FP1

The Salto total ankle replacement: mid term survivorship and functional outcomes in a prospective patient cohort

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Introduction: The role of total ankle replacements remains unproven within orthopaedic literature. We present a prospective series of patients who underwent a SALTO TAR (Tornier) between October 2006 and January 2014.
Methods: A cohort of 53 TAR (50 patients) were prospectively followed up and assessed clinically, radiologically and asked to complete FAOS, VAS and Modified AOFAS scores. Four patients had bilateral procedures. The mean age was 71 years old (range 42-92). The mean follow up was 55 months (range 6-92). Nineteen TARs (19 patients) have a follow up of more than 60 months.
Results: Our survival rate is 98% as one patient proceeded to have an ankle fusion at 12 months due to loosening. Three patients had ankle arthroscopies at 1 year post TAR; one for removal of a fibula cyst, one for synovitis in the lateral gutter and another for fibula impingement. One patient had an early postoperative infection.
Mean overall FAOS scores were 73.4 for the entire cohort and 74.2 for the cohort with over 5 years follow-up. Mean modified AOFAS scores for the entire cohort and the cohort with over 5 years follow up was 71.5 and 78.9 respectively. Mean VAS scores for the entire cohort and the cohort with over 5 years follow-up was 18.8 and 25.8 respectively.
Discussion: Ankle joint arthrodesis has been shown to be a reliable in relieving pain and result in good patient satisfaction. However, total ankle replacement provides an alternative surgical option for the management of ankle arthritis. The improving survivorship of ankle replacements is making this an increasingly popular option. Our follow-up of almost five years as an entire cohort, but also those with over five years, show that these latest generations of TAR have excellent mid term survivorship, accompanied by high levels of patient satisfaction and function.

FP2

The early multicentre results of the rebalance total ankle replacement

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Introduction: We present the early results of 220 Rebalance Total Ankle Replacements performed in 6 centres in 4 different countries.
Methods: The Rebalance Total Ankle Replacement is a new 3 component uncemented mobile bearing prosthesis with a surface coating of ´bonemaster´ and an ´e´ poly bearing. The prosthesis was released in a limited way in May 2011. Since then 220 replacements have been implanted in 218 patients in 6 centres in 4 different countries(UK,Sweden,Canada,Czech Republic). All the x-rays and case notes were reviewed.63 prostheses have a minimum follow up of 2 years. Outcome measures included revision of the prosthesis, and the incidence of progressive and non-progesssive radiolucent lines around the prosthesis.
Results: 7 patients underwent revision or are awaiting revision of their prosthesis. Reasons for revision included loosening(2), infection(1), malposition(2), periprosthetic fracture(1), impingement(1). 9 patients had non-progressive radiolucent lines and 2 patients had progressive radiolucent lines. 1 patient with progressive radiolucent lines is waiting revision for suspected infection. 8 patients suffered fractures to the lateral malleolus and 4 to the medial malleolus. There were no cases of balloon osteolysis. 29 patients had pre-op AOFAS scores= 41(12-67). 21 had 1 year post-op AOFAS scores= 73.5(26-100). 12 had 2 year AOFAS scores= 75.5(50-100).
Conclusion: The early results are encouraging and we believe support its wider use.

FP3

Complication rates amongst 4 surgeons on a consecutive series of 202 total ankle replacements

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Introduction: The aim of this study was to identify the rate of complications of total ankle replacement in a single Centre to help with informed patient consent.
Methods: Between 2008 and 2012, 202 total ankle replacements (TARs) were performed by 4 surgeons at our Institute. Data was collected on all patients; demographics, arthritic disease, pre-operative deformity, prosthesis and all early and late complications.
Results: 4 surgeons (A, B, C, D) performed 63, 55, 48 and 36 TARs (178 De Puy Mobility and 24 Corin Zenith). 130 patients had primary osteoarthrosis, 35 had rheumatoid and 36 had post traumatic osteoarthrosis. There were no differences in patient demographics for each surgeon.
There were 3 deep infections (A,B,C,D: 1,0,2,0). There were 18 medial malleolar fractures (8 intra-operative [4,1,1,2], 3 early (< 3 months) [1,1,0,1] and 7 late (>3 months) [2,2,2,1]). There were 2 lateral malleolar fractures, both intra-operative (0,0,1,1). There were 15 patients who developed superficial wound infections, which resolved fully with oral antibiotics (4,3,4,4). A further 7 patients had a delay to wound healing (wound not fully healed at 3 months) (4,0,2,1); 2 of these developed deep infection and failed. 22 patients had persistent medial gutter pain (9,4,5,4); all had undergone Mobility TAR. 4 patients developed recurrent edge loading and have had to be revised (4 converted to TTC fusion) (2,0,2,0). We report complications in 32% of patients. Overall 9 TARs failed and underwent revision to fusion (2,2,5,0).
Conclusion: We report an overall complication rate of 32% following TARs, however most are minor and don't affect clinical outcome. We had a 1.5% deep infection rate. Complication rates were comparable between 4 surgeons. There was a difference in medial gutter pain rate between implants (13% v 0% Mobility to Zenith). This data provides detailed complication rates for informed consent.

FP4
Outcomes of salvage procedures for failed total ankle replacements

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Introduction: We report the outcomes of salvage procedures in total ankle replacement (TAR) in a single surgeon series.
Methods: This study was a retrospective review of patients who had undergone salvage procedures with tibio-talo-calcaneal (TTC) fusion for failed TAR over a period from 1999-2013 in a single centre. In this period, 317 TAR were performed of which 11 have failed necessitating conversion to TTC fusion. Clinical documentation and radiographs were reviewed for cause of failure, type of graft for fusion, time to radiological/clinical union and complications including further surgeries.
Results: The causes of failure of the TAR were pain from instability/impingement in 8, fracture in one, subsidence of the talar component in one and infection in one. From the group of 11 patients, 8 patients went onto union at a mean of 10 months (7-14). All 8 patients had femoral head structural allografts to maintain limb length for the procedure and 3 required a secondary procedure to dynamise the nail. 2 patients with femoral head structural allografts developed infections necessitating removal of the graft and conversion to an external fixator of which one united and the other developed a painless fibrous union. 1 patient developed non-union with progressive deformity of the ankle resulting in a Symes amputation.
Conclusions: From our series of patients we have demonstrated that failure of TAR requiring salvage procedures is a relatively rare event (3.5%). The use of TTC fusion is successful in the majority of patients and the use of femoral head structural allografts allows preservation of leg length with good rates of union.

FP5
How do 5-year patient reported outcomes (PROMS) of TAR compare with TKR and THR?

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Introduction: Ankle arthritis is a leading cause of pain and disability. The effect of this condition on physical and mental health is similar to end stage hip arthritis. There is paucity of literature on PROMS following total ankle replacements (TAR) in comparison to total hip replacement (THR) or knee replacement (TKR). We aimed to study 5 year outcomes of TAR in comparison with TKR and THR.
Methods: PROMS data from patients who underwent a primary THR, TKR or TAR from March 2003 to 2013 were collected from our hospital patient registry. They were divided into 3 groups based on the type of primary joint replacement. Patient demographics and patient reported outcomes (WOMAC, SF-36 scores and patient satisfaction scores at follow up) were compared at pre-op and 5 year follow up.
Results: There was data available on 1920 THR, 2582 TKR and 248 TAR patients. Pre-operatively, TAR patients reported higher function scores when compared to THR and TKR (40.2 vs. 34.2 and 35.8; $p < 0.05$). For SF-36 scores, there was no difference between groups for general health, role emotional components ($P>0.05$); TAR patients reported similar scores to TKRs for physical domains; to THRs for the mental domains ($P>0.05$). At 5 years post-op, TARs reported lower scores than THRs and TKRs for function and stiffness. For SF-36 scores, TARs reported similar outcomes to THR and TKR for mental health components ($p>0.05$), similar scores to TKR for 3/4 physical domains ($p< 0.05$), but lower satisfaction rates for ADL and

recreation when compared to THR (P< 0.05).
Conclusion: TAR patients had similar outcomes to THR or TKR patients for disease specific and mental health domains, and lower patient satisfaction rates in terms of pain relief, ADL and recreation. Further research is warranted including clinical outcomes along with PROMS with a long term follow up.

FP6

The first 3-years of the national joint registry for ankles: patterns of uptake and compliance, and a comparison with that of hips, knees and shoulders

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The National Joint Registry (NJR) was established in 2003, and was extended to include ankle arthroplasty on 1st April 2010, and shoulder and elbow arthroplasty in April 2012.
The aim of this study was to evaluate the uptake of the NJR for ankle arthroplasty over its first 3 years. This is compared to the first 3 years of hip and knee data, and the first year of shoulder and elbow data.
The methods of measuring compliance are also evaluated. NJR compliance is measured by comparing the number of procedures submitted to the NJR, against the number of levies raised through implant sales. This applies to all of the UK, and both independent and NHS providers. However, compliance can also be measured by comparing NJR submissions with data submitted to the Hospital Episode Statistics (HES) database. This only relates to NHS institutions in England.
The NJR ankle data was compared to implant data, and adjusted to compare to HES data, to evaluate the different methods of measuring compliance.
We also compared these figures with the first 3 years for hip and knee arthroplasties and the first year for shoulder and elbow arthroplasties.
Results: In 2011 there were 493 arthroplasties and the compliance was 64% against industry data. In 2012 there were 590 procedures with compliance improved to 77% against industry data. When adjusting NJR to compare with HES data, the compliance was 87% in 2012., with 507 ankle arthroplasties registered with the NJR and 582 on HES data. The reasons for this discrepancy are discussed. The specific difficulties of capturing ankle revisions are discussed, as some get revised to arthrodeses.
The uptake is significantly higher than the first year for all other joints (shoulders 52%, hips 57%, knees 57%, and elbows 60%).

FP7

PROMS 2.0 in elective foot and ankle surgery early experience from University Hospital of South Manchester

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Introduction: PREMS and PROMS are part of the national initiative of the DoH. They measure quality from patient perspective and also help patient choice. We present our pioneering experience of PROMS 2.0 which is a semi automated web based system to collect and analyse outcome data in real time.
Materials and methods: Data was prospectively collected from January 2013 to June 2014. Outcome measures included EQ-5D VAS, EQ-5D Health Index, and MOxFQ, collected pre-operatively and post-operatively. Patient Personal Experience (PPE-15) was collected postoperatively. A semi-automated e mail based system - Amplitude - was used.
Results: 345 patients consented to participate.147 patients (42.6%) and 168 pathways (47%) signed up for PROMs 2.0 programme. 40 (27%) did not complete either pre-op or post op questionnaire after signing up. 30 patients (20.4%) completed pre-op and at least one post op score. 99 patients (58.9%) completed PPE questionnaire. 83% of respondents had improved or unchanged EQ-5D VAS score, and EQ-5D Health Index. MOxFQ scores showed improvement in over 80% of responses. 88% responded favourably (YES) to PPE 15 questionnaire.
Conclusion: Our data shows an improvement in PROMS and a favourable PREMS in excess of 80% of our elective foot & ankle patients following surgery. Patient response was higher for PPE questionnaire compared to other PROMs outcomes. Methods to increase patient enrolment and to encourage higher participation are required. We feel patient education and simplification of PROMS 2.0 are the key.

FP8

Mid-term outcomes following first metatarsophalangeal joint replacement using the Toefit-Plus™ prosthesis

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Introduction: This study evaluates the mid-term results of first metatarsophalangeal joint replacement (MTPJR) for hallux rigidus using the Toefit-Plus™ prosthesis.
Methods: We prospectively studied the outcomes of 86 MTPJR in 73 patients using the AOFAS-HMI score and radiological follow up over a period from 2006 to 2013, with surgeries performed by a single surgeon at two centres. Patients were reviewed, scored and radiographs obtained pre-operatively and then at intervals of 6 weeks, 6 months, 12 months and then yearly. The mean follow up was 33 months (2-72).
Results: The mean AOFAS score of the patients not requiring revision at 1 year was 92, at 2 years was 94, at 3 years was 91, at 4 years was 99, at 5 years was 93, at 6 years was 100 and at 7 years was 97. 18 joints have either been revised or listed for revision giving a revision rate of 21%; this occurred at a mean of 33 months post-surgery. Reasons for revision included loosening of components in 13, infection in 1, dislocation in 2, malalignment in 1 and persistent pain in 1. Eight patients sustained intra-operative fractures requiring circlage wiring, of which 7 went on to union and one required revision. 25 patients had evidence of radiological loosening of which 22 were around the phalangeal component and 3 were around the metatarsal component.
Conclusions: First MTPJ replacement resulted in improved outcomes in patients with hallux rigidus who do not require revision in the medium term, however the revision rate is unacceptably high and as such we have discontinued use of this prosthesis. Radiological loosening of the components is high and needs monitoring for progression which may necessitate revision.

FP9
Clinical and radiographic outcomes of a large series of toe fusions using the Smart Toe implant

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Introduction: In 2009 the Smart Toe implant was introduced as an option for lesser toe fusion in our department. The Smart Toe is an intramedullary device made from Nitinol, an alloy that can change shape with a change of temperature, expanding within the intramedullary canals of the proximal and middle phalanx to achieve fixation. The advantages of the Smart Toe are that patients are spared 6 weeks with K-wires protruding from their toes and there is no need for wire removal. We conducted a retrospective review of radiographic and clinical outcomes to assess the performance of this implant.
Methods: We present a consecutive series of 192 toe fusions using the Smart Toe implant in 86 patients, between January 2009 and November 2013. All radiographs and case notes were reviewed to assess for radiological fusion, satisfactory clinical outcome and complications.
Results: One patient was lost to all follow up. Radiographic follow up was available for 186 of 192 implants (95%). 137 toes (74%) were fused by 6 weeks, and 152 (81%) at final follow up. Clinical notes were available for 182 implants (94%) in 85 patients. At 6 weeks 50 patients reported satisfactory outcomes in 105 toe fusions (58%). At final follow up 70 patients reported satisfactory outcomes in 150 toe fusions (82%). 7 patients experienced complications in 19 toes (10%). 2 implants were broken and 2 implants had cut out. There were 3 phalanx fractures. In all 4 toes were revised, and there was 1 amputation. Clinically, out of the 34 non-united toes only 5 were symptomatic.
Conclusion: Overall 82% of toe fusions using the Smart Toe implant yielded entirely satisfactory clinical outcomes. Radiographic fusion occurred in 81% but most non-unions were asymptomatic. There were a small number of significant complications, and 4 patients out of 85 required revision surgery.

FP10
Forefoot deformity in rheumatoid arthritis - a comparison of shod and non-shod populations

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Introduction: All reported RA forefoot deformities in the literature so far have arisen from shoe wearing populations. Our aim in this study was to compare hallucal deformities seen in a shod to a non-shod population.
Methods: A case-control study was undertaken in two specialist foot and ankle units, one in India and one in the UK. All patients suffering from RA and attending for consideration of forefoot surgery from January 2007 to October 2013 were included in this study. Standardized anteroposterior weight bearing radiographs were obtained to measure the hallux valgus, inter-metatarsal and metatarsus primus varus angles.
Results: In the shod population, there was 1 hallux varus deformity, 10 without hallucal deformity and 90 feet with varying degrees of hallux valgus deformity. In contrast, in the unshod population, there were 19 hallux varus deformities and 6 hallux valgus deformities. There was great variability in the lesser toe deformity seen. In the shod population, it was most common to see dorsal subluxation or dislocation, with the 5th toe in a varus

position. This was seen in 95% (n=96) of the shod population. In the unshod population, the most common lesser toe deformity seen was varus deviation or dislocation. This was present in 80% (n=20) of the unshod population.
Conclusion: Instability of the metatarsophalangeal joint in the rheumatoid foot predisposes it to significant deformity. External forces of shoe wear dictate the deformity, with hallux valgus being the most likely scenario in a shoe-wearing patient. In the non-shoe wearing population, intrinsic forces and weight bearing forces determine the deformity, with hallux varus being the most common presenting problem.

FP11
Corticosteroid injections for Morton's neuroma - does ultrasound guidance improve efficacy? A randomised controlled trial

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Background: The purpose of this double-blind randomised controlled trial was to assess whether ultrasound guidance improved the efficacy of steroid injections for Morton's neuroma (MN).
Methods: Following IRB approval, cases with MN confirmed on ultrasound were randomised to 2 groups: Group 1 received ultrasound-guided injections (1ml 40mg Depo-Medrone and 1ml 1% lignocaine) and Group 2 received the same injection under sham ultrasound guidance. All ultrasounds and injections were performed by a single MSK radiologist. Patients were reviewed at 3 months.
The primary outcome measure was the VAS for pain. The study was powered to detect a MCID of 15mm on a 100mm VAS scale between the groups (21 per group). Secondary outcomes included the Manchester-Oxford Foot Questionnaire (MOxFQ), Johnson's satisfaction scale and failure of treatment.
Results: 50 cases (feet) were recruited for this study. Demographics included 29 female to 21 male with a mean age of 58 years (29 - 88 yr). Five cases declined further participation and were excluded from analysis. The VAS score improved significantly in both groups (64 to 25mm in Group 1 vs. 67 to 34mm in Group 2; $p< 0.005$) but there was no significant difference between the groups ($p=0.08$). Similarly, the improvement in MOxFQ scores was also significant in both groups (38 to 18 in Group 1 vs. 38 to 23 in Group 2; $p< 0.05$) but did not reach statistical significance when the groups were compared ($p=0.086$). The Johnson's satisfaction scale was however, significantly better in Group 1 ($p=0.011$). Seventy-percent in Group 1 were either completely satisfied/ satisfied with minor reservation compared to only 50% in Group 2. At 3 months, 17% in Group 1 versus 36% in Group 2 failed treatment.
Conclusion: The results suggest that the use of ultrasound guidance improved the efficacy of steroid injections for symptomatic Morton's neuroma.

FP12
Abdominal fat transfer for recreating fat pad in hind foot and forefoot

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Introduction:
• Primary functions of heel and forefoot fat pad - shock absorber at heel strike, energy dissipation, load bearing, grip and insulation. •Reliability of weight bearing heel pad thickness measurements by ultrasound has been determined by Rome et al.1
• Importance of soft tissue fillers has been recently popularised by Coleman.2
Methods and materials:
• Harvesting done by standard low pressure liposuction using small cannula •Grafting using small needle depositing the small globules of fat in multiple layers of soft tissue.
• There is an expectation that up to 50% of the fat will be lost and so upto 19mls of fat placed per foot.
• Patients were kept NWB for 4-6 weeks post op and then allowed to mobilise fully. •Case notes were prospectively collated and analysed.
• Pre and post-op ultrasound scans were performed to document the depth of the heel/forefoot fat pad.
• Clinical pictures were taken and post-op patient satisfaction scores were done as well.
Results:

- We treated 9 feet in 5 patients.
- 5 heel fat pad transfers and 4 forefoot.
- Pain completely relieved in all feet
- No complications
- Average pre-op VAS - 3/ Post-op - 9
- Average pre-op AOFAS score - 70/ post-op - 105.
- Follow-up 6months - maximum 23 months.

Conclusion:
• Fat transfer is usually used for cosmetic reasons and occasionally to improve scars. •Very few reports from South America have been published for patients using high heels giving pain but none for patients with a pathological anomaly.
• The technique seems to highly effective with no complications so far.
• It is currently being used on other painful problems in other areas of the sole with equal success.
• Abdominal fat transfer is an innovative technique aimed at getting rid of the 'heel pad syndrome'

FP13
The footprint of the Achilles tendon - a cadaveric study

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Introduction: The insertion footprint of the different muscles tendon fascicles of the Achilles Tendon on the calcanium tuberosity has not been described before.
Method: Twelve fresh frozen leg specimens were dissected to identify the different Achilles Tendon fascicles insertion footprint on the calcaneum in relation to their corresponding muscles. Further ten embalmed cadaveric leg specimens were examined to confirm an observation on the retrocalcaneal bursa.
Results: The superficial part of the AT insertion is made by tendon fascicles from the medial head of the gastrocnemius muscle which insert over the entire width of the inferior facet of the calcaneal tuberosity. In three specimens, this insertion had continuity with the plantar fascia in the form of periostium. The deep part of the TA insertion is made of fascicles from the soleus tendon which insert on the medial aspect of the middle facet of the calcaneal tuberosity while the lateral head of the gastrocnemius tendon fascicles insert on the lateral aspect of the middle facet of the calcaneal tuberosity. A bicameral retrocalcaneal bursa was present in 68% of examined legs.
Conclusion: This new observation and description of the Achilles insertion footprint and the retrocalcaneal bursa may allow a detailed understanding of the function of each muscular part of the gastrosoleous complex. This has potential significant clinical relevance in the treatment of Achilles pathologies around its insertion.

FP14
Plantaris excision in the treatment of non-insertional Achilles tendinopathy in elite athletes

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Background: Achilles pathology is a serious and frequently occurring problem, especially in elite athletes. Recent research has suggested a role for the plantaris tendon in non-insertional achilles tendinopathy. We report on the outcomes after excision of the plantaris tendon in elite athletes.
Aim: To assess whether or not excising the plantaris tendon improves the symptoms of Achilles tendinopathy in elite athletes.
Methods: A group of 32 elite athletes who underwent plantaris tendon excision to treat medially located pain associated with non-insertional Achilles tendinopathy were investigated. Outcomes were assessed with pre and post-operative Visual Analogue Scores (VAS) for pain and the Foot and Ankle Outcome Score (FAOS) as well as time to return to sport and satisfaction scores.
Results: At a mean follow-up of 22.4 months (12-48), 29/32 (90%) of athletes were satisfied with the results. 30/32 athletes (94%) returned to sport at a mean of 10.3 weeks (5-27). The mean VAS score improved from 5.8 to 0.8 ($p < 0.01$) and the mean FAOS improved in all domains ($p < 0.01$).
Conclusions: The plantaris tendon may be responsible for symptoms in some patients with non-insertional Achilles tendinopathy. Excision using a mini-incision technique carries a low risk of complications and may provide significant improvement in symptoms enabling an early return to elite level sports.

FP15
Non-operative treatment of tendo-achilles rupture: is "gap size" important in determining suitability for functional rehabilitation?

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Introduction: The treatment of acute rupture of the tendo-achilles remains controversial. There is good evidence to suggest that outcomes are the same for both operative and non-operative treatment when a

functional rehabilitation program is utilised. However, debate continues as to whether the radiological gap-size between the proximal and distal remnants of the tendon has an influence on the suitability for non-operative management.
Methods: All adult patients who attended the emergency department with a clinically suspected tendo-achilles rupture were place in a plantarflexed cast, and underwent MRI scanning to confirm the diagnosis. They were then counselled on the risks and benefits of operative versus non-operative treatment. Patients opting for non-operative treatment were asked to take part in the study and treated using a functional rehabilitation programme. Gap sizes were determined using a standardised protocol by a single musculoskeletal radiologist blinded to the clinical outcomes.
Results: A total of 69 patients have been recruited into the study, 40 have complete their one year review. There were two re-ruptures. The average age was 42.4 years (range 19-70). The average gap size recorded by MRI was 40.4mm (range 6-110). The average ATRS score was 80 (range 17-100) and the single limb heel raise percentage of contralateral side was 64.8% (range 4-115). The Spearman rank correlation coefficient comparing gap size and ATRS score was 0.272 ($p=0.045$) and for gap size and strength was 0.158 ($p=0.165$).
Conclusion: This study shows a weak positive correlation between MRI measured gap size of the ruptured tendo-achilles and the Achilles tendon Total Rupture Score at one year. No correlation could be demonstrated between gap size and strength at one year. These results suggest that the MRI measured gap size is unimportant in predicting outcome and hence suitability for non-operative treatment of tendo-achilles rupture using functional rehabilitation.

FP16
Return to sport following syndesmosis injuries in 64 elite athletes - factors affecting need for stabilization and presentation of a modified classification

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Isolated syndesmosis injuries lead to a prolonged time away from sport. Stable injuries respond well to conservative management whilst unstable injuries with diastasis require fixation. However, grade II injuries may have latent instability which is only present on stressing the syndesmosis during loading. They are difficult to identify with the current classification system and inappropriate treatment can lead to late morbidity.
A prospective series of 64 isolated grade II syndesmosis injuries in professional athletes are reported. Clinical and MRI findings were used to determine whether the injury was stable (grade IIa) or unstable requiring arthroscopic assessment and possible surgical stabilization (grade IIb).
38/64 athletes had a possible grade IIb injury. 36/38 were deemed unstable at arthroscopy and stabilized with a Tightrope. At a minimum of 12 months all athletes returned to their previous level of sport - grade IIa injuries returned to play significantly earlier that grade IIb (64 versus 45 days; $p< 0.001$). Injury to both AITFL and deltoid ligaments had a significant chance of being unstable whereas concomitant injury to the ATFL appeared protective leading to an earlier mean time to return to sport and were less likely to be suggesting a different mechanism of injury. Although the external rotation test was sensitive it was less specific than a positive squeeze test which was associated with increased severity of injury with a longer return to sport and increased need for stabilization.
We have identified specific clinical and radiological findings to increase accuracy of differentiating stable from unstable grade II syndesmosis injury enabling appropriate management, predictable time of return to sport and minimizing the risk of later symptoms. Those athletes with no diastasis but AITFL rupture, injury to the deltoid and/or a positive squeeze test are more likely to have an unstable syndesmosis and may warrant arthroscopic assessment.

FP17
A simplified, validated method for measuring fibular reduction on CT scan

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Fibular malreduction is an important cause of pain after ankle fracture fixation. Plain radiographs have been shown to be unreliable at measuring mal reduction when compared to CT scans. Davidovitch developed a validated method of measuring malrotation, diastasis and AP translation. His method relies on finding the axis of the fibula. Elgafy demonstrated that the fibula morphology varies greatly, and in many cases it can be difficult finding the fibular axis.
We developed a new method of measuring the ankle syndesmosis on CT scans. We used CT scans in 16 normal subjects after a power calculation. Two assessors independently measured the ankle syndesmosis using the davidovitch method, and our new protocol.
We demonstrated that after statistical analysis (Pearson Product Moment Correlation) our method showed improved inter-observer reliability (0.99 and 0.95 vs 0.77 and 0.58 respectively) for diastasis and AP translation, and improved intra-observer reliability (0.99 and 0.99 vs 0.96 and 0.91 respectively). We found that fibular rotation was difficult to measure accurately.

We believe that out method is a simple, accurate and reproducible system for measuring the ankle syndesmosis. We believe that this method could be used to assess fibular reduction after obtaining CT images of the uninjured side for comparison.

FP18

Syndesmotic arthrodesis for chronic inferior tibiofibular joint instability

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Introduction: Failure to adequately treat an injury of the syndesmosis leads to poor functional outcomes and posttraumatic arthritis. Many techniques have been proposed to salvage chronic instability. We report on the largest series of chronic syndesmotic injuries to be managed by syndesmotic arthrodesis from Europe to date.
Aim: To determine the radiographic and clinical outcomes for this technique at our institute.
Methods: Patients were followed-up prospectively. Relevant radiological and clinical data were obtained from electronic and case note review. The AOFAS score was utilised.
Results: A total of 6 patients were found. The average age was 33 years and the mean length of follow-up was 20 months.
Arthrodesis was radiologically successful in all cases. Mean pre-operative and post-operative AOFAS scores were 70 and 82 respectively. All patients had some persistent ankle pain. One third had radiological progression of ankle osteoarthritis. Complications consisted of one patient with scar sensitivity.
Conclusions: This technique has a role in the salvage of chronic ankle syndesmotic instability. However patients must be counselled to the likelihood of ongoing symptoms.

FP19

The risk of talar shift in nonoperatively treated Weber B lateral malleolar fractures with suspected medial injury: a clinical and radiological outcomes analysis

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Introduction: Isolated Weber B lateral malleolus fractures heal uneventfully, but concern that late subluxation may occur due to unrecognised medial ligament tearing, despite an intact mortice on initial radiographs, often results in overtreatment. The aim of this study was to determine the incidence of late talar shift with nonoperative management in a cohort of patients with no initial talar shift, and also record functional outcomes at 16-28 months following injury.
Methods: This was a retrospective review of 129 patients with Weber B lateral malleolar fractures initially referred to the fracture clinic between October 2011 and October 2012. Eight had obvious talar shift and therefore underwent surgery, with the remaining 121 treated in plaster (n=41), a Velcro boot (n=70) or bandage (n=10). No stress x-rays or MRI scans were performed. Weight-bearing was permitted as pain allowed. Radiographs taken on discharge from the clinic were reviewed to assess talar shift. Functional outcomes assessment was carried out using Manchester Oxford Foot Questionnaire and Olerud-Molander score.
Results: None of the 121 patients had talar shift initially; 21 patients where medial injury was strongly suspected were closely followed and had check x-rays more often (average 2.9 appointments per patient) than the other groups. No patients had talar shift in any of the subsequent x-rays and therefore none underwent delayed internal fixation. The mean MOXFQ and Olerud-Molander scores were 27 and 78 respectively in 57 patients and the functional outcomes were not influenced by type of immobilisation or suspected medial injury.
Conclusion: Our observation is that the risk of late talar shift is likely to be low in patients where initial x-rays had showed no talar displacement. It may be unnecessary to perform additional tests/imaging to establish the integrity of the medial ligament as satisfactory functional results are routinely observed.

FP20

Has the best practice tariff for hip fractures resulted in patients with unstable ankle fractures waiting longer for surgery?

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Introduction: The Best Practice Tariff (BPT) for hip fractures was introduced in April 2010 to promote a number of quality markers, including surgery within 36 hours. We conducted an audit to see whether the introduction of the BPT has had an inadvertent adverse effect on delay to fixation of unstable ankle fractures.

Method: We compared the delay to surgery for 50 consecutive patients with unstable ankle fractures in the 2009 financial year with another 50 patients treated in the 2011 financial year, ie one year after the introduction of the BPT. There were no other changes in service in our department in this period. All radiographs were reviewed and classified using the Lauge-Hansen system by 2 surgeons. Excel was used for data analysis using unpaired T-Test and chi-squared test to assess significance.
Results: 2 patients with pilon fractures were excluded from each group. Demographics and fracture pattern between the remaining 48 patients in each group were similar. The mean delay to surgery before BPT was 2.2 days compared with 3.8 days after its introduction ($p = 0.01$). 7 patients waited more than 5 days for surgery before BPT compared with 17 patients after its introduction ($p < 0.001$). There was 1 manipulation under anaesthetic (MUA) before BPT and 8 MUAs in 7 patients after its introduction ($p < 0.001$).
Conclusion: There is a significant association between the introduction of BPT for hip fractures and an increase in the delay to surgery for patients with unstable ankle fractures by an average of 1.6 days. More patients waited more than 5 days for surgery and there were more MUAs. We postulate that in a resource-limited NHS, prioritizing one patient group inevitably disadvantages others. Orthopaedic trauma services must adapt to national guidance to ensure all patients are treated in a timely fashion.

FP21

Soft tissue complications of the surgical treatment of unstable fractures of the ankle: is it timing of the surgery or the implants?

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Introduction: Early stabilization has the potential to expedite early return to function and reduce hospital stay thus reducing cost to health care. A clinical audit was performed to test the hypothesis that early surgical stabilization lowers the rate of soft tissue complications and is not influenced by choice of distal fibular implants used for stabilization of ankle fractures.
Methods: All surgically treated adult patients with isolated unstable ankle fracture were included from April 2012 to April 2013 at a MTC in UK. Patients with poly-trauma were excluded.
All patients underwent a standard surgical protocol: aim for early definitive surgical fixation (ORIF) within 24 hours however if significantly swollen than temporary stabilization with an external fixation followed by a staged definitive fixation.
Results: In total 172 consecutive unstable ankle fractures were included in one-year study period. Definitive fixation (ORIF) was achieved in 91% patients with only 9% patients required temporary stabilization with external fixation. Fibular locking plates were used in 59(38%) patients compared to conventional one-third tubular plates in 91(60%) patients.
In ORIF group 42% (73) patients were operated within 24 hours of admission whilst 58% (83) under went early fixation after 24-72 hours.
At one year follow up complications were recorded in 18(11%) patients including metal irritation requiring removal of implant in 6(4%) patients. Wound complications and deep infection leading to a further surgical procedure in 8(5%) patients.
There was no statistical difference between complication rates ($p=0.016$) in early versus delayed fixation groups. Fibular locking plates were associated with higher soft tissue complications (13%) as compared with conventional plates (2%) ($p=0.004$).
Conclusion: Our study showed that the timing of the surgery has less influence on the complications of the ankle fracture fixation. However choice of implants requires careful consideration and we suggest caution against use of current fibular locking plates.

FP22

Return to sport following lateral ligament repair of the ankle in professional athletes

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Lateral ligament injuries of the ankle account for up to 50% of all sporting injuries. Recent literature has supported early reconstruction of severe acute lateral ligament injuries in professional athletes suggesting that it may allow earlier rehabilitation whilst reducing the incidence of recurrent instability. The results of acute lateral ligament reconstruction in respect to return to sport in professional athletes has not been previously reported.
A consecutive series of professional athletes were treated operatively for clinically and radiologically confirmed grade III lateral ligament injury. All patients were assessed at a minimum of 2 years post surgery.
33 ankles in 33 athletes underwent anatomical reconstruction (modified Brostrum repair) for acute lateral ligament injury. 22/33 had isolated complete rupture to ATFL and CFL whilst 11/33 had additional injuries - three OCL, six deltoid ligament injuries, a syndesmosis injury and a combined deltoid ligament injury with OCL. The mean time to return to training and sports for those with an isolated lateral ligament injury was 58 days

(range 49-110) and 72 days (range 56-127) respectively. However, for those with a concomitant injury the time to return to training and sports 98 days (63-152) and 116 days (82-178) days respectively. This delay was significant ($p < 0.01$). No patient developed recurrent instability of the ankle and all returned to their pre-injury level of professional sports.
Lateral ligament reconstruction is a safe and effective treatment for acute severe lateral ligament ruptures providing a stable ankle and an expected return to sports at about 10 weeks. Associated ankle injuries may allow the athlete to return to the same level of competition but the club and player need to know that timing of return may be delayed.

FP23

Step-by-step recognition of peroneal tendon dislocation in association with calcaneal fractures

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Introduction: Although dislocation of the peroneal tendons (PT's) in association with calcaneal fractures has been described over 25 years ago, it frequently passes unrecognised by radiologists and orthopaedic surgeons. This retrospective study aims to determine the prevalence of PT dislocation in association with calcaneal fractures at a single institution and describe systematic steps to avoid missed diagnosis at each stage of management.
Methods: CT scans of all patients with calcaneal fractures from the Picture Archiving and Communications System (PACS) from 2010 were systematically reviewed. The senior author and a Musculoskeletal Radiologist analysed the images for concomitant dislocation or subluxation of the PT's, utilizing criteria as defined by Ho et al. Further to this we included patients who sustained calcaneal fractures with associated PT dislocation prior to June 2010 and were referred either for primary open reduction or later with post-traumatic osteoarthrosis of the subtalar joint.
Results: Over three years and nine months beginning in June 2010, 71 calcaneal fractures were identified on PACS. 15 of those had associated subluxation or dislocation of the peroneal tendons either on CT scan or at surgery (21%). 10 of our 71 patients exhibited a fleck sign on plain anteroposterior ankle x-ray (14.1%) suggesting potential avulsion of the superior peroneal retinaculum.
The combined cohort comprised 28 patients, 23 men and 5 women, aged 21 to 82 years (average, 46.3 years). 22 (79%) of PT dislocations were not recognised at the original injury. In six patients undergoing operative fixation, five (83.3%) had dislocated PT's noted on CT scan. In one case (16.7%) the peroneal tendons were clinically dislocated.
Conclusion: The PT dislocation rate in this paper is comparable with the literature. Patients should undergo careful clinical examination, radiological assessment with x-ray and CT followed by probing at surgery to ensure the diagnosis is not missed.

FP24

Plantar plate imaging - correlating ultrasound arthrography and surgical findings

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Introduction: Instability and synovitis of the lesser metatarsalphalangeal (MTP) joints is a significant cause of forefoot pain. Plantar plate imaging traditionally has been through MRI and fluoroscopic arthrography. We have described ultrasound arthrography as a less resource-intensive technique without radiation exposure. We report the correlation between ultrasound arthographic and surgical findings.
Methods: Patients with lesser MTP joint instability and pain underwent ultrasound arthrography by a consultant musculoskeletal radiologist. The main finding was the presence of a full or partial tear of the plantar plate. In some patients the location of the tear along with its size in the long and short axis was also reported.
Authors who were not involved in the imaging or surgery reviewed the operation notes of patients who underwent surgery to identify
· Whether a partial or full thickness tear was identified
· Size and location of the tear
The accuracy of ultrasound arthrography was calculated using surgical findings as the standard.
Results: 53 patients with 55 joints underwent ultrasound arthrography, and of these 34 went on to have surgery. 23 patients had adequate documentation of surgical and ultrasound findings. Surgery confirmed plantar plate tears in 21 patients (91.3%) with 9 full thickness tears and 7 partial thickness tears confirmed both operatively and with ultrasound (in 5 patients the operation note did not specify completeness of tear). In 2 patients, in whom ultrasound demonstrated a partial thickness tear, no tear was found at surgery. The sensitivity of ultrasound arthrography for plantar plate tears is 100%, specificity is 0% (although based on few patients), and positive predictive value of 91.3%.

Conclusion: Ultrasound arthrography has a high sensitivity, but low specificity for plantar plate tears, comparable with ultrasound in previous studies. It allows differentiation of partial and full thickness tears which may be important for treatment.

FP25

An algorithm to assist the surgical decision making in the operative management of the cavovarus foot

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Introduction: The cavovarus foot is a complex deformity caused by muscle imbalance, soft-tissue contracture and secondary bony abnormality. It is a combination of hindfoot, midfoot and forefoot deformity and the decision making process for surgical management can be difficult. The process of deciding which combination of procedures is required is often poorly understood. We present an algorithm to assist with this decision making.
Methods: We have analysed a single surgeon's experience of cavovarus foot correction, from a consecutive series of 50 patients over 5 years, to develop an algorithm to guide operative decision making. Cases included cavovarus deformity secondary to cerebral palsy, Friedreich's ataxia, Charcot Marie Tooth disease, post-traumatic contracture, post-cerebrovascular accident, iatrogenic post-surgery and physiological cavus. We have taken a systematic approach to each component of the deformity in order to generate the algorithm.
Results: To assist in rationalising the traditional 'a-la-carte' approach, our algorithm describes what we believe are the indications for a variety of surgical interventions, including soft tissue contracture release, osteotomies of the hindfoot, midfoot and forefoot, tendon transfer and soft tissue balancing, and arthrodesis. We detail the decision making process for each surgical option and give the reasons for each decision. We have also reviewed the available literature on this topic, to produce an evidence-based and useable tool for surgical planning.
Conclusion: The surgical decision making process in the management of the cavovarus foot is complex. We believe that this algorithm, based on extensive personal experience and up-to-date published evidence, provides a clear and proven framework on which surgical decision making can be guided and justified.

FP26

Minimally invasive calcaneal osteotomy; a safe alternative to open calcaneal osteotomy with fewer complications

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Background: Calcaneal osteotomy is an established technique in correcting hind foot deformity. Patients have traditionally received an open osteotomy through Atkins lateral approach. In order to reduce the rate of wound complications associated with the Atkins approach, a minimally invasive surgical (MIS) technique has been adopted since 2011. This uses a low-speed, high-torque burr to perform the same osteotomy under radiographic guidance. The results of the new MIS technique, including post-operative complication rates, are compared to the standard open approach.
Methods: The safety of the new MIS technique was investigated by conducting a case controlled study on all patients who underwent displacement calcaneal osteotomy at the Nuffield Orthopaedic Centre, Oxford from 2008 to 2014. The primary outcome measure was 30 day post-operative complication rate. Secondary outcome measures included operating time, duration of stay, fusion rates and amount of displacement achieved.
Results: 82 patients underwent calcaneal osteotomy as part of their corrective surgery; 50 patients in the Open approach group and 32 patients in MIS group. The average age at the time of surgery was 47.7 years (range 16-77) for the Open group and 48.5 (range 21-77) in the MIS group. A mean calcaneal displacement of 8.0mm (s.d. 1.32, 7 to 11 mm) and 8.33mm (s.d.1.53, 6 to 10 mm) was achieved through the MIS and open approaches respectively. There were significantly fewer wound complications in the MIS group (6.25%) compared to the Open group (28%, P=0.021) and the MIS group was associated with significantly lower rates of wound infection (3% versus 20%, *P*=0.043). Three patients in the Open group experienced sural peripheral neuropathy.
Conclusions: MIS calcaneal osteotomy was found to be a safe technique. It was as effective as calcaneal osteotomy performed through an open lateral approach but was associated with significantly fewer wound complications and fewer nerve complications.

FP27

Minimally invasive calcaneal osteotomies: are neurovascular structures at risk? A cadaveric study

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Introduction: There are concerns with the use of the Shannon burr in calcaneal osteotomies entered from the lateral side, with the medial structures possibly at risk when performing the osteotomy of the medial calcaneal wall. Our aims with this study were to investigate the neurovascular relationships with the calcaneal osteotomy performed using a Shannon burr.
Methods: This study was performed at the anatomy department, University of Sussex, Brighton. There were 13 fresh frozen below knee cadaveric specimens obtained for this study. The osteotomy was performed using a Shannon burr using a minimally invasive technique. The neurovascular structures were then dissected out to analyse their relation and any damage.
Results: Laterally, there was no evidence of damage to any neurological structure in 11 feet. In two feet, a very small lateral calcaneal branch was transected. In both cases, this was a very proximal branch from the sural nerve. There were between one and five lateral calcaneal branches of the sural nerve, and a very proximal branch present in nine feet. The minimum distance from the burr to the sural nerve was 9mm. In all cases, the entry point was within 6mm of the closest lateral calcaneal branch. Medially, there was no evidence of damage to any neurovascular structure. Quadratus plantae was present in 12 of 13 feet acting as a barrier to the neurovascular structures, and was not breached by the burr, shielding the neurovascular structures from injury. There were one or two medial calcaneal nerve branches, which all crossed the osteotomy, but were not damaged.
Conclusion: The calcaneal osteotomy performed by a Shannon burr can cause possible damage to small branches of the sural nerve, but is protected by QP form causing damage to any medial structures.

FP28

Outcome of distal metaphyseal metatarsal osteotomy (DMMO) for lesser toe metatrsalgia in a teaching hospital

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Introduction: The surgical treatment of intractable metatarsalgia has been traditionally been an intra-articular Weil's type of metatarsal osteotomy. In such cases, we adopted the option of performing a minimally invasive distal metaphyseal metatarsal ostetomy (DMMO) to decompress the affected ray. The meta-tarsophalangeal joint was not jeopardised. We present our outcomes of Minimally Invasive Surgery for metatarsalgia performed at our teaching hospital.
Material and methods: This is a multi-surgeon consecutive series of all the thirty patients who underwent DMMO. The sex ratio was M: F- 13:17. Average age of patients was 60 yrs. More than one metatarsal osteotomy was done in all cases. The aim was to try and decompress the affected rays but at the same time, restore the metatarsal parabola.
It was performed under image-intensifier guidance, using burrs inserted via stab incisions. Patients were encouraged to walk on operated foot straight after the operation; the rationale being that the metatarsal length sets automatically upon weight bearing on the foot. Outcome was measured with Manchester-Oxford Foot Questionnaire's (MOXFQ's) and visual analogue pain score (VAS). Minimum follow up was for six months.
Results: The average MOXFQ score was 26. Average improvement in the visual analogue pain score was 3.5. VAS deteriorated in three patients' whose pain got worse after surgery. Among these three, two had a further procedure on their toes. All of the patients experience prolonged forefoot swelling for at least 3 months.
Discussion: The most common complication after intra-articular ostetomy of the metatarsal head is stiffness of the metatarsophalangeal joint. We believe that using minimally invasive surgery with an extra-articular osteotomy, reduces the soft tissue injury to the joint, and therefore the amount of post-operative stiffness. In our cohort of patients, DMMO is associated with good patient satisfaction and low complication rates in the vast majority of cases.

FP29

The effect of the Cotton osteotomy on midfoot sag during reconstruction of adult acquired flatfoot deformity

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Introduction: The purpose of this study was to elucidate the specific radiographic effects that the Cotton osteotomy confers when used in combination with other reconstructive procedures in the management of the flexible flat foot deformity.
Methods: Between 2002-2013, 198 Cotton osteotomies were retrospectively identified following IRB approval. 131 were excluded on the basis of ipsilateral mid/hindfoot arthrodesis, inadequate radiographs or being less than 18yrs old at time of surgery. Parameters including the articular surface angles of the hindfoot/forefoot, Meary's angle and a newly defined Medial Arch Sag Angle (MASA) were recorded. A matched group of patients

who did not undergo a Cotton osteotomy but who underwent similar hindfoot reconstructive procedures served as historic controls.
Results: 67 Cotton osteotomies in 59 patients with a mean age of 45 years (range, 18-80) were evaluated. Concomitant procedures included combinations of tibialis posterior tendon (PTT) reconstruction, Evans lateral column lengthening, medial displacement calcaneal osteotomy (MDCO).
In all patients who underwent a Cotton osteotomy, there were statistically significant improvements in the articular surface angles along the medial side of the foot ($p < 0.05$). Improvement in arch height was also found to be statistically significant ($p < 0.05$).
In comparison to matched controls, the Cotton osteotomy did not improve Meary´s angle but provided an additional 11.21° of MASA correction ($p < 0.05$) when used in in conjunction with the Evans procedure and PTT reconstruction. A similar trend was seen with MDCO and PTT reconstruction.
Discussion: This study confirms the Cotton osteotomy is a powerful surgical adjunct in flatfoot reconstruction and quantifies the additional 11.21° of MASA correction it provides when the Cotton osteotomy is added to a calcaneal osteotomy and PTT reconstruction. This has relevance as an alternative for selection of a medial column stabilization procedure, which is joint sparing.

FP30
Evaluation of acute charcot foot using SPECT/CT imaging

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Introduction: Charcot arthropathy is a complex condition affecting diabetic patients with neuropathy. Diagnosis of acute Charcot arthropathy particularly in absence of any perceptible trauma is very challenging as clinically it can mimic osteomyelitis and cellulitis. Delay in recognition of Charcot arthropathy can result in gross instability of foot and ankle. Early diagnosis can provide an opportunity to halt the progression of disease. We report the role of SPECT /CT in the early diagnosis and elucidation of the natural progression of the disease.
Methods: Our multidisciplinary team analysed the scans of neuropathic patients presented with acute red, hot, swollen foot with normal radiological findings (Eichenholtz stage 0), attending the diabetic foot clinic from 2009-2013.The patients were selected from our database, clinic and nuclear medicine records. Initial workup included the assessment of peripheral neuropathy, temperature difference, between the feet, serum inflammatory markers and weight bearing dorsoplantar, lateral and oblique x-rays. All patients had three dimensional triple Phase Bone Scan using 800Mbq ^{99m}Tc HDP followed by CT scan. Those patients with obvious radiological findings and signs of infection were excluded.
Results: We evaluated 193 scans in 189 patients. One hundred and forty nine patients showed increase in focal radionuclide uptake at ligament insertion or subchondral bone with a positive predictive value of 77 percent. Forty four out of 193 were negative for Charcot changes and they were not treated as Charcot. These patients did not develop any Charcot changes in the mean follow up of 8 months, indicating a clinically false positive rate of 23%.
Conclusion: SPECT/CT scan is a highly sensitive and specific tool for early diagnosis and accurate localisation of Charcot neuroarthropathy as clinical examination results in high false positive rate. SPECT/CT also helps to understand the natural progression of this disease.

FP31
Outcomes in acute Charcot neuroarthropathy - a single centre experience over 5 years

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The aim of this project was to look at time taken to achieve clinical resolution of diabetic charcot neuroarthropathy (CN) and to see if there was a correlation with location within the foot and overall outcomes. A **r**etrospective analysis of newly presenting acute CN patients between 2007 & 2012 was performed. Clinic records were examined to determine the site of the CN; total time treated in a TCC or other removable offloading devices; the presence of co-morbidities.
Fifty CN cases presented during this time. The mean age was 62.5±11.7 (SD) years. Eleven patients had type 1 diabetes mellitus (T1DM). The mean duration of diabetes was 29.7±12.9 years for T1DM, and 14.4±10.7 years for type 2 diabetics. All had palpable foot pulses & peripheral neuropathy at diagnosis. 82% had retinopathy; 34% had CKD stage 3-4. For the 42 patients who completed treatment, the mean duration was 53.9±28.0 weeks, of which a mean of 30.2±25.0 weeks was spent in a TCC. 23.7±16.2 weeks were spent in other offloading devices. Mean duration of treatment for forefoot, mid-foot & hind-foot was 47.2±22.6, 55.9±30.6 & 51.8±23.1 weeks respectively. Thirty-six patients were treated with TCC & other removable offloading devices, 6 were treated with one modality. Fourteen of the 36 (38.9%) required re-casting. Eight patients did not complete treatment: 4 underwent below knee amputation, 2 died, 2 were still undergoing treatment.
In our cohort the mean length of treatment is dependent on the position of the CN. The mean time to resolution is just over 1 year. However, a high percentage (38.9%) deteriorated after coming out of a TCC. This study

highlights the need to develop more precise measures to help manage acute CN.

FP32
Arthroscopic ankle fusion for avascular necrosis of the talus; a case series

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Background: Avascular necrosis (AVN) of the talus is a painful condition caused by trauma, steroids, alcoholism and haematological disorders. It is difficult to treat and at present there is insufficient evidence in favour of any particular strategy. The aim of operative therapy should be to relieve symptoms, maintain the normal architecture of the talus and treat associated arthritis. Small case series have described early core decompression, retrograde tibiotalocalcaneal arthrodesies and open tibio-calcaneal arthrodesis. Open procedures risk further talar collapse by disrupting its blood supply, and tibiotalocalcanal fusion sacrifices both the ankle and subtalar joints. The hypothesis is that arthroscopic ankle fusion relieves symptoms of AVN talus while preserving the subtalar joint and preventing further collapse.
Methods: A case study was performed of 16 patients with AVN who underwent arthroscopic ankle fusion at the Nuffield Orthopaedic Centre, Oxford, UK between 1998 and 2012. Clinical notes, radiographs and MRI was used to investigate the cause, co-morbidities and treatment outcomes following arthroscopic ankle fusion. Our primary outcome was fusion rate. Secondary outcomes included peri-operative complications, ongoing pain and subsequent operative intervention.
Results: The average age at the time of operation was 53.5 years (range 17 to 69). The presumed causes of AVN talus were steroids (3 patients), trauma (3 patients), haematological (2 patients), and alcoholism. The aetiology was unknown in 7 patients. Clinical and radiological fusion at the ankle joint was confirmed in 14/16 patients (2 were followed elsewhere). 11 patients were satisfied with the result at discharge, reporting no post operative complications. 3 patients had ongoing pain. 2 patients reported metalware irritation. 2 patients underwent a subsequent subtalar fusion.
Conclusions: Arthroscopic ankle fusion is a safe and reliable treatment of symptomatic AVN talus. It is a minimally invasive procedure potentially improving blood supply to the the talus and sparing the subtalar joint.

FP33
Is bone allograft the right choice for tibio-talo-calcaneal fusions using the hindfoot nailing system? Nottingham Hospitals' Experience

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Introduction: This study presents a series of 64 patients undergoing tibio-talo-calcaneal (TTC) fusions with a hindfoot nail to compare the times to union and complications comparing use of allograft with no allograft.
Methods: We conducted a retrospective review of patients undergoing a TTC fusion with a hindfoot nail from a period from 2010 to 2013. A total of 64 patients were collated which were performed by 3 surgeons across two centres.
We reviewed the medical notes to determine the complications associated with the procedures and the radiographs to assess the time to clinical/radiological union. A comparison between the patients who had undergone a TTC fusion with allograft versus patients who had not received any allograft was made.
Results: Within our group, *n* = 15 (23%) patients had allograft utilised and *n*= 49 (77%) patients underwent TTC fusion without allograft.
Within the allograft group, the mean time to union was longer and the complications included deep infection *n*= 2 (13%), prominent metalwork *n*=2(13%). The mean number of operations per patient was 1.33. Within the group not receiving allograft, the mean time to union was shorter than that of allograft group and the complications noted were fracture *n*=1 (2%), prominent metal work *n*= 1 (2%) & non-union *n*= 5 (10%), with the mean number of operations per patient being 1.18.
Conclusions: In our study we have found that patients undergoing TTC fusion with bulk allograft had longer times to union with a higher rate of complication p =0.22 and increased number of surgeries. When managing patients with bone loss, the benefits of utilising allograft to maintain limb length versus the longer time to union and increased rate of secondary surgeries needs to be balanced, but appears justified in our series.

FP34
Assessment of smoking status in patients undergoing foot and ankle surgery

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Introduction: Wound healing and poor bone healing are complications seen in patients who smoke and some surgeons prefer not to operate on smokers. However, self reporting of smoking by patients may be biased. This study compares self-reporting of smoking habits and cotinine levels in the urine of our patients.
Method: 77 patients admitted for an osteotomy or arthrodesis procedure between September 2013 and May 2014 agreed to participate in this study. A questionnaire was completed and a urine sample was obtained and tested for cotinine, a metabolite of nicotine, by 2 techniques: a dipstick, the COT One Step Cotinine Test, yielding a positive result when the cotinine in the urine exceeds 200 ng/mL and the Concateno laboratory assay test, providing a mean value to give a qualitative reading whereby the cut off for non-smokers is 500ng/ml.
Results: Questionnaire results showed that 12 participants were active smokers, 35 classed themselves as ex-smokers and 30 were non-smokers. A dipstick result was negative in all the non-smokers, in 31/35 (89%) of the ex-smokers and in 4/12 (25%) of the current smokers. The dipstick test was positive in 4 self-reporting ex-smokers and only 8 of the 12 current smokers. The laboratory assay gave readings from 21 to 45,657 with higher readings being from heavier smokers. It correctly gave a value < 500 for all self-reporting non-smokers but 3 of the 35 self-reporting ex-smokers had a value between 500-5000ng/ml.
Conclusion: Whilst the majority of our patients had matching self-reporting smoking status and urine cotinine levels, 10% of self-reported ex-smokers had a high level of urine cotinine due to the test limitations or reporting bias by our patients. The £1.50 COT dipstick test is a cheap and easy way to correctly confirm a non-smoker compared to the Concateno laboratory assay which costs £7 excluding portering costs.

FP35
Vitamin D deficiency and non-union in foot and ankle surgery

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Introduction: Vitamin D plays an important role in bone turnover. Deficiency (including borderline deficiency, or insufficiency) has a known association with fractures and has been linked to delayed or non-union of fractures. We therefore routinely test vitamin D in cases of non-union. Noting a high rate of vitamin D deficiency in this group, we instituted a policy to routinely screen for and treat vitamin D deficiency in both post-operative and pre-operative patients. We hypothesised that, in the post-operative patients, levels would correlate with rates of union.
Methods: We sent serum vitamin D levels on consecutive post-operative patients seen in clinics between January and May 2014. They included those with an arthrodesis of the ankle, triple joint or first MTPJ. Union was deemed to have occurred when the patient was comfortable full weight bearing and radiographs showed trabeculae crossing the fusion site. Non-unions were all confirmed with computed tomography.
Results: Ten patients were treated for non-union, and had a mean serum vitamin D of 58nmol/L. Fourteen patients (collected over a shorter time period) had confirmed union, with a mean vitamin D of 90nmol/L. This was statistically significant on a one tailed Student's t test (p=0.038). Vitamin D was deficient in five (50%) of non-unions and in three (21%) of unions, giving an odds ratio of 3.67.
Conclusions: Our early results show a significant association of serum vitamin D levels with likelihood of non-union, and we continue to collect data. There is a high prevalence of vitamin D deficiency in our patient population. This is of concern both for the outcome of their surgery and for their lifetime fracture risk. We recommend either screening for or presumptively treating vitamin D deficiency.

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Comparison of microbiology cultures from deep tissue biopsies compared to superficial swabs from infected diabetic ulcers

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Introduction: Diabetic ulcer superficial swab cultures have a low specificity for guiding antibiotic treatment. Some studies have recently re-assessed and advocated the role of superficial swabs. We have performed an analysis of microbiology results in patients with infected diabetic ulcers to further appraise the need for using deep tissue cultures as a guide for antimicrobial treatment.
Methods: We reviewed 23 consecutive diabetic patients in 2013. All patients underwent investigation and treatment by the Orthopaedic department for deep, intractable diabetic ulceration. Microbiology culture results from superficial swabs were compared to deep tissue and bone biopsies.
Results: The mean numbers of isolates from soft tissue and bone biopsies were 2.1 and 1.8 respectively (range 1-4). The most prevalent organisms seen in deep samples were anaerobes (9 patients), Staphylococcus aureus (8 patients) and entrococci (4 patients). In superficial swabs, 74% cultured non-specific, mixed skin flora and enteric species. The remaining 6 patients cultured Staphylococcus aureus alone (1), with Steptococcus (2), Pseudomonas (2) and MRSA (1). All 23 soft tissue biopsies were culture positive, 19 bone biopsies were positive of which 14 grew the same organisms of soft tissue cultures. In deep tissue/ bone biopsies, 13/23 patients cultured specifically organisms that were seen non-specifically in superficial swab cultures. However, in 10 patients deep tissue specimens, grew organisms that were not cultured from superficial swabs with 6 of these being anaerobes.

Conclusion: We have shown that in 43% of cases, deep tissue cultures isolated organisms that were not grown by superficial swab cultures. In 26% of these cases the organism was an anaerobe favouring deep, low oxygen tension environments. We refute recent evidence claiming the value of superficial swabs. We implore physicians treating patients with these ulcers to refer to an Orthopaedic surgeon to perform deep tissue biopsies and treat according to their culture results.