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FP1

Correlation and comparison of syndesmosis dimension on CT and MRI

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Introduction: Recent published studies have examined the normal dimensions of the syndesmosis on CT. However, previous anatomical studies have shown variations of the articulating facets within the tibialae fibularis and may contribute to the false appearance of increased spacing within the syndesmosis.
In this study, we measured and compared anterior and posterior distances of the distal tibiofibular(DTF) syndesmosis on MRI and CT imaging.
Methods: We identified adult patients who had had both a CT scan and an MRI scan of their ipsilateral ankle to investigate symptoms *unrelated* to the DTF syndesmosis. The anterior and the posterior DTF dimensions were measured on CT and MRI axial images, at the level of the distal tibial physeal scar. This was taken from anterior tubercle of tibia and from the most anterior aspect of the posterior tibial tubercle to the nearest point of medial aspect of the fibula. The geometrical shapes of the syndesmosis and the anterior tibial tubercle were also recorded.
Results: 16 ankles in 15 patients were included. The mean age was 34.6+/-8.8 years. The mean (SD) for the anterior DTF distance was 2.0mm (0.7mm) on MRI and 2.9mm (0.9mm) on CT whilst the mean posterior DTF distance was 3.2mm (1.1mm) on MRI and 4.3mm (1.0mm) on CT. This difference reached statistical significance ($p < 0.001$, paired T-test).
When examining the shape of the syndesmosis on MRI, 56% were crescent and 44% rectangular, this was compared to 69% and 31%, respectively, on CT. There was, however, no statistical difference in the shape of the syndesmosis between the two radiological modalities ($p = 0.625$, McNemar test).
Conclusion: CT appears to over-estimate the distal tibiofibular separation and may lead to a false positive diagnosis. Further studies are needed to establish the reliability in the use of CT scans to investigate normal and abnormal syndesmosis.

FP2

Validating loads going through the lower limbs in various positions during a weight-bearing CT scanner

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Aims: With the advent of standing CT and MRI scans, there is increasing interest in establishing the role and usefulness of these investigations. When ordering a standing investigation, we assume that 100% of body weight is loaded through the limb, but most machines have handlebars for support and some have seats to allow patients the

opportunity to sit. The aim of this study was to evaluate the amount of load going through the lower limbs in various positions supported and unsupported, to explore the range and variation in measurements obtained.
Methods: Following ethics and local IRB approval, 40 healthy volunteers were asked to stand on an electronic weighing scales and be measured for height. They were then asked to stand on an identical electronic weighing scale on the PedCAT standing CT. Their weight was measured single and double leg stance, with the hands supported and unsupported on the side bars. The subjects were then asked to sit with a single and then both legs on the scale.
Results: 40 subjects participated. 28 were female, average BMI 25.8 (4.98). By holding on to the hand rails between 10-20% (2.0) of body weight was removed. Single stance meant 85% (4.0) of body weight went through the single limb and by sitting, with the single limb on the scanner only 8.8% (2.3) of body weight goes through the limb.
Conclusions: Standing CT and MRI are increasing in popularity. We now know that in standing the majority of body weight is transferred to the limbs, but if the subject is holding onto support up to 20% of body weight is removed. If the subject is sitting then only 9% of body weight goes through the single limb. This information will help inform future studies that use weight bearing MRI or CT.

FP3

Early evaluation of a cone based weightbearing CT scanner in foot and ankle patients

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Introduction: Cone Based CT (CBCT) scanning uses a point source and a planar detector with parallel data acquisition and volumetric coverage of the area of interest. The pedCAT (Curvebeam USA) scanner is marketed as a low radiation dose, compact, faster and inexpensive CT scanner that can be used to obtain both non- weightbearing and true 3 dimensional weightbearing views.
Method: A review of the first 100 CBCT scanning in our unit has been performed to assess ease of scanning, imaging time, radiation dose and value of imaging as opposed to conventional imaging.
Results: A pedcat CT scan was available within minutes of the request, similar to plain radiographs but much earlier than a 6 week delay for a patient to attend a new appointment for a conventional CT. All patients returned to see the clinician for a clinical decision in the same NHS clinic and did not require a new clinic visit; illustrative cases include fracture/ subluxation detection, surgical planning, extent of arthritis and 3D assessment of union of arthrodeses.
All patients were able to transfer to the scanner with ease and the imaging time was 10 times than a conventional CT.The radiation dose to the patients was 9% that of a full gantry system.
Weightbearing CT scanning enabled a 3D evaluation of reduction of joint space and ankle/ hindfoot alignment. Anterior ankle and sesamoid impingement have been diagnosed in patients with previously obscure pain
Conclusion: 3D Cone Beam imaging has been found to be easily accessible, rapidly performed and safer to the patient in providing a lower radiation dose. Weightbearing

3D imaging provides additional diagnostic information.

FP4

Does the presence of intra-articular pathology affect the outcome following modified Brostrom repair for lateral ligament instability of the ankle?

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Aim: Ankle sprains are one of the most common sports injuries. Around 10 -20 % of the acute ankle sprains may lead to the sequelae of chronic ankle instability. Around 15-35% of the patients have residual pain following successful lateral ligament reconstruction. One of the reasons suggested for the persistent symptoms following lateral ligament reconstruction has been the presence of intra-articular pathology.
Methods and materials: We performed ankle arthroscopy on all patients undergoing the modified Brostrom repair and compared patients with associated intra-articular pathology to those without any intra-articular pathology.
Results: A total of 35 patients underwent the modified Brostrom procedure during the study period. 11/25 patients were found to have associated intra-articular pathology. The average age for both the groups was 33 years. The average follow-up duration was 75 months and 71 months for the intra-articular pathology group and the normal articular groups respectively. The difference in the SAFAS (Sports athlete foot and ankle score) was statistically better in the group without any intra-articular pathology (93.7 compared to 71.6, p-value < 0.05)
Conclusions: The patients who have an associated intra-articular pathology whilst undergoing the stabilisation of lateral ligament instability of the ankle have a slightly poorer outcome compared to those without any intra-articular pathology
Secondly, the SAFAS scoring system seems to overcome the ceiling effect seen in other scoring systems when used for the athletic population.

FP6

Does intra-osseous fixation with the IO FiX improve force and contact area in foot and ankle fusions?

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When inserting a lag-screw across an arthrodesis, stress is concentrated under the screw head risking asymmetrical force distribution and fracture of the cortical bone bridge. The IO FiX (Extremity Medical, NJ USA) is a new intraosseous device comprising an X-Post on one side of and parallel to the arthrodesis and a lag-screw inserted through the head of the X-Post which reinforces the cortical bone bridge**.** The X-Post behaves as an internal washer improving force distribution across the arthrodesis. Being

intraosseous, near to the neutral axis of bend also means the device is fatigue-resistant and soft tissue irritation is reduced.
The IO FiX has not been independently verified and therefore we analysed its performance in a human cadaveric ankle model. Our null hypothesis was there is no difference in force generation and contact area in an ankle arthrodesis when the IO FiX is compared with partially-threaded lag-screws.
We used ten randomized cadaver ankles with a mean age of seventy-one years (44-84 years) prepared with flat arthrodesis cuts. A Tek-scan (Boston, USA) pressure transducer was used to measure force and contact area produced when the IO FiX was compared with a standard lag-screw and washer.
The median average force in the IO FiX group was 3.95 kg and 2.35 kg in the lag-screw group ($p=< 0.01$ Wilcoxon signed-rank). The IO FiX was able to create a more uniform contact area within the arthrodesis with a median average of 3.41 cm^2 compared with 2.42 cm^2 in the lag-screw group ($p=< 0.03$ Wilcoxon signed rank).
Our results suggest the IO FiX improves force generation and contact area across the arthrodesis. With the theoretical advantages of reduced soft tissue irritation and a lower risk of fatigue failure, the IO FiX offers a significant advantage compared with traditional fixation techniques.

FP7

Intra operative radiation exposure increases when trainee orthopaedic surgeons are allowed to operate on ankle fractures

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Introduction: Unstable ankle fractures are commonly treated with operative fixation. Isolated lateral malleolus fractures (Weber B) are often operated by orthopaedic trainees.Operative fixation of these fractures is included in the index procedures of procedure based assessment (PBA) of intercollegiate Surgical Curriculum Programme (ISCP). Orthopaedic trainees are expected to be competent in this procedure by the end of their training. Fluoroscopic guidance is essential for adequate reduction and safe fixation of these fractures.
Aims: It is currently unknown if patients are exposed to excess radiation when they are operated by trainees compared to consultant surgeons. It is a common perception that trainees take more time to fix these fractures compared to trained consultants thereby exposing patients to untoward effects of prolonged tourniquet time.
Method: A retrospective review of fifty patients undergoing operative fixation of Weber B lateral malleolus fractures were undertaken.Twenty five patients were operated by orthopaedic consultants and the remaining (n=25) by orthopaedic trainees.The tourniquet time and the intra-operative radiation dose using the fluoroscope were recorded.
Results: Patients operated by trainees were exposed to significantly higher dose of intra-operative radiation (median, 6.5Gy vs 46.2Gy; interquartile range,0.87-15.8 vs 8.37-140.3;P=0.003). However, there was no statistical difference in the duration of application of the tourniquet in between the two groups (median, 59 minutes vs79 minutes; interquartile range, 45-95 vs 69-102; P=0.12).

Discussion: This is the first study to indicate that patients are at risk of higher radiation exposure when operated by orthopaedic trainees whilst the times taken to fix Weber B ankle fractures are almost similar to those undergoing surgery by a consultant grade surgeon.

FP8

Does functional outcome depend on the quality of the fracture fixation? Inter-observer variability of radiological evaluation of surgical ankle fracture fixation. Analysis of 61 cases

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Introduction: Inadequate reduction and fixation of ankle fractures leads to poor clinical outcomes although there are no well-established criteria to evaluate the quality of surgical fracture fixation of the ankle. The aim of our study was to validate Pettrone's criteria that can be used in the radiological assessment of the quality of ankle fracture fixation that predict the functional outcome.
Methods: A retrospective study was completed following the operative management of ankle fractures at a University teaching hospital between 1st January 2009 and 31st December 2009 were included in the study. Exclusion criteria were paediatric fractures, polytrauma, and fractures involving the tibial plafond. The fracture pattern was classified using the AO classification system. Three independent Foot and Ankle Consultants assessed the quality of surgical ankle fracture fixation using Pettrone's criteria. Aproximately one year following the surgery, functional outcome was obtained using Lower Extremity Function Score (LEFS) and a modified American Orthopaedic Foot and Ankle Society score (AOFAS). The Mann-Whitney test was used for the LEFS and AOFAS functional scores. Logistic regression was performed upon age and gender with regards to functional outcome. Given that the Kappa coefficient is a pair wise statistic, the average pair wise agreement for each category of the Pettrone criteria was also determined.
Results: Sixty-one consecutive patients were included in the study with a mean age of 51years (17-74years) and a mean follow-up of 17.41 months (13-24months). Using Pettrone's criterias, mean interobserver agreement was 90.0% (89.4-92.6%) with inadequate reduction in 20 cases (32.5%). Mean LEFS following inadequate reduction was 47.5 (1-79) and following satisfactory reduction was 55.9 (9-80) p=0.03.
Conclusion: Pettrone's criteria has high interobserver agreement for the quality of surgical fracture fixation of the ankle which correlates with functional outcome.

FP9

Outcomes and complications of 76 operatively treated pilon fractures of the distal tibia

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Introduction: In this cohort study, we present comprehensive injury specific and surgical outcome data from one of the largest reported series of distal tibial pilon fractures, treated in our tertiary referral centre.
Methods: A series of 76 pilon fractures were retrospectively reviewed from case notes, plain radiographs and computed tomography (CT) imaging. Patient demographics, injury and fracture patterns, methods and timing of fixation and clinical and radiological outcomes were assessed over a mean follow up period of 8.6 months (range 2–30).
Results: Definitive fixation was most commonly performed through an open technique with plate fixation. CT imaging was used to plan the most direct approach to access the fracture fragments. The majority of cases were classified as AO/OTA 43.C3.
When definitive open fixation for closed fracture was performed within 48 hours, the rate of deep infection or wound complication was 0%. When performed on day 3–5, the deep infection rate was 0% but the superficial wound complication rate was 23.5%. From day six onwards, the deep infection rate was 4% and the superficial wound complication rate was 8%.
The rate of wound complications after double plate fixation of the tibia using two separate incisions was 23.1%, compared to 11.7% after single incision and plating.
The rate of non-union was 9.7%. Symptomatic post-traumatic arthritis requiring orthopaedic management occurred in 9.9%. Further surgery was required in 27.8% of all patients.
Conclusion: Outcomes from our unit compare favourably with those from large trauma centres worldwide. Our study supports the use of early definitive fixation, within 48 hours, to achieve low rates of wound complications. We support an "unsafe window" for definitive fixation of three to five days post injury due to the high rate of wound complications. The likelihood of developing post-traumatic arthritis and of requiring further surgery is high.

FP10

Severe foot and ankle injuries at trauma units: a relic of the past?

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Introduction: In April 2012 National Trauma Networks were introduced in England to optimise the management of major trauma. All patients with an ISS of ≥ 16 should be transferred to the regional Major Trauma Centre (level 1). Our hypothesis was that severe foot and ankle injuries would no longer be managed in Trauma Units (level 2).
Methods: A retrospective analysis of the epidemiology of severe foot and ankle injuries was performed, analysing the Gloucestershire foot and ankle trauma database, from a Trauma Unit, for a catchment population of 750,000 people. The rate of open fractures, mangled feet and requirements for stabilisation with external fixation were reviewed

before and after the introduction. This was compared to the foot and ankle injuries triaged to the regional Major Trauma Centre (MTC) using the TARN database information.
Results: The incidence of open foot and ankle injuries was 2.9 per 100,000 per year. There were 5.1% open injuries before the Network and 3.2% after. There was no statistically significant change in the application of external fixators. The frequency of mangled feet was 3.6% before and 6% after the Network commenced, showing no significant fall.
Analysis of TARN data from the MTC demonstrated that only 18% of patients had an ISS ≥ 16. The majority of patients brought to the MTC with foot and ankle injuries were either polytrauma patients (43%) or required plastic surgery intervention for open fractures (69%). Only 4.5% of patients had isolated, closed foot and ankle injuries.
Conclusion: We found there to be no decrease in our numbers of mangled ankles, external fixations nor open fractures following the introduction of the Trauma Network. There is still a need for Foot & Ankle Surgeons at Trauma Units to manage complex foot and ankle injuries, because the majority have an ISS < 16.

FP11

A comparison of operative versus non-operative management of displaced intra-articular fractures of the os-calcis

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Introduction: The os-calcis is the most common tarsal bone to fracture. It can lead to a debilitating arthritis and has considerable socio-economic implications.
In the literature there is great debate as to whether operative or non-operative management has a better outcome.
Previous smaller case series report improved results from surgery whereas the one randomised trial showed no overall benefit from surgery. However sub-group analysis identified patients that had a better outcome with operative management. Results from the UK heel fracture trial are awaited.
We present a 5 year series from a single centre, single surgeon that includes 143 fractures. There are currently no comparable published data.
Methods: We reviewed 143 intra-articular fractures of the os calcis.
All fractures were evaluated using CT scans and classified according to Sanders system.
The functional outcome of Sanders type 2 fractures were evaluated using Atkins scoring system.
Evaluation took place annually between 2 and 7 years post injury.
A comparison was made between type 2 fractures treated operatively and those treated non-operatively.
Results: 143 patients with Type 2 sanders fractures were reviewed from 2 years to 7 years post injury.
109 patients were treated operatively, 34 patients were treated non-operatively.
The mean score for 2 part fractures treated operatively was 76.52 (range 73-78 SD +/- 2.9).
The mean score for 2 part fractures treated non-operatively was 60.88 (range 59-69 SD +/- 5.76).

The mean difference in scores was 15.64. This was stastiscally significant. CI (11.4 --- 19.24) P < 0.05
Conclusion: Data from our single centre, single surgeon series showed that patients with 2 part os calcis fractures have significantly better functional outcome than those managed non-operatively.
This is in keeping with smaller data sets in the published literature.

FP12

The epidemiology of calcaneal fractures requiring operative fixation: our 10 years' experience

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Introduction: Calcaneal fractures are rare but debilitating injuries assumed to affect particular demographic sub groups. This study aimed to relate epidemiological factors (age, gender, smoking status and social deprivation scores) to the incidence of calcaneal fractures requiring operative fixation over a 10-year period.
Methods: Data (age, gender and smoking status) was extracted from a prospective trauma database regarding calcaneal fractures between September 2002 and September 2012. The Rank of Index of Multiple Deprivation (IMD) scores was collated for each patient and data sub-stratified in 20% centiles. 2010 National Census Data was used to formulate patient subgroups and incidences. Resulting data was subjected to statistical analysis through calculation of relative risk (RR) scores with 95% confidence intervals (95% CI).
Results: 101 calcaneal fractures in 95 patients that underwent operative fixation were identified. 3 open fractures in 3 patients were excluded. In males, the annual incidence of calcaneal fractures requiring operative fixation was 5.10 per 100,000 compared to 1.25 per 100,000 in females (RR 1.60, 95% CI 1.45-1.77). The mean age in males was 36.8 years with a peak incidence between 20-29 years old. The mean age of females was 42.5 years with a peak incidence between 30-39 years old. In females, there was a more even spread throughout all ages with a gradual increase in incidence towards post-menopausal ages.
54 (55.1%) fractures requiring operative fixation occurred in smokers compared to 44 (44.9%) in non-smokers, (RR 2.00, 95% CI 1.39-2.88). Rank of IMD scores revealed 34.0 % of all fractures occurred in the top 20% (RR 1.7, 95% CI 1.28- 2.26) most deprived areas and 58.5% of fractures in the top 40% most deprived areas.
Conclusions: This study indicates that male gender, smoking status and high rank of multiple deprivation scores are independent characteristics associated with calcaneal fractures requiring operative fixation.

FP13

A 10-year report of post-operative complications of calcaneal fractures treated by internal fixation: who is at risk?

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Introduction: We report our 10-year experience of post-operative complications of calcaneal fractures treated by internal fixation and attempt to correlate these with previously cited patient risk factors.
Methods: All calcaneal fractures treated by internal fixation in our Major Trauma Centre between September 2002 and September 2012 were identified. Patient indices (age, gender, smoking status and pre-existing co-morbidities), time to surgery and method of surgery (open reduction and internal fixation (ORIF) versus closed reduction and percutaneous fixation) were recorded. Primary outcome was the incidence of wound infection requiring intravenous antibiotics and/or re-operation. Statistical analysis through Mann-Whitney-Wilcoxon testing and relative risk ratio calculations with 95% Confidence Intervals (CI) was performed.
Results: 98 calcaneal fractures in 92 patients were identified. 79 (80.6%) fractures occurred in males, 19 (19.4%) in females. 54 (55.1%) were smokers and 44 (44.9%) non-smokers. 18 (18.4%) were treated by closed reduction and percutaenous fixation and 80 (81.6%) by ORIF.
3 (3.1%) patients (all male) developed post-operative wound infection (RR 0.96, 95% CI 0.92-1.00), of which 1 was a smoker (RR 1.03 95% CI 0.95-1.11). All infections occurred in patients treated percutaneously (RR 6.33, 95% CI 3.99- 10.08). There was no significant difference in mean time to surgery (p=0.069) and mean age (p=0.31) for those patients experiencing wound complications and those who did not.
Conclusions: This study reports an overall wound infection rate in keeping with current literature. There was no statistically significant increased risk of wound infection in smokers or male patients. All infections occurred in patients who had percutaneous treatment.
These findings support the continued treatment of displaced calcaneal fractures by open reduction and internal fixation through a conventional extended lateral approach. There is no justification in denying surgery to males or smokers although these two factors have been cited as poor prognostic indicators in earlier studies.

FP14

Percutaneous arthroscopic calcaneal osteosynthesis (PACO) for significantly displaced intra-articular calcaneal fractures

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Introduction: Open reduction and internal fixation of displaced intra-articular calcaneal fractures is susceptible to a high incidence of wound complications. Displaced fractures create abnormal contact characteristics at the subtalar joint, resulting in poor functional outcome and arthritis. We present the functional outcomes of 32 fractures (Sanders 2 and 3) at an average follow up of two years.

Methods: Over a 57 month period, 32 fractures (29 patients) underwent this technique in a London level 1 trauma centre. Open fractures were excluded.. The previously described technique with sinus tarsi portals was used. Pre and post-operative radiographs and functional outcomes were assessed.
Results: Our patient cohort consisted of 20 male (23 fractures) and 9 female patients. Classification via the Sanders system revealed 37% 2A, 9% 2B, 41% 3AB, 9% 3AC and 3%3BC. Mean follow up period was 24,2 months (range 5-57). All patients were operated on within 7 days of injury. Average inpatient stay was 1.9 days. 1 patient sustained a port site infection which was managed conservatively, while screws were removed from 2 patients. We had no cases of deep infections. The Bohler's angle increased from 10 to 29 degrees post operatively. Mean modified AOFAS scores (maximum score 60) was 40.3 (11-60), average VAS was 29.8mm and CFS was 78.1. Importantly the majority of patients returned to their pre injury employment.
Conclusion: PACO is a demanding technique with an associated learning curve. However, our series shows that it is a safe and reproducible technique for significantly displaced intra-articular fractures. Post operative results are very encouraging with high levels of patient satisfaction and return to pre injury employment and activities. In addition it is a more cost effective treatment option as it is associated with minimal wound complications and a reduced hospital stay.

FP15

Mini-open arthroscopic-assisted calcaneal osteosynthesis (MACO): initial experience with severely comminuted intraarticular fractures

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Introduction: Percutaneous fixation of intraarticular calcaneal fractures adequately restore the subtalar joint with lower soft tissue complications and equivalent short-term results compared to open fixation. However, studies have largely focused on less severe fracture types (Sanders types 2/3). We report our initial experience of this relatively new Mini-open Arthroscopic-assisted Calcaneal Osteosynthesis (MACO) technique for more comminuted calcaneal fractures (Sanders types 3/4).
Methods: We prospectively studied consecutive patients with intraarticular calcaneal fractures requiring surgical fixation between April 2012 and June 2013. MACO involves initial subtalar arthroscopic debridement, with subsequent fluoroscopic-assisted, mini-open reduction and fixation of depressed fragments using cannulated screws. Outcome scores (Manchester-Oxford Foot(MOXFQ), AOFAS Hindfoot and SF-36 questionnaires) and radiological parameters were recorded with a mean follow-up of 12 months (7-13).
Results: There were 9 patients (7 M:2 F) with a mean age of 45.4 years (24-70). All had intra-articular joint depression-type fractures: 5 Sanders type 3 and 4 Sanders type 4. Mean time to surgery was 6.6 days (1-13), operating time was 89.4 minutes (66-130) and inpatient stay was 1.7 days (1-4). All wounds healed without complication and one patient required change of a long screw 11 days post-operatively. There were significant post-operative improvements in the mean Bohler's angle (-2º[-27.2-14.8] to 30º[10.2-41.3], p< 0.0002) and angle of Gissane (95º[66.2-111.7] to 111º[101.6-120], p=0.004). Mean outcome scores were 60.8(41-86) for MOXFQ and 75.3(55-92) for AOFAS Hindfoot, with 55.9% developing moderate/severe subtalar joint stiffness. Mean

physical and mental SF-36 summary scores were 35.5(24.5-41.5) and 51.7(40.8-61.7) respectively.

Conclusion: We describe the MACO technique for Sanders types 3/4 calcaneal fractures. There were no soft tissue complications with good short-term outcomes, despite a reduction in hindfoot mobility. Restoration of the joint and bone stock without infection is desirable in the event of subsequent arthrodesis. We propose MACO is a valuable alternative technique to open fixation.

Thursday, 7th November 2013

FP16

A new scoring system for sesamoid displacement in hallux valgus

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Introduction: It has been shown that inadequate reduction of the sesamoids can lead to recurrent hallux valgus. It can be difficult however to assess the sesamoid position. We propose a simple method of grading sesamoid position; the sesamoid width ratio. We aim to assess for a difference in ratio between those with and without hallux valgus and subsequent correlation with increased deformity. The new grading system can then be tested for inter-observer reliability.
Methods: 277 (103 normal, 87 preoperative, 87 postoperative) AP weight bearing foot radiographs were analyzed for hallux valgus angle (HVA), intermetatarsal angle (IMA), and both medial and lateral sesamoid width (mm). The sesamoid width ratio (SWR; lateral/medial width) was then calculated. Using statistical methods based upon HVA and IMA grading, three groups of increasing hallux valgus severity, in accordance with SWR, were defined; normal ≥1.30, moderate 1.29 --- 0.95 and severe ≤0.94. Sixty images (10 normal, 25 preoperative, 25 postoperative) were then sent on disc to three separate reviewers to assess for inter-observer error.
Results: A statistically significant correlation was shown between the SWR and both HVA and IMA (r = -0.24 and -0.18 respectively, $p < 0.05$). Once organized into normal, moderate and severe, in accordance with SWR, both the HVA and IMA group means were statistically different (ANOVA $p < 0.0001$ and $p < 0.0002$). With regards to inter-observer error, a fair agreement between raters existed when looking at group classification (Fleiss' kappa 0.33, 0.10 to 0.53 95% CI). The intra-class correlation (ICC), looking at the SWR value, returned a similar result (ICC = 0.35).
Conclusion: The diameter and subsequent ratio of sesamoid width is an easy value to calculate. There is good correlation between the SWR and hallux valgus deformity as defined by HVA or IMA. The sesamoid width ratio exhibits fair inter-observer reliability.

FP17

Does bunion surgery actually narrow the foot? Assessment of outcomes of surgery using traditional angles and a new radiographic measure of severity --- the forefoot: hindfoot ratio. Correlation with clinical outcomes

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Background: Various angles have been used to grade the severity of hallux valgus deformity. They are useful in surgical planning but do not correlate with symptom severity or improvement. We feel that there is a fundamental mismatch between the width of the forefoot and the width of the hindfoot and that this is more clinically relevant, we describe two techniques for measuring this. We aim to measure the degree of foot narrowing after surgery and moreover how this correlates to the severity of pre-

and post operative outcomes.
Methods: 200 consecutive bunion operations were assessed with weight bearing radiographs. The HVA and IMA were measured according to standard practice. We also assessed forefoot width using two methods we have described. The first is the 'Forefoot Width' measured as a perpendicular to the midfoot (a technique we have previously validated). The 'Foot Ratio' is calculated as a function of the calcaneal width. Clinical outcomes were assessed using the MOXFQ and AOFAS.
Results: Bunion surgery narrows the osseous width of the forefoot. This narrowing can be by as much as 23mm in cases with severe deformity. We found that the Forefoot: Hindfoot ratio correlated with symptom severity and that normalisation of the ratio to below 2.5 was associated with better outcomes. This is important as small absolute corrections were associated with good outcomes.
Conclusion: Our measure of Forefoot Width is reproducible and allows for variations such as forefoot adductus. We feel that the Forefoot:Hindfoot ratio is more important as this determines the ability to fit into off-the-shelf footwear rather than requiring bespoke or modified footwear. This is the first study to look at the ability to narrow the forefoot and has important implications in determining patient selection and post-operative outcomes.

FP18

The management of severe hallux valgus with the Chevron osteotomy: clinical and radiological outcomes

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Background: The Chevron osteotomy is straightforward, requires less dissection and allows earlier rehabilitation than some other osteotomies. However it is generally perceived as unsuitable for severe deformities[1, 2, 3] even though a 2012 meta-analysis[4] and an earlier RCT[5] failed to show any advantage of the scarf over the chevron. We aim to assess the correctability of severe HV comparing the correction, the clinical outcomes and complications of the Chevron osteotomy with other techniques employed in a consecutive series.
Methodology: We reviewed a series of 92 cases of severe hallux valgus (IMA >17^{o} regardless of the HVA). The follow-up period varied from 1 to 4 years. Pre-operative x-rays and final post-operative weight-bearing x-rays were performed. Outcome scores (MOXFQ and AOFAS), IMA, HVA and foot width were collected. Complications were monitored.
Results: There were 97 cases of severe hallux valgus performed during the study period, 55 were treated with a large-shift modified Chevron osteotomy, 42 with a number of other techniques that included Ludloff, Basal or Scarf osteotomy and also fusion in the form of a Lapidus or 1st MTP.
The average pre-operative measurements were IMA of 19.1^{o}, HVA of 40^{o}, osseous forefoot width of 93.2 mm and the forefoot: hindfoot ratio was 3.11. Post-operatively the measurements were IMA of 9.2 and HVA of 9.76, the osseous forefoot width was 82.8mm and the forefoot: hindfoot ratio was 2.57.
Radiological outcomes for the Chevrons were similar to the alternative techniques though the rate of recovery was better. There is an increase in the rate of screw removal

after a large shift Chevron osteotomy, reasons for this are discussed.
Conclusion: The Chevron osteotomy is successful in the management of severe hallux valgus. It has the advantage of being a stable osteotomy that permits immediate weight-bearing and movement of the MTP joint.

FP19

A case-controlled study of minimally invasive vs open hallux valgus surgery

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Background: Previous attempts at small incision hallux valgus surgery have compromised the principles of bunion correction in order to minimise the incision. The Minimally Invasive Chevron/ Akin (MICA) is a technique that enables an open modified Chevron/ Akin to be done through a 3mm incision, facilitated by a 2mm Shannon burr.
Methodology: This is a consecutive case series performed between 2009 and 2012. This includes the learning curve for minimally invasive surgery. All cases were performed by a single surgeon at two different sites, one centre where minimally invasive surgery is available and the other where it is not. The standard procedure in both centres is a modified Chevron osteotomy. Regardless of whether the osteotomy was performed open or minimally invasive two-screw fixation was performed..
Retrospective analysis includes the IMA, HVA, M1 length, forefoot width and forefoot: hindfoot ratio. Clinical outcomes include the MOXFQ, AOFAS, and assessment of complications.
Results: There were 70 cases in each arm. Follow-up was 4years to 6 months. The radiological outcomes were similar in both groups. There was an increased rate of screw removal in the MICA group. There were also cases of hallux varus, these occurred in the cases with severe pre-operative IMA angles that also had a lateral release and an Akin. There was high satisfaction in both groups.
Conclusion: This is the only comparison of minimally invasive and open techniques that has been performed, providing a direct comparison of the utility of a burr compared to a saw. These early results demonstrate the efficacy of a Minimally Invasive Chevron/ Akin in terms of achieving radiological correction. The clinical outcomes are excellent but there is a learning curve and this needs to be managed.

FP20

Zadek's calcaneal osteotomy for insertional Achilles pathology

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Introduction: The dorsal closing wedge calcaneal osteotomy has been described for the treatment of insertional pathology of the tendo-achilles. The aim of this study was to evaluate the efficacy of the technique using outcome measures.
Method: This was a prospective case series. Patients were included if they had tendo-achilles insertional pathology (calcific tendonitis, bursitis or Haglund's deformity). A short extended lateral approach was used and a 1 cm dorsally based closing wedge osteotomy of the calcaneus performed. Fixation was with 2 staples. Patients were scored pre-operatively and at 6 and 12 months post-operatively using the VISA-A and AOFAS ankle-hindfoot scores. Results were analysed with the paired student t-test.
Results: Twenty five feet in 23 patients were enrolled in the study February 2011 --- May 2013. 22 patients underwent the osteotomy (9 males and 14 females). Average age was 47.2 years (range 19-62 years).12 feet have been followed up for 1 year, 6 for 6 months, 5 less than 6 months.
Average VISA-A improvement was 27.87 points (-13 - 71) at 6 months p=0.001 and 38 (-13 - 81) at 12 months p=0.001. Average AOFAS improvement was 11 points (-8 - 31) at 6 months p=0.005 and 11 (-18 - 42) at 12 months p=0.04.
82.3% of patients would have the procedure again.
Complications included minor wound problems (3), sural nerve symptoms (1) and plantar fasciitis (3). All complications have resolved.
Conclusion: The results of this study show that the use of the Zadek osteotomy of the calcaneus can provide consistent symptomatic relief from insertional Achilles pathology by altering the biomechanics of the tendon without disrupting the bursa. There is a small risk of minor complications, which should be included in the consent process.

FP21

The anatomical relationships of the gastrocnemius and peroneus longus muscles, determining the practicality of a novel tendon transfer

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Introduction: Peroneal muscle weakness is a common pathology in foot and ankle surgery. Polio, charcot marie tooth disease and spina bifida are associated with varying degrees of peroneal muscle paralysis.
Tibialis Posterior, an antagonist of the peroneal muscles, becomes pathologically dominant, causing foot adduction and contributes to cavus foot posture.
Refunctioning the peroneus muscles would enhance stability in toe off and resist the deforming force of tibialis posterior.

This study determines the feasibility of a novel tendon transfer between peroneus longus and gastrocnemius, thus enabling gastrocnemius to power a paralysed peroneus tendon.
Method: 12 human disarticulated lower limbs were dissected to determine the safety and practicality of a tendon transfer between peroneus longus and gastrocnemius at the junction of the middle and distal thirds of the fibula.
The following measurements were made and anatomical relationships quantified at the proposed site of the tendon transfer: The distance of the sural nerve to the palpable posterior border of the fibula; the angular relationship of the peroneus longus tendon to gastrocnemius and the achilles tendon; the surgical field for the proposed tendon transfer was explored to determine the presence of hazards which would prevent the tendon transfer.
Results: The mean angle between the tendons of peroneus longus and gastrocnemius/achilles tendon was 3°.
The sural nerve lies on average 30 mm posterior to the palpable posterior border of the fibula.
There were no significant intervening structures to prevent the proposed tendon transfer.
Conclusion: The line of action of peroneus longus and gastrocnemius are as near parallel as to be functionally collinear. The action of gastrocnemius may be harnessed to effectively power a paralysed peroneus longus tendon, without significant loss of force owing to revectoring of forces. The surgical approach to effect such a tendon transfer is both safe and practical.

FP22

Extracorporeal shockwave for plantar fasciitis: continuing good results

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Introduction: Plantar Fasciitis is an extremely common and challenging problem that presents itself to foot and ankle practitioners. Many different treatment modalities are available for this condition, with little proven benefit. ECSWT was approved for use by the FDA for the treatment of chronic proximal plantar fasciitis in 2002 and NICE published guidance in 2009 recommending its use in refractory cases.
Methods: Patients who diagnosed with ultrasound scan, and for whom other treatments were unsuccessful, underwent treatment on an outpatient basis. They had three 4-5 minute sessions, once a week. A Spectrum machine was used delivering 10 Hz waves in 500 preset pulses at 2 bar pressure, followed by 2000 preset pulses at 2.5 bar pressure. Pre - and 3 month post-treatment pain levels were recorded using a 10 point Visual Analogue Scale.
Results: 210 courses of treatment have been performed on 181 feet belonging to 135 patients. 46 patients have had treatment to both feet. 121 treatments have paired pre and postoperative VAS scores. 79 had a reduced score post treatment (65.2%), 17 had

an increased score (14%), and 24 had a score which remained unchanged (19.8%). 65.8% subjectively felt they had improved. Overall there was an average reduction in VAS score from 7 to 4.975, a reduction of 2.025 points (p=0.000000000151).
Discussion: The majority of patients show a benefit in terms of an overall reduction in pain score, though it is not clear how many patients would have improved spontaneously in that time. However, there is further work to do in terms of a more detailed evaluation of the effect on foot function: anecdotally the treatment may significantly improve start up pain. We would also like to see if we can establish a benefit for the therapy earlier in the disease process.

FP23

Improving the consent process in foot and ankle surgery: use of patient specific literature

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Informed consent is integral to good-practice. It protects the patient and offers proof of discussion and interaction between the surgeon and the patient. We compare efficacy of last clinic consent, specialised consent clinic with or without provision of patient specific literature.
Group A patients underwent written consent at their last outpatient clinic and conformation of consent on the morning of surgery. Group B underwent consent in designated pre-admission clinic in the week prior to surgery. Group (C) attended the same preadmission clinic and were provided with a surgeon dictated written explanation of their surgery and particular risks.
This included a explanation of the procedure, complications, risks and rewards in layman's terms, aimed at patients with a reading age of 14 years, with advice concerning alternative procedures and the consequences of taking no action. The risks are graded: common, less common and rare.
All patients undertook a pre-surgery questionnaire on the morning of surgery by an independent observer prior to any contact with the surgical team. Questions focused on their planed procedure, post-operative instructions and possible complications in order to assess the recall of the consent process. A VAS-scale was added to assess overall satisfaction. Statistical analysis was undertaken by a T-test.
In total 162-patients were assessed, the response rate was 68.5% (n=111). In-group A (n=16) 18.8% patients remembered 3 relevant complications, 56.2% recalled their post-operative considerations their overall satisfaction was 4/10. In-group B (n=57) 45.5% remembered three complications, 63.7% recalled their postoperative considerations and had a patient satisfaction of 5/10. In-group C (n=38) 48.3% remembered three complications, and 70.7% recalled postoperative considerations, the overall satisfaction improved to 6/10.
We observed that the consent process is improved by the use of routine pre-operative consent clinics; however the addition of patient specific literature is observed to further-improve recall and satisfaction.

FP24

Reduction in re-rupture rate using a new standardised Achilles tendon rupture pathway and protocol in a dedicated clinic

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Introduction: Historically the incidence of Achilles re-ruptures has been described as around 5% after surgical repair and up to 21% after conservative management. In 2008 we commenced a dedicated Achilles tendon rupture clinic for both conservative and surgically managed patients using new standardised operating procedures (SOP). We have evaluated the impact of this new service, particularly with regard to re-rupture rate.
Materials and methods: The SOP was stage dependent and included an initial ultrasound examination, functional orthotics with early weight bearing, accelerated exercise and guidelines for the return to work and sport. Evaluation included re-rupture rate, complication rate, and outcome measured by the Achilles Tendon Total Rupture Score (ATRS) and Achilles Tendon Repair Score (AS). A basic cost evaluation was performed to assess any potential savings.
Results: A total of 213 patients (151 treated conservatively and 62 surgically) were included. Re-rupture occurred in two patients (1 conservative and 1 surgically managed). There were 16 major complications e.g. DVT, wound infection. The mean ATRS was 54.79, 67.66 and 71.05 at 4, 6 and 9 months respectively and the mean AS was 64.67, 73.96 and 71.05 at 4, 6 and 9 months respectively. The reduction in re-rupture compared to the literature was 4.1% and 19.1% for surgical and conservatively treated patients respectively. Cost savings achieved were £50,000 each annum. This was due to both a decrease in the number of re-ruptures as well as a decrease in the number of patients being managed operatively.
Conclusion: A dedicated follow up Achilles clinic treating acute Achilles tendon ruptures using monitored SOP's, provides an exceptionally low re-rupture rate (0.9%), excellent patient outcome and potential cost savings compared to a traditional fracture clinic approach. The reduction in re-rupture rate, and therefore cost savings, is greater in conservatively managed patients.

FP25

An evaluation of retrospective SF-12 and Foot Function Index (FFI) outcome scores in elective foot and ankle surgery

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Introduction: Patient reported outcome measures are becoming more popular in their use. Retrospective scoring is not yet a validated method of data collection but one that could greatly decrease the complexity of research projects. We aim to compare preoperative and retrospective scores in order to assess their correlation and accuracy.

Methods: 36 patients underwent elective foot and ankle surgery. All patients were scored preoperatively using the SF-12 and FFI. Patients then recorded both PROMs retrospectively at the three month follow up (av. 139 days). Results were then analyzed for statistical significance.
Results: 36 patients (av. age 54.6 years) completed both sets of questionnaires. There were 15 hindfoot and 21 forefoot procedures. Two patients (5.6%) recalled their identical preoperative SF12 score. No retrospective FFI scores were identical.
The mean percentage difference between the two preoperative scores was; -0.9% (-5.8 to 4.0%, 95% CI) for SF12 and 40.7% (25.3 to 56.1%, 95% CI) for FFI. This retrospective accuracy was statistically significant ($p < 0.001$). When both scores were plotted against each other, the outcome measurements showed positive correlations (SF 12 p 0.31, FFI p 0.81).
With both PROMs mean percentage differences combined, patients undergoing hindfoot procedures (13.5%; 5.8 to 21.3%, 95% CI) were more accurate with retrospective scoring than their forefoot counterparts (26.8%; 10.4 to 43.1%, 95% CI). This was not statistically significant.
Conclusion: Retrospective scoring appears to lack accuracy when compared to prospective methods. However, our data shows the SF12 is recalled more accurately than the FFI ($p < 0.001$) and to an average discrepancy of < 1% when compared to the original preoperative result. These results show patients tend to recall their symptoms at a worse level preoperatively than originally described, especially those with forefoot problems.

FP26

Incidence of clinically relevant venous thromboembolism after foot and ankle surgery

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Introduction: Surgeons want to counsel their patients accurately about the risks of rare complications. This is difficult for venous thromboembolism (VTE), as most studies report rates of asymptomatic disease, which may not be clinically relevant. Generic guidelines promote chemoprophylaxis in foot and ankle surgery despite a relative dearth of evidence. We therefore calculated the rate of confirmed, symptomatic deep vein thrombosis and pulmonary embolism, after surgery or trauma to the foot or ankle, in our hospital.
Methods: In a retrospective cohort design, we scrutinised referrals for venous Doppler ultrasound and computed tomography pulmonary angiography, and found all confirmed deep vein thromboses (DVTs) or pulmonary embolisms (PEs) over an 18 month period from November 2010 to May 2012. These patients were cross-referenced with our orthopaedic database. All adult trauma admissions and fracture clinic attendances were retrieved and divided according to injury. We then identified all adult elective patients using Healthcare Resource Group code data.
Results: Out of 1763 elective foot and ankle procedures, there were five DVTs (incidence 0.28%) and no PEs. Out of 1970 patients with ankle fractures, seventeen (0.86%) sustained DVTs (thirteen conservatively, four operatively managed) and five PEs (0.25%). Of 147 patients with Achilles tendon rupture, three (2%) had a DVT and

two (1.36%) a PE ($p< 0.05$). Summing together all fractures of the foot, of 1775 patients, two (0.05%) had a DVT and there were no PEs.
Conclusion: Currently this group of patients does not routinely receive anticoagulants. The relatively low incidence of symptomatic VTE is reassuring and will help to inform surgeons when considering the risks and benefits of anticoagulation. However, Achilles rupture is confirmed as a higher risk injury, which therefore is more likely to benefit from either increased vigilance or anticoagulation. Large randomised trials measuring clinically relevant VTE (rather than asymptomatic DVT) are needed.

FP27

Venous throboembolism (VTE) prophylaxis following elective hindfoot surgery

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Introduction: The National institute of Health and Clinical Excellence (NICE) guidelines for thromboprophylaxis following lower limb surgery and plastercast immobilisation recommend pharmacological prophylaxis be considered until the cast is removed. These guidelines have been extrapolated from data for hip and knee arthroplasty, and trauma studies. Recent studies have questioned the validity of these guidelines. At Portsmouth, low molecular weight heparin (LMWH) is prescribed for 14 days following surgery in high risk patients. The protocol predates the most recent NICE guidance. We set out to investigate whether this was a safe method of thromboprophylaxis following elective hindfoot surgery.
Methods: A retrospective audit of all patients undergoing hindfoot surgery between 01/01/10 and 31/12/12 was performed. All patients were immobilised in a POP backslab and prescribed 14 days of LMWH. All patients were reviewed at 2 weeks and converted to a full cast or boot. Immobilisation was continued for between 6 and 12 weeks.
A list of all patients who had undergone investigation for deep vein thrombosis at Queen Alexandra hospital from 01/01/10 to 28/03/13 was obtained from the VTE investigation department.
The two lists were cross referenced to identify any DVTs occurring following hindfoot surgery and plastercast immobilisation.
Results: During the 3 years, 197 major hindfoot operations were performed in 194 patients. Mean age was 53 years (range18-82) and 94 males with 100 females.
Two patients had confirmed deep vein thromboses; 1 patient at 13 days post op while receiving LMWH prophylaxis.
Conclusion: Symptomatic VTE following elective hindfoot surgery and post operative plaster cast immobilisation in our hospital is rare. There are no randomnised controlled trials to guide thromboprophylaxis regimes following hindfoot surgery. Based on our results, our protocol appears to be effective and safe.

FP28

Analysis of current venous thromboembolism risk assessment tools in trauma patients treated with cast immobilisation

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Introduction: NICE guidelines state that every patient should be assessed for their VTE risk on admission to hospital. The aim of this study was to determine whether currently recommended risk assessment tools (Nygaard, Caprini, NICE and Plymouth) can correctly identify the patients at risk.
Methods: In a consecutive series of over 750 trauma patients treated with cast immobilisation 23 were found to have suffered a VTE. Their notes were retrospectively reviewed to discover how many had been assessed for their VTE risk on admission. Additionally, the 4 most current Risk Assessment Tools were used to retrospectively score the patients for their VTE risk to determine whether they would have been identified as at risk of sVTE, had the RAMs been used at the time. We also identified a matched group of patients in the same cohort who had not suffered a VTE and they were also retrospectively risk assessed.
Results: NICE (2010), Caprini (2001) and Nygaard (2009) identified 100% of the 750 patients as at risk of sVTE but had a specificity of 0% as only 23 went on to develop VTE. The Plymouth Score (2010) was more specific and identified 56.3% patients of the 23 confirmed VTEs as 'at risk'. However it would not have recommended prophylaxis in the remaining 46.7& that did in fact go on to developed VTE.
Conclusion: The tools used in this study have no clinical utility in this patient group. Detailed evaluation of the different RAMs is required in order to improve their discriminatory power. A reliance on NICE, Caprini and Nygaard tools would have required all 750 patients in this group to have been treated with thromboprophylaxis and therefore lacked sensitivity. However the Plymouth Score would have failed to recommend thromboprophylaxis in half of the patients who eventually developed VTE.

Friday, 8th November 2013

FP29

A comparison of non-union rates following first metatarsophalangeal joint fusion with three dorsal plating systems

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Introduction: Techniques devised for 1st MTPJ arthrodesis have been described since 1979 when Humbert et al published a 'tongue and trough' technique. Common contemporary techniques include fixation with single or crossed screws, or dorsal plates and these are suitable for a variety of indications. All three contemporary techniques have demonstrated a wide range of fusion rates. This study reports a comparison of non-union rates of the 1st metatarsophalangeal joint (MTPJ) with the current *Memometal Anchorage*™ dorsal plate system and the previous *Hallu-fix*™ and *Charlotte*™ systems.
Methods: Between 01/2009 and 07/2012 174 consecutive 1st MTPJ fusions were performed for 153 patients (Mean age 62, range 42 to 83) by three surgeons at one University teaching hospital. 40 patients (23%) were male and 132 (77%) female. Patients without available radiographs were excluded from the study. 20 patients received *Hallu-fix*™ plates, 76 *Charlotte*™ plates and 76 *Memometal Anchorage*™. Radiographs of the feet were taken from four weeks postoperatively and reviewed for incomplete bone bridging and increased radiolucency around screws.
Results: 12 (7.0%) non-unions were identified in total during followup. A single (5.0%) *Hallu-fix*™ system, 9 (11.8%) *Charlotte*™ systems and 2 (2.6%) *Memometal Anchorage*™ plating systems did not develop a satisfactory fusion. Typical followup in patients in whom there were no postoperative complications and who developed satisfactory bony union was 12 weeks. Those with non-unions were followed until revision procedures were successful.
Conclusion: The total non-union rate of this centre during the period compares favourably with published literature suggesting the technique is suitable for numerous indications in 1st MTPJ fusion. With a non-union rate of 5.0%, the *Hallu-fix*™ shows favourable results when compared authors using the same system. The *Charlotte*™ system demonstrated an 11.8% non-union rate, comparing poorly with published literature. The *Memometal Anchorage*™ system, with a non-union rate of 2.6%, demonstrated promising results.

FP30

Arthroscopic resection of talocalcaneal coalitions: a bicentre case series of a new technique

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Introduction: Symptomatic tarsal coalitions failing conservative treatment are traditionally managed by open resection. Arthroscopic excision of calcaneonavicular

bars have previously been described as has a technique for excising talocalcaneal bars using an arthroscope to guide an open resection. We describe a purely arthroscopic technique for excising talocalcaneal coalitions. We present a retrospective two-surgeon case series of the first eight patients (nine feet).
Methods: Subtalar arthroscopy is performed from two standard sinus tarsi portals with the patient in a saggy lateral position. Coalitions are resected with a barrel burr after soft tissue clearance with arthroscopic shavers. Early postoperative mobilisation and non-steroidal anti-inflammatory drugs prevent recurrence of coalition. Outcome measures include restoration of subtalar movements, return to work and sports, visual analogue pain scales and Sports Athlete Foot and Ankle Scores (SAFAS). Follow-up ranges from 1 to 5.5 years.
Results: Pain and SAFAS scores improved in 7 patients. Subtalar movements were improved in all feet and were sustained to final follow-up. All patients achieved early good function and returned to sports and demanding jobs. One patient's pain recurred requiring subsequent fusions. One posterior tibial nerve was damaged. Both of these patients had coalitions extending across more than one quarter of the posterior facet.
Conclusion: Minimal destruction of bone and soft tissues with an arthroscopic technique allows early mobilization and minimizes pain. We acknowledge the risk of neurological damage from both open and arthroscopic excision of tarsal coalitions. Patient selection and preoperative planning are crucial to avoid relapse and complication. If significant degenerative changes are present at surgery or resections are too extensive onto the posterior facet early recurrence of pain may occur. This series from two independent surgeons supports the feasibility and effectiveness of this technique.

FP31

Arthroscopic triple and modified double hindfoot arthrodesis: technical note and case series

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Introduction: In a consecutive series of 71 arthroscopic subtalar arthrodeses performed between 2004 and 2011, 14 also involved arthroscopic decortication of the talonavicular joint (double arthrodesis) and 4 the subtalar, talonavicular and calcaneocuboid joints (triple arthrodeses).
Methods: We examined complications, union rates in all 18 patients and clinical outcomes in 16 for whom this was the sole procedure.
Results: Mean age was 62 (45 --- 78). Two talonavicular joints failed to unite and a third patient suffered a diabetic Charcot midfoot neuro-arthropathy. These patients' outcomes were classified as poor. Two patients underwent planned major ankle or midfoot surgery in addition to arthroscopic double arthrodeses. These joints united but these patients were not included in the clinical review to avoid confounding outcomes. Mean follow-up for the remaining 13 patients was 4.4 (1.75 - 7.5) years. There were no immediate perioperative complications. All 4 patients with triple fusions united with good or excellent outcomes. The nine patients receiving double arthrodesis united with 8 good or excellent outcomes. The remaining patient reported good deformity correction and stability but disappointing pain relief, (classification poor).

Conclusions: Double and triple arthrodeses remain valid salvage options for painful arthrosis and severe deformity. Preservation of the calcaneocuboid joint permits a relative lateral column lengthening when correcting planovalgus deformity. Arthroscopic surgery offers preservation and protection of soft tissues and reduces wound tension. The sinus tarsi approach permits good visualisation and decortication of the triple joints and rotatory correction of deformity. This technique is not appropriate when there is extensive bone loss requiring block bone grafting. Early complications are reduced and late complications such as non-union and arthrosis of adjacent joints seem similar to those reported in studies on open arthrodeses.

FP32

Short term outcomes of total ankle replacements

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Introduction: The National Joint Registry has been capturing data on ankle replacement surgery since April 2010. This currently represents the largest cohort of ankles replacements captured worldwide and is a valuable resource to give us short term outcome of ankle replacement surgery.
Methods: All the ankle replacements on the NJR were linked to the HES database using deterministic methods. The results were then anonymised. We then looked at Hopital admissions aftert he ankle replacement had taken place.
Results: There were just over 1600 ankles on the NJR and linking to HES gave 2065 records. 1437 of these were relavant to TAR. There were 12 malleolar fractures post-op and 6 DVT/PE which required readmission. there were 49 reoperations other than revision, 12 of which were ankle arthroscopies, and 14 removal of metalwork.
Conclusion: Ankle replacement is a effective procedure but does carry with it the risk of short term reoperation.

FP33

13-19 year results of a consecutive series of 200 Scandinavian Total Ankle Replacements (STAR): the Wrightington experience

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Introduction: The Scandinavian Total Ankle Replacement (STAR) is a three-component, uncemented implant in widespread use throughout Europe. STAR has achieved encouraging results with short and medium term outcome. We present the long term (13-19 year) results of a consecutive series of 200 STAR ankles.
Methods: Between November 1993 and February 2000, a total of 200 consecutive STARs were carried out in 184 patients. Patients were followed up both clinically and radiologically, until death or failure, with time to decision to revision or fusion as the endpoint. Pain and function were assessed using the American Orthopaedic Foot and Ankle Society (AOFAS) ankle and hindfoot score.

Results: Of the 200 STARs, 109 (105 patients) were alive at latest review. 12 STARs (11 patients) were lost to follow-up, leaving 97 ankles for clinical review. Of these, 76 ankles were surviving and 21 ankles had failed [13 underwent arthrodesis, 4 had an exchange of poly insert, and 4 had a revision TAR], with mean time to failure 82 months (2-156 months). For the 91 ankles in 79 patients who died during the study, 8 had failed [6 underwent revision TAR and 2 had an arthrodesis]. The implant survival at 15 years with endpoint of revision for any reason was 76.9% [95% CI 66.4 to 87.3]. The mean AOFAS score was 72 [20 to 96]. The mean annual failure rate was 1.5%, which was steady across the study period.
Conclusion: The 15 year survivorship for the STAR prosthesis was 76.9%, which provides a benchmark for other later design ankle prostheses. We found no drop off in failure rate or function over the study period.

FP34

Comparative study of the Nottingham Foot and Ankle Unit outcomes of the Scandinavian Total Ankle Replacement (STAR) and the mobility total ankle replacement

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Introduction: Total ankle replacement is a recognised treatment for disabling end stage ankle arthritis and an alternative to arthrodesis, although results are not yet comparable to other joint replacements. This has stimulated a constant evolution in design of implants and instrumentation. The Nottingham Foot and Ankle Unit used the STAR until 2005, when it switched to Mobility, due to the perceived advantages of less bone resection, improved instrumentation and potentially less polyethylene insert wear. The aim of this study is to report the unit's results and review the different outcomes between the two ankle replacements used.
Methods: A retrospective analysis of all total ankle replacements carried out by the foot and ankle unit at Nottingham City Hospital between March 1999 and June 2013. Post operative complications, associated reoperations and revisions were recorded. The American Orthopaedic Foot and Ankle Score (AOFAS), Foot Function Index (FFI), European five dimension quality of life scores (EQ-D5) and patient satisfaction was independently assessed at each follow up visit. Other ankle replacements or those performed elsewhere or with less than 12 month follow up were excluded.
Results: 162 Mobility and 148 STARs' were assessed. The mean follow up was 7 years (1-13yrs,) STAR and 3.5 years (1- 8 yrs) Mobility. Post-operative complication rate of 15% STAR and 13% Mobility, associated operation rate of 15% STAR and 10% Mobility with revision rate of 19% STAR at 13 years and 4.3 % Mobility at 8 years. Both STAR and Mobility groups showed improvements in AOFAS, FFI, EQ-D5 and patient satisfaction, but there were no significant differences between the two groups.
Conclusion: This is one of the largest comparative series of total ankle replacements and shows that patient satisfaction, pain and function is improved. The Mobility total ankle replacement had fewer revisions and complications compared to STAR.

FP35

A prospective randomised controlled trial of hyaluronic acid in patients with symptomatic ankle osteoarthritis

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Introduction: Symptomatic treatment of ankle osteoarthritis (OA) with corticosteroid injections is well established. Hyaluronic acid is also reported as an effective symptomatic treatment for ankle OA but these two treatments have not been compared directly.
Methods: A prospective randomised controlled trial in patients with symptomatic ankle osteoarthritis. Twenty patients per group were required based on a significance level of 0.05, and a drop out rate of 5%. Patients were blindly allocated to the treatment or control group. Injections were carried out by the clinician in the outpatient department. Treatment group received Ostenil 20mg and control group received Depomedrone 40mg (both as single injections). The treatment arm was allocated by computer generated block randomization to match treatment allocation with grade of arthritis. The primary outcome measure was the change in Visual Analogue Scale (VAS) pain score at 6 months. Secondary outcome was the change in AOFAS score at 6 months. Research ethics committee approval was obtained.
Results: A total of 42 patients were recruited of which 38 completed the study. Male recruits predominated (79%; 33 recruits). More than 70% had radiographic OA of grade 3 or more. Both groups demonstrated statistically significant improvements in VAS at weeks 3, 6, and 3 months over baseline, but the Ostenil group faired better at 6 months follow‐up. (difference in VAS scores of 3.5 Ostenil VAS ‐ 4; Steroid VAS ‐ 7.5; Mann Whitney test (p< =0.05). There was no statistical difference in AOFAS scores between both groups at baseline and follow‐up (p = 0.48, Mann Whitney test). No complications noted. 30% of patients have had their surgical procedures delayed for 6 month post injection.
Conclusion: The Ostenil group revealed similar clinical efficacy to steroid group, however the benefits provided by Ostenil lasted longer. Ostenil provided sufficient mid‐term pain‐relief whilst patient awaits further definitive intervention.

FP36

Too young for an ankle replacement? Does the age of a patient impact on outcome following total ankle replacement

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Introduction: Total Ankle Replacement is proving to be a viable option for younger patients with Post Traumatic Osteoarthritis of the Ankle. The aim of our study was to study the clinical and patient reported outcomes between patients of < 60 and >60 years who underwent TAR.
Method: Patients who underwent a TAR between March 2006 and May 2009 were

invited to take part in the hospital patient registry. They were divided into two groups based on Age (Group A-Age>60 and Group B-Age< 60). Patient demographics, co-morbidities, Clinical (AOFAS) outcomes, patient reported outcomes (FAOS, SF-36, patient satisfaction) and complications were collected from patients pre-operatively and at 1, 2 and 3 years follow up. Comparisons were made between groups for all outcome measures.
Results: There were 56 patients in Group A and 32 patients in Group B. There was no difference in Gender, side of operation and diagnosis reported between the 2 groups (P>0.05). Group A reported higher number of co-morbidities than Group B (1.54 vs. 1.00); p=0.032. There was no difference in AOFAS scores and FAOS scores for pain and function at all follow up times (p>0.05). Although Group B reported worse scores for FAOS stiffness pre-operatively (p=0.002) and at 1 year (p=0.029); there was no difference between scores at 2 and 3 years follow up. There was no difference in SF-36 scores and patient satisfaction and complications between groups. We expect to have the 4 year results processed by October this year.
Conclusion: We have found satisfactory outcomes following TAR, both clinical and patient reported, irrespective of age of patient. Although long-term survivorship results for TAR are unavailable, we feel that younger age may not be a contra-indication to TAR as it provides good quality of life and potentially allows continuation of work.

FP37

Return to work after total ankle replacement: a cross sectional study

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Introduction: The aim of this study was to assess patients reported fitness to return to work and to driving after ankle replacement.
Method: Using Hospital Joint Registry, patients who underwent ankle replacement between 2006 and 2011 were invited to take part in the study. Questionnaires were sent to these patients. Participants were asked to report the nature and pattern of their work (full time or part time), time it took to return to work and subsequent nature of work. Participants were also asked about time to return to driving.
Results: 173 participants were given eight weeks to reply. In this time there were 131 responses (response rate 76%). There were 79 male and 52 female respondents. Of the responses 61% (n=80) were retired, 24% (n=42) were employed, 5% (n=9) were unemployed before the surgery. Of those who were employed prior to ankle replacement, 29 respondents reported working full time and 11 respondents were working part time and 5 were self employed. 10 (24%) patients returned to work at 6 weeks 22 (52%) were able to work by 3 months. Following surgery 5 of the patients did not return to work off which one took retirement. 45 (40%) respondents could drive at 6 weeks, 34 (22%) at 3 months and 11 by 6 months. 20 (12%) patients did not drive before surgery. There were 23 responses about nature of employment, 10 being manual workers and 13 being office workers. Of the manual workers 5 patients returned to full time work.
Conclusion: We conclude from this study that the 76% of the employed patients prior to their ankle replacement were able to return to work by 6 months with 24 % returning by 6 weeks. 71% were able to drive at 3 months after surgery.

FP38

Gait analysis following Mobility™ total ankle replacement (TAR)

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Introduction: There is paucity of literature on Gait analysis following Total Ankle Replacement (TAR). We aimed to study changes to gait after successful Mobility TAR.
Methods: 20 patients who underwent a primary TAR, with a diagnosis of either OA or PTOA were recruited between October 2008 and March 2011. Gait analysis was carried out using the Helen Hayes marker system with VICON 3D opto-electric system pre-operatively, 3, 6 and 12 months post-operatively. Ankle kinematics and spatio-temporal parameters of gait were studied.
Results: 20 patients were included. Mean age was 63.6 years (Range 43-84), mean BMI was 29.6 ± 4.08. Diagnosis was OA in 12 (52.2%) and PTOA in 8 (34.8%). Results showed increase in average and maximum range of dorsiflexion from (3° to 7°) and (11° to 17°) respectively from pre-op to 1 year, but statistically not significant ($p>0.05$). Of the temporal variables, Average Cadence increased from Pre-op to 1 year (102 to 106 steps/min); double support (0.35% to 0.31%), single support (0.41% to 0.39%) and toe off point at gait cycle (63.9% to 62.4%) decreased from pre-op to 1 year, but failed to achieve statistical significance ($p>0.05$). For distance variables, Step length showed a significant increase from pre-op to 1 year (0.21m/s to 0.58m/s; $p< 0.001$); stride length increased (1.05m/s to 1.13m/s), step time and stride time decreased (0.60secs to 0.58secs) and (1.19 to 1.14secs) respectively and Walking speed increased (0.90m/s to 1.00m/s) from pre-op to 1 year, but statistically not significant ($P>0.05$).
Conclusion: There was significant improvement in step length after TAR from pre-op to 1 year. Although the results showed a trend for improvement in average dorsiflexion, average cadence, stride length, walking speed, decreased step and stride length times, which showed improvement in walking pattern in these group of patients, but failed to achieve statistical significance.

FP39

What are the risks for early failure of total ankle replacement? Is there a valid classification?

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Introduction: Prompted by the success of hip and knee arthroplasty, total ankle replacement (TAR) has become increasingly popular as a treatment for end stage arthritic complaints of the ankle. Glazebrook et al proposed a three grade classification of complications to assist prediction of early implant failure. We have compared the

experience of a tertiary referral centre in the UK to Glazebrook's proposed system.
Method: A retrospective review of the Sheffield Foot and Ankle Unit TAR database was performed from 1995 to 2010. All complications were recorded and categorised using Glazebrook's proposed system. Glazebrook described eight main complications of increasing severity. Low grade complications; Post operative bone fracture, Intra-operative bone fracture and wound healing problems were very unlikely to lead to revision. Medium grade complications; technical error and subsidence, lead to failure < 50% of the time. High grade complications; deep infection, aseptic loosening and implant failure lead to revision >50% of the time.
Results: 217 TAR were implanted in 198 patients with a minimum follow up of 30 months. The complication rate was 23% with a revision rate of 17%. All complications recorded in our study except intraoperative bone fracture and wound healing had a failure rate of at least 50%.
Conclusion: The proposed classification system of Glazebrook et al was the first step towards an international system of classifying TAR complications. Most complications associated with TAR have a significant impact on the lifespan of a TAR. Glazebrook et al's proposed three tier system did not reliably reflect our experience. We would categorise complications as either high or low risk for early failure of TAR.

FP40

Tibiotalocalcaneal (TTC) fusion with a hindfoot nail and femoral head allograft for failed total ankle replacements (TARs)

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Introduction: TTC fusion for the salvage of failed TARs with significant bone loss using a hindfoot nail and femoral head allograft has been reported in a number of small series. We present our experience of this procedure.
Method: Review of the theatre records from 2006 to July 2011 identified twenty four cases using this technique. The case notes and imaging were retrospectively reviewed.
Results: Overall eighteen of the twenty four cases had achieved union (mean time 18.8 months). Of this number two had under gone a revision hindfoot nailing and another case needed revision with a circular frame. A further three cases required dynamisation to unite.
There were five non unions and one loss to follow up (at two months).
Complications included one deep infection (non union) and one case with chronic regional pain syndrome.
Metalwork complications included five nail fractures and five cases that required prominent screw removal.
Conclusions: This is the largest series reported using this technique for the salvage of failed TARs with significant bone loss. Other smaller series using this technique have reported union rates around fifty per cent.
The time to union is long and half of these cases required further procedures during this course.This is important to reflect when consenting the patient for this type of surgery.