of the socket with erosion of the roof graft. The 10 year survival was 98.6% (95% confidence intervals (CI) 92.5 to 100) and at 15 years was 95.3% (95% CI 88.1 to 100). The functional outcome and radiographic assessment will be presented.

**Conclusions:** Autologous roof graft with cemented socket as part of THA for patients with acetabular dysplasia offers excellent survival in the mid term. Incorporation of the roof graft facilitates revision of the socket.

## Paper 93

### Access to health care for osteoporotic hip fracture patients in South Africa - Part of the FRAX Multicenter study

**K Jordaan, S Dela, M Lukhele, F Paruk, A Kalla, M Conradie, B Cassim**

**Purpose of the study:** The larger study aim is to determine the ethnic and gender specific incidence of hip fractures in South Africa (SA) and to understand the burden of the disease in our multi-ethnic population. The specific purpose of this study was to document the access to health care for this specific population group and to document time between injury, admission and surgical treatment.

**Methods:** A prospective multi-center observational study was conducted in Gauteng, KwaZulu-Natal (KZN) and the Western Cape (WC). All patients  $\geq 40$  years presenting with an osteoporotic hip fracture to both public and private sector hospitals within the defined geographic areas were captured by trained fieldworkers. Traumatic and pathological fractures were excluded. Data were recorded from April 2017 – December 2017. Additional data captured include time of fall, time of admission and time of surgery.

(SUN HREC N15/09/085)

**Results:** A total of 2115 patients (n=682 male; n=1433 female) were included. KZN n=826, Gauteng n=426 and WC n=863 patients. Of these, 1412 (66.7%) were treated in public hospitals and 701 (33.2%) in private hospitals. The median time from fall to admission to hospital was 15 h, whilst the median time from admission to surgery was 95.4 h (nearly 4 days). Finally, the median time from fall to surgery was 124 h (>5 days). These times were significantly longer in the public sector compared to private hospitals.

**Conclusion:** Morbidity and mortality for osteoporotic hip fractures are known to be very high and international data suggests the biggest modifiable risk factor to reduce this morbidity and mortality to be the time between fractures to surgery. Public health care hospitals have different barriers to surgery than private health care hospitals in SA to address the delays but this study nonetheless highlights areas to be improved. This is the largest and most representative data on incidence of osteoporotic hip fractures in SA.

## Paper 94

### Perthes Disease – Valgizing Osteotomy

**A Naidoo, MN Rasool**

**Background:** The main aim of operative treatment in Perthes disease is containment of the femoral head and preventing further deformation. For advanced Perthes, or a noncontainable head, salvage procedures involving osteotomies of the pelvis or proximal femur have been described. Within this noncontainable group is a subset of patients who present with hinge abduction, and a large flattened head which is laterally subluxed. In this group of 18 patients we evaluate the use of a valgizing osteotomy stabilised with an intermediate pin and plate, and the radiological and clinical outcomes.

**Methods:** Eighteen patients with Perthes Disease were included in this study. They all presented with a painful short limb gait, a fixed

flexion deformity of the hip and hinge abduction. They were treated between 2007 and 2017 by adductor tenotomy, a closing wedge valgizing osteotomy, derotation to neutral was performed to correct any external rotation deformity, and extension to correct flexion deformity - a pin and plate was applied. Strict non weightbearing post op was enforced by a uslab spica, or in an older child by a period of skin traction followed by non weightbearing with crutches.

**Results:** There were 13 boys and 5 girls. Hinge abduction was not present post osteotomy on the table. The leg length discrepancy improved by 1.5- 2cm in all patients, with a gradual improvement of hip range of movement. Two patients also had a shelf osteotomy to improve containment of the head. Radiographs show improved remodelling of the femoral head with an increase in the neck shaft angle. The pin and plate was removed at one year.

**Conclusion:** The valgizing osteotomy is a useful salvage procedure to improve outcomes in Perthes Disease.

## Paper 95

### The effect of lateralisation on reverse shoulder arthroplasty outcomes - a biomechanical study

**JG Glenday, S Roche, T Rosch, S Sivarasu**

**Background:** It has been suggested that lateralisation can improve the functional outcomes of reverse shoulder arthroplasty. This study makes use of a biomechanical shoulder model to investigate the changes to the reverse shoulder through lateralisation of the glenosphere and humerus.

**Methods:** The reconstructed scapula and humerus from 15 CT scans were used to customise a 3D biomechanical model of the shoulder. Each model underwent a virtual surgery using the Delta XTEND, which was 3D reconstructed from an explant. 3 configurations were tested: the default location with no offset and 2 offset locations (10 mm of glenosphere lateralisation and 5 mm of humeral lateralisation, which was achieved via medialisation of the humeral tray). Impingement-free range of motion (IFROM) and mean deltoid muscle force were measured during abduction and forward flexion.

**Results:** During both motions, glenosphere lateralisation increased both outcome measures. During abduction, IFROM increased by 50.3° (95%CI: 41.8, 58.9) and mean deltoid muscle force increased

by 16.6 N (95%CI: 41.8, 58.9). During forward flexion, IFROM increased by 27.1° (95%CI: 20.9, 33.4) and mean deltoid muscle force increased by 11.4 N (95%CI: 8.7, 14.1). Humeral lateralisation had no effect on IFROM and decreased mean deltoid muscle force during both motions. Mean deltoid muscle force decreased by -17.1 N (95%CI: -20.3, -14.0) and -1.7 N (95%CI: -2.5, -0.9) for abduction and forward flexion, respectively.

**Conclusion:** This study has highlighted that glenosphere lateralisation can improve IFROM at the expense of increased effort required by the patient. Whereas, humeral lateralisation can decrease the effort required by the patient and has no effect on IFROM. These results provide insight into the functional changes due to lateralisation of the prosthesis.

## Paper 96

### *Ethnic and gender specific incidence rates for hip fractures in South Africa - A multicentre study*

**K Jordaan, S Dela, F Paruk, M Lukhele, A Kalla, M Conradie, B Cassim**

**Background:** To determine ethnic and gender specific incidence rates of hip fractures in South Africa (SA) and to understand the burden of the disease in our multi-ethnic population. The secondary purpose is to develop a FRAX® base model for SA.

**Methods:** A prospective, multi-centre, observational study was conducted in Gauteng, KwaZulu-Natal and the Western Cape. All patients ≥40 years presenting with an osteoporotic hip fracture to both public and private sector hospitals within the defined geographic areas were captured between April 2017 – December 2017 by trained fieldworkers. Traumatic and pathological fractures were excluded. (HREC N15/09/085)

**Results:** A total of 2115 patients (n=682 male; n=1433 female) were

included of African (n=563, 26.6%); Coloured (n=384, 18.2%); Indian (n=284, 13.4%) and White (n=882, 41.7%) ethnicity. Women were significantly older than men in the total and each ethnic group (p<0.001). Additionally, White subjects were significantly older (p<0.001) and Africans significantly younger (p<0.001) than other groups. Differences in the gender- and ethnic-specific, age-adjusted incidence rates were observed: in women, the highest incidence rate was noted in Whites (164.8 per 100 000), followed by Indians (128.7 per 100 000) with the lowest rates in Coloured and African women (61 and 36.7 per 100 000, respectively). A similar pattern was seen in men albeit at lower rates, with the highest rate in White men (73.1 per 100 000). An increase in the relative risk with increased age in the i) total cohort, ii) in women, and iii) in White, Indian and Coloured women was observed.

**Conclusion:** Hip fractures occur in all ethnic groups at higher rates than previously thought. Differences in the ethnic specific incidence rates suggest that ethnic specific FRAX® models are required for South Africa.

## Paper 97

### *Optimisation of reverse shoulder arthroplasty through the combination of prosthesis placement modifications - a biomechanical study*

**JD Glenday, S Roche, T Rosch, S Sivarasu**

**Background:** It is hypothesised that an optimised placement of the reverse shoulder prosthesis can be obtained. This study makes use of a biomechanical shoulder model to investigate the changes to the reverse shoulder through the combination of glenosphere eccentric placement, humeral tray placement, humeral tray depth decreases and augmentation of the greater tuberosity (which increased its effective radius).

**Methods:** The reconstructed scapula and humerus from 15 CT scans were used to customise a 3D biomechanical model of the shoulder. Each model underwent a virtual surgery using the Delta XTEND, which was 3D reconstructed from an explant. 144 configurations were tested in each model: the default location with

no offsets and 143 offset locations that systematically combined the 4 types of modifications and their associated altered placements. Impingement-free range of motion (IFROM), mean deltoid muscle force and glenohumeral joint stability were measured during abduction and forward flexion. A score between -1 to 1 was assigned to each combination of offset configuration and outcome measure, for a given motion. This score was based on the offset configuration's effect relative to the default and, consequently, a maximum score of 6 was obtainable.

**Results:** The range of scores achieved was 0 to 4.5. The maximum score was achieved by combining a 5 mm inferior glenosphere translation, a 2.5 mm medial humeral tray translation and a 5 mm augmentation to the greater tuberosity. It was also observed that this result was not sensitive to decreases in humeral tray depth.

**Conclusion:** This study has demonstrated that placement of the reverse shoulder prosthesis can be modified to optimise functional outcomes. That being said, the optimal configuration was unable to maximise all 6 outcome measures and obtained an overall score of 4.5 (75%).

## Paper 98

### *A clinical audit of ankle fractures presenting to an academic hospital and its subsequent burden of care*

**F Ahmed**, JRT Piertzak, S van De Venter, F Ahmed

**Background:** Ankle fractures are one of the most common fractures presenting to accident and emergency units in South Africa. The aim of the study was to retrospectively analyse the epidemiology of patients presenting to a Tertiary level academic hospital and its subsequent burden of care. This included determining basic demographic data, length of hospital stay, mechanisms of injury, implants used, 30 day readmission rate and the overall cost of an admission of an ankle fracture to both the hospital and the patient.

**Results:** There were 104 patients presenting between October 2017 and March 2018. Of these, 51 were female and 53 were male patients. The average age of patients sustaining ankle fractures was 53 years.

Each fracture was classified according to the Danis weber classification and the Hersovici classification if the posterior malleolus was involved. Of the 104 patients admitted 18 were classified as Danis Weber A, 60 were classified as Danis Weber B and 26 were classified as Weber C. The mechanisms of injury included Fall From height, Pedestrian Vehicle Accidents, Motor Vehicle Accidents, Sports related accidents as well as simple falls. The average time to surgery was 9.5 days. 44 percent of patients was operated on an emergency list after hours and 15 percent were operated during working hours. 6 percent of patients was operated on by consultants during elective list surgery. The implants used to maintain reduction included 64 precontoured locking plates, 8 Semitubular plates and 32 DCP plates. The average length of hospital stay was 10.2 days. 6 patients were readmitted within 30 days of admission, all for wound related complications.

**Conclusion:** Ankle fractures present a significant burden on orthopaedic health care provision at Tertiary level Academic hospitals. A definite trend is emerging for the use of locked precontoured plates which as dramatically increased the financial burden. Better health care policies may alleviate this burden whilst still insuring proper care of ankle fractures.

## Paper 101

### *Correlation between acute pain relief and platelet counts of intra-articular platelet injections for osteoarthritis of the knee*

**AW Maina**, BR Gelbart, P Firer

**Background:** Intra-articular administration of platelet rich plasma (PRP) for pain management has been described for the management of osteoarthritis of the knee (OAK). There are several techniques employed to prepare PRP, resulting in varying platelet concentrations. Pain relief from PRP administration has also been variable. As there is no local anaesthetic or immune modulatory mechanism employed, patients often enquire about the impact of PRP on their pain. We evaluated the acute effect on pain and the relation to platelet count.

**Hypothesis:** PRP injections provide acute pain relief in OAK. There is a relationship is between pain relief and PRP platelet count.

**Study design:** Prospective cohort study

**Methods:** Outpatients with OAK, received three PRP injections, a week apart. Pain was quantified at baseline, and a week following every injection for each knee using the Visual Analog Scale (VAS). Whole blood platelet counts (WBPC) and PRP platelet counts were done prior to and post processing of the patients blood.

**Results:** Forty six patients (63 knees) with an average age of  $66.43 \pm 14.27$  years participated. 73% of knees had OAK Kellgren and Lawrence grade (KLG) 3 or worse in one or more compartments. Mean baseline VAS was  $6.5 \pm 3.24$  and significantly abated with a mean decrease of  $3.31 \pm 2.94$  cm over the course of treatment in all participants ( $p < 0.05$ ). A Minimal Clinically Important Difference of  $\geq 15$ mm was observed in 75% of the patients at the last visit (range: -80mm – 25mm). Platelet counts of  $260.18 \pm 72.35$  (WBPC) and  $366.11 \pm 130.49$  (PRP) were observed, with a percentage change of 36.41% (range: -31% - 113%). Improvement in pain was no related to change in platelet count.

**Conclusion:** PRP injections improve pain in the first two weeks of treatment. The improvement is not related to platelet count.

## Paper 102

### *The influence of shortening on clinical outcome in healed, displaced, midshaft clavicle fractures after nonoperative treatment*

**E Goudie**, ND Clement, IR Murray, M Wilson, CM Robinson

**Background:** The association between clavicular shortening and shoulder function following displaced midshaft clavicle fractures remains controversial. This study evaluates the effect of clavicular shortening, measured by three-dimensional CT, on functional outcomes and patient satisfaction following nonoperative treatment of displaced midshaft clavicle fractures up to one year following injury.

**Methods:** The data used in this study were collected as part of a multicentre prospective randomised control trial comparing open reduction and plate fixation with nonoperative treatment for displaced midshaft clavicle fractures. Patients randomised to nonoperative treatment and who healed by one year were included in the present study. Clavicle shortening relative to the contralateral uninjured clavicle was measured using three-dimensional CT. Outcome analysis was conducted at six weeks, three months, six months and one year following injury and included the DASH, Constant and SF-12 scores, and patient satisfaction.

**Results:** The mean shortening of injured clavicles, relative to the contralateral side, was 11mm (+/- 7.6mm) with a mean proportional shortening of 8%. Proportional shortening of the clavicle did not

significantly ( $p=0.84$ ) correlate with any functional outcome score at any follow-up time point. Assessment of satisfaction at one year also failed to demonstrate a significant difference in clavicle shortening between satisfied and unsatisfied patients.

*Conclusion:* This study has shown no association between shortening and functional outcome or satisfaction in patients with

healed displaced midshaft clavicle fractures. Caution should be exercised in using shortening to inform treatment decisions to avoid exposing large numbers of patients who would otherwise regain good shoulder function without intervention to potential surgical complications.

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## Paper 108

### *The timing of arthroplasty for femoral neck fractures: A three-year audit at Central Academic Hospital*

**FC Conradie**, G Pienaar, K Jordaan, M Burger

*Background:* Displaced femoral neck fractures are frequent, represent a great health care problem, and have a significant impact on healthcare costs. The type of hip arthroplasty depends on the physiological age and patients level of activity and include unipolar or bipolar hemiarthroplasty (HA) and total hip arthroplasty (THA). Numerous studies advocate early operative treatment to reduce morbidity and mortality. The purpose of this audit is to assess our patient cohort in terms of time to surgery and compare it with the literature.

*Methods:* A retrospective audit was done of all adult patients with femoral neck fractures treated with arthroplasty at a single

academic hospital from January 2015 to December 2017. Data captured was: demographics, time to admission and surgery, type arthroplasty and mortality. Ethics Reference #: N18/03/029

*Results:* A total of 338 patients (101 males and 237 females), with a mean age of 78 years (range 46–103) were included. Average time from injury to admission was 10 days, with average time to surgery from admission being 155 hours. Total hip replacement was used in 181 patients (53%), a Cemented Bipolar in 124 patients (37%) and 33 (10%) Cemented Thompsons.

*Conclusions:* The burden of femoral neck fractures is tremendous. “Time to surgery” is one of the modifiable risk factors that can decrease the morbidity and mortality associated with this injury. We report on the surgical waiting time in our cohort of patients, which is much longer compared with international data.

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## Paper 109

### *Shoulder pain in elite cricketers : an under-reported injury*

**J Gray**, M Dutton, N Tam, S Roche

*Objectives:* To determine the incidence and prevalence of shoulder injury in elite South African cricketers.

*Design:* Prospective longitudinal cohort study

*Methods:* 105 elite South African cricket players were evaluated for previous shoulder injury and present shoulder function using the Kerlan- Jobe Othopaedic Clinic Shoulder and Elbow Score (KJOC score) prior to the start of the season. Non-contact dominant shoulder injuries were monitored throughout the season.

*Results:* During the 2016/2017 season, 18% (95% CI: 0.11 – 0.25) of cricketers sustained a non-contact dominant shoulder injury

during the 2016/2017 season. Injury risk was shown to double with a history of previous shoulder injury. Those cricketers who had a history of previous shoulder injury demonstrated significantly lower pre-season KJOC scores ( $p = 0.001$ ) indicating reduced shoulder function at the start of the season. Eleven injuries occurred during matches, while seven occurred during cricket specific training. The highest injury incidence occurred during five-day test matches for the National squad at a rate of 4.1 shoulder injuries per 1000 player hours. Overall the national players were approximately 17 times more likely to develop a shoulder injury in the 2016/2017 season than the franchise squad players (annual incidence of 3.04 compared to 0.18).

*Conclusion:* Shoulder injury incidence in cricket is severely understated. A greater focus on preventative programmes to reduce injury are warranted.

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## Paper 110

### *How did the introduction of global fee for arthroplasty affect my practice?*

**BR Gelbart**, M Street, P Firer

*Background:* Alternative reimbursement models (ARM's) is the buzzword in arthroplasty. This has manifested in the global fee arrangements proposed and implemented by a number of healthcare funders. We undertook a trial of a combined surgeon/funder managed reimbursement model implemented in our knee arthroplasty practice. We chose to implement a plan whereby the variable fees would be the hospital fee and the surgeons fee and

that these would be renegotiated at 6 month intervals.

We hypothesized that our practice would become more cost efficient without a change in short term outcomes.

*Methods:* We retrospectively reviewed a sample of cases from before implementation of the global fee arrangement and compared that to the cases done post implementation of the global fee arrangement. We then subdivided the “post” cases into those cases who were included into the fee arrangement and those who were performed at the same time on a fee for service basis. We assessed duration of hospital stay, theatre time, theatre costs and readmission rates and short term post-operative complications.

**Results:** This is a current ongoing study and we continue to collect results and currently our numbers are too small to draw conclusions.

However, we do believe that due to the interest, controversy and pressure that this new model is placing on all stakeholders, that we should present our data at this meeting.

**Conclusion:** Global fees and alternative reimbursement models are being implemented by funders. We feel that as the surgeons we should be critically analysing our data and discussing how we can ensure safety and sustainability of these models.

## Paper 111

### High incidence of lucent lines on post-operative radiographs of short femoral stems

**L Mokete**, JRT Pietrzak, K Sikhauli, D van der Jagt

**Background:** Short cementless femoral stems in hip replacement surgery are an attractive concept because of the potential for bone preservation. However, there is concern about the stability of the short prosthesis and implantation can be more technically challenging than in a standard length prosthesis.

**Methods:** We initiated a prospective randomized trial to study blood metal ion levels in total hip replacements with either a monolithic or a modular neck short femoral stem of the same design (Smith and Nephew SMF and SMF modular stems). To the best of our knowledge these are the only femoral stems of the same design that were available in monolithic and modular neck forms. The stems were coupled to 36mm Oxinium heads and all patients received a metal acetabular shell with a highly cross-linked polyethylene liner. The aim of the study was to determine the contribution of the neck modularity to blood metal ions.

**Results:** The trial was stopped prematurely after recruitment of 17 patients (8 modular, 9 monolithic, 11 females, average age 61

years, range 39-73) because of a high incidence of post-operative radiolucent lines around the femoral stems. The lucent lines were seen in both the monolithic and modular neck stems. They became evident at six months and continued to progress at two years follow-up. All but two patients (modular stems) had radiolucent lines on radiographs in more than one zone at two years follow-up. Sepsis work-up was negative.

The primary diagnosis was osteoarthritis in 13 patients, osteonecrosis in two and neck of femur fracture in two patients. The patients remained active with UCLA activity scores of six or higher at one and two year follow-up excepting one patient with a score of 5 who underwent revision surgery before the two years follow-up. Average two years blood ion levels for the modular stem were 13.04nmol/L (Chromium) and 35.14nmol/L (Cobalt) and 5.58nmol/L (Chromium) and 3.16nmol/L (Cobalt) for the monolithic stem.

**Conclusion:** We report an unexpected high incidence of radiolucent lines in both the modular and monolithic SMF short stems following total hip replacement. The modular stem has subsequently been recalled but we would urge caution in the use of the monolithic stem.

## Paper 112

### Cadaver validation study of computer model for insertion site of latissimus dorsi tendon transfers

**S Thompson**, S Roche, S Sivarasu, D Henderson

**Background:** Latissimus dorsi (LD) tendon transfers have been shown to be an effective treatment for massive or irreparable tears posterior rotator cuff tears. This procedure can have unpredictable outcomes This may be due to different suggested insertion sites used for the LD tendon transfer.

**Aims and Objectives:** The aim of this study is to use a cadaver study to validate a previously completed computer model simulating LD tendon transfer using different insertion points on the humerus.

**Methods:** 4 fresh frozen cadaver torsos (8 shoulders) were mounted into a specifically designed rig. The LD was transferred to 7 points of the humeral head. The strain generated by the humerus

in rotation on the clamps was measured at 0° and 90° of forward flexion for each point. The results were analysed using a One-Way Anova with post hoc Tukey test. The cadaver and *in-silico* results were compared by scaling the *in-silico* results to be overlaid on the cadaver results and then visually compared.

**Results:** The maximum rotation load was generated at Point 1. The second most optimal set of points for generating rotation were points 2,3, and 6. Points 4 - 6 were not significantly different from one another, but were all significantly different from points 1 - 3 ( $p = 0.00$ )

**Conclusions:** The cadaver study confirmed the *in-silico* model that the lesser tuberosity is the optimal point for maximum rotation strength at 0° of flexion and no flexion strength. For maximum rotation strength and no flexion throughout the motion of flexion, the face of the greater tuberosity is the optimal point. For maximum rotation throughout the flexion moment and flexion strength at low angles, points 4 and 5 (the posterior edge of the greater tuberosity) is the optimal point.

## Paper 113

### Early South African experience with robotic joint replacement surgery

**L Mokete**, JRT Pietrzak, E Hoosen, K Sikhauli, D van der Jagt

**Background:** The ultimate joint replacement would be one that consistently satisfies the expectations of the patient and outlasts the patient. Modifications in prosthesis design, implant materials and implantation techniques have all contributed in helping us to

get closer to the ideal joint replacement. Robotic assisted joint replacement surgery is the latest technology introduced to improve implantation of hip and knee prosthesis. We have had access to this technology since November 2016 and we report our early experience.

**Methods:** We retrospectively studied all patients who underwent total hip or uni-compartmental knee replacement surgery using the MAKO robotic assisted arm (Stryker) and unicompartmental knee replacement and total knee replacement using the NAVIO robotic guided hand-held platform (Smith and Nephew). The MAKO workflow requires a pre-operative CT scan and the NAVIO uses image based real time hand held CT free technology.

**Results:** 15 total hip replacements and 13 unicompartmental knee replacements were done using the MAKO robotic arm. Four total knee replacements and four partial knee replacements were

done using Navio technology. The pathology in the hips replaced consisted of osteoarthritis in the main but also included protrusio and dysplasia. Average surgical time for the MAKO hip replacements was 120 minutes (69 – 138mins). The average time for the MAKO unicompartmental knee replacement was 124 mins (105-157mins). Cup placement was within 2 degrees of planned orientation (inclination and version) and limb alignment was within 3 degrees of planned alignment in all cases. There were intra-operative registration error conflicts in two hip replacements. These were resolved with satisfactory completion of the cases. There were no adverse events.

**Conclusion:** Both technologies were associated with a learning curve and increased operative time was the consequence. In addition, there was a price premium for using the technology. However, we achieved consistently accurate placement of implants. We found the MAKO technology especially useful in the planning and execution of complex hip replacements.

## Paper 114

### Grip strength following total wrist arthrodesis- a prospective study

A Alexander, O Koch, TLB le Roux

**Background:** To determine the change in grip strength and patient reported outcome measurements postoperatively, as compared to the same side preoperative values, in subjects undergoing total wrist arthrodesis.

**Methods:** This prospective study included patients with wrist arthritis (inflammatory arthritis excluded), aged from 19 to 86 with a minimum follow up of 1 year. Grip strength was measured preoperatively and at least 1 year postoperatively using the Jamar (Patterson medical) dynamometer in the standardised method, as part of a set protocol. Functional outcomes were assessed by the Disabilities of arm, shoulder and hand (DASH) scores, completed preoperatively and at 1 year postoperatively.

The differences in measurements were assessed using a paired samples T- test, as well as the percentage changes between measurements.

**Results:** 20 Patients were analysed, with 15 patients having surgery on the right and 5 on the left, with a mean age of 48,05 (+-67). The mean percentage gain in postoperative grip strength was 111,3% (P<0,01; CI 95%) and 449,9% (P<0,035; CI 95%) on the right and left respectively. The mean improvement in DASH score was 27,3 (P<0,0000006; CI95%). Further analysis revealed mean postoperative grip strengths, to within 5% (+-87,2) and 19% (+-48,1) of age related normative values, on the right and left respectively. The analysis of the nonoperative sides showed a mean grip strength increase of 24% (+-276).

**Conclusion:** The results of this study show that total wrist arthrodesis, when performed in subjects with wrist degeneration other than inflammatory arthritis, is associated with improvement in grip strength and patient reported outcome.

## Paper 116

### Combined use of acute and gradual correction with the external fixator in Blount's disease

KS Bila, MA Morule, RG Golele

**Background:** The treatment of Blount's disease could be challenging and diverse. There are numerous surgical methods in the treatment of this condition. Moreover, no one method could be perceived as superior to the other. The use of external fixator is becoming popular to address complex deformities. Gradual correction has been used with good outcome. However, in severe deformities, this method could mean a prolonged period in a frame and incomplete correction due consolidation before full correction is achieved. Acute correction only could predispose to compartment syndrome. The combination of the two methods mitigate complications associated with the use of each method alone.

**Aims and Objectives:** To determine the effectiveness of the combined acute and gradual correction with the external fixator in Blount's disease in terms of correction, union and complications.

**Methods:** A retrospective study was conducted where the records and X-Rays of the patients treated using the combined acute and

gradual correction were retrieved. From 2013 to 2017 a total of 17 patients were surgically treated for Blount's. Eight patients met the criteria for they were treated using the combination of the acute and gradual correction methods (7 had bilateral Blount's, however one patient with bilateral disease, had one limb treated by the said combination). The degree of correction of varus was assessed on pre-operative and post-correction X-rays. Internal rotation deformity correction and limb length inequality were assessed clinically. Complications such as neurovascular compromise, minor and major pin tract infection and hardware complications were documented. The pre-operative planning, surgical technique and post-operative treatment protocol is reviewed.

**Results:** The varus ranged from 20 degrees to 45 degrees. The correction ranged from 5 degrees to -7 degrees. The Internal rotation was corrected to between 5° to 10° of external rotation in all patients. The mean time in the frame was 90 days. One patient had residual varus of 8 degrees, three patients had peroneal palsy that recovered fully, and one patient needed an additional acute correction due to struts loosening. One patient needed surgical debridement of the osteotomy site due to infection.

**Conclusion:** Combined acute and gradual correction using the external fixator for severe Blount's is effective and could shortened the treatment period.

## Paper 117

### Survivorship of patients who underwent forequarter amputation of the upper limb for tumour treatment

**KS Bila, W Steenkamp, MA Morule, RG Golele**

**Background:** Forequarter amputation is one of the surgical treatment of advanced cancer involving the proximal humerus. The procedure leaves both surgical and emotional scars. There are times where both the surgeon and the patient are left with no other option of treatment modality.

**Aims and Objectives:** To look at the survivorship and patient satisfaction following this treatment method.

**Methods:** A retrospective study was conducted where the records and X-Rays of the patients treated for proximal humerus

malignancies by way of forequarter amputation. During the period 2015 to 2017 a total of three patients were treated for proximal humerus malignant tumours. The patients were assessed with respect to their quality of life post-surgical intervention.

**Results:** There were three female patients aged 7, 11 and 27 years respectively who presented with stage IV malignancy. They were clinically assessed and investigated appropriately. The histological findings: 2 were osteosarcoma and one was a chondrosarcoma. Those with osteosarcoma had lung metastasis at presentation. The indication for surgery was for palliation as the disease was advanced. They all underwent the procedure. The osteosarcoma patients were subjected to chemotherapy before and after surgery. The follow up period ranges from 8 to 32 months. They are all still alive and reported better quality of life for the pain is well controlled.

**Conclusion:** This surgical modality could still be used in advanced malignant disease.

## Paper 118

### Superior capsule ligament reconstruction: results at one year

**NP Bhagwan**

**Background:** To assess the clinical and radiological results of the first 11 patients who underwent superior capsular reconstruction using a porcine patch

**Methods:** 11 patients who were operated on for irreparable supraspinatus tears between 2015 and 2017 were followed for a minimum of 12 months using a variety of clinical scores and MRI.

**Results:** All patients showed improvements in pain and Range of motion. However, there was no significant gains in strength. MRI detected presence of the graft at one year but no improvement in the acromio-humeral distance. No significant complications were noted.

**Conclusion:** Superior capsule reconstruction provides another safe option for the treatment of irreparable supraspinatus tears. The indications remain to be defined.

## Paper 120

### Medium term outcomes of two versions of guided motion total knee replacement design

**N Sikhauli, N Sikhauli, L Mokete, TRJ Pietrzak, K Nokweyi, R Kgabo, DR van der Jagt**

**Background:** The Journey total knee replacement was introduced as a new class of knee replacement prosthesis designed to simulate normal knee kinematic. In vivo studies demonstrated that the bicruciate substituting design did not have paradoxical anterior shift which was common with earlier designs of contemporary knee replacement. Furthermore, there was enhanced posterior femoral rollback in keeping with normal knee kinematics. However, the Journey knee replacement was subsequently recalled because of adverse events, complication specific to this design included instability and iliotibial band friction syndrome. The design was modified with the introduction of Journey II knee replacement. We had the unique opportunity of implanting both The Journey and Journey II in the context of a controlled trial.

**Material and Methods:** We studied the outcome of patients that were entered into a controlled randomised trial single blinded to compare implant alignment with and without the use of computer-assisted navigation system following total knee arthroplasty. The trial commenced February 2011 and ended August 2013. Pre-operative knee, functional and WOMAC score were documented.

Standard post-operative knee follow-up was adhered to and post-operative knee scores were completed as a standard practice in our clinic.

**Results:** 140 eligible patients were enrolled to the trial, 67 Journey and 77 Journey II. 109 patients were traceable with 16 confirmed dead at a minimum of 5 years' follow-up, further 3 patients were excluded because they had moved cities and had only followed up once since operation. Journey and Journey II pre-op knee score averaged 38 (9-63) and 39 (10-66) respectively and their functional score mean 61 (5-85) and 63 (10-95) respectively. At 6 years' minimum follow-up Journey and Journey II knee score mean 88 (22-105) and 73 (24-99) respectively and their functional score mean 75 (5-103) and 67 (5-100) respectively. There was also a significant improvement in WOMAC score. The complication ranged from dislocations, periprosthetic fracture, periprosthetic joint infection, medial collateral rupture, and extensor mechanism disruption.

**Conclusion:** There were slightly more revision cases in Journey compared to Journey II especially dislocation at 16 months, but equitable non-implant specific complications. The knee functional score plateaued at 12-18 months post operation and there was no significant difference or both groups at average 6 years (64-86 months) follow-up. This would suggest that the Journey knee cases that were not complicated by instability do as well as Journey II beyond 18 months and further.

## Paper 121

### *Distressingly low levels of vitamin D in arthroplasty patients could increase peri-prosthetic infections*

**AA van Zyl**, D Dippenaar, JF van der Merwe

**Background:** Vitamin D has gained increased attention in recent times not only in its role in bone health and calcium homeostasis but also for its role in immunomodulation. Even in sunny South Africa most people avoid the sun or use sunblock creams thus decreasing the skins ability to manufacture this essential vitamin. Elderly patients, who are the group mostly seen for joint replacements, are more prone to having low Vit D levels.

Decreased Vit D has now been implicated as a contributory factor in the incidence of peri-prosthetic infections. All immune cells express Vit D receptors, as well as showing 1 $\alpha$ -hydroxylase activity and supports the differentiation of CD4 & T cells which could explain the decreased immune response and associated increased sepsis risk of patients with low levels of Vit D.

**Methods:** Since January 2017 - March 2018 all patients, who were planned from lower limb joint replacements, were tested for Vitamin D (25 DH cholecalciferol) as part of a general screening for fitness before operations.

**Results:** A total of 451 patients were screened, 166 had hip replacements, 253 had knee replacements. (32 patients were

screened but did not have an operation for various reasons). Of these patients 75 % had decreased Vit D levels (<30ng/ml) with a range of 7 – 50ng/ml. 25,9% had Vit D levels below 20ng/ml, 23,8% had Vit D levels between 20 – 24,9 ng/ml, 25% had Vit D levels between 25 – 29,9 ng/ml, 25% had Vit D levels of 30 and above ng/ml. All patients with levels below 30ng/ml were treated with Cholecalciferol 50,000 IU weekly for 8 weeks as well as B-Cal-D (400 IU Vit D3 and 500mg calcium carbonate) daily preoperatively and were encouraged to continue with B-Cal-D dly for life. No patients developed infection in the time frame of this study. The cost of Vit D lab test(Ampath) = R190.30 and the cost of initial treatment = R 200.00, total costs = R390.30. Of futher orthopaedic interest is that low vit D levels is implicated in osteoporosis, loss of muscle power, as well as effect on neuro inflammatory and neurodegenerative illnesses like multiple sclerosis, neuromyelitis and Alzheimer disease, all of which have an increase of falls and hip fractures which could lead to joint replacements. Prevention of surgical site infections when operation on these patients is of utmost importance. Due to the common low levels of Vit D seen in our patients we propose that all patients who are planned for joint replacements screened for Vit D levels and should be treated prior to, as well as post-operatively with Vit D supplements as a preventative measure for the prevention of peri-prosthetic infections.

**Conclusion:** We believe that this would be a cost-effective test considering the huge costs / morbidity if peri-prosthetic infection should occur.