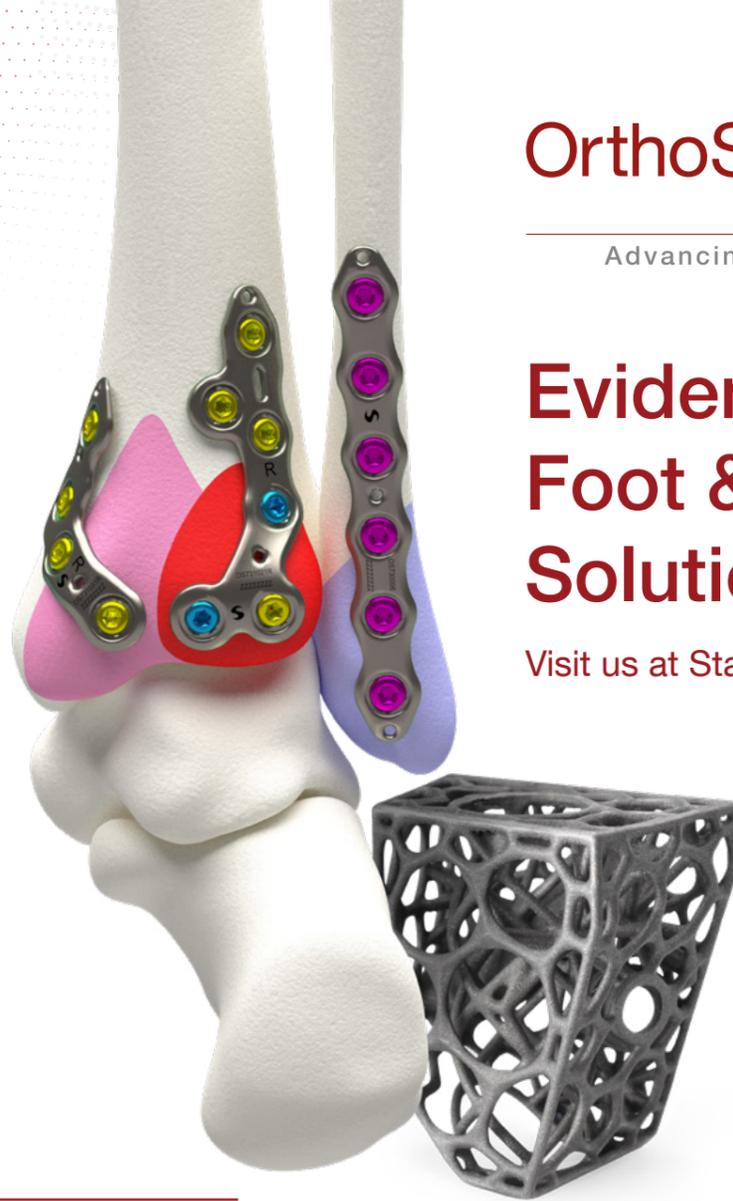


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# BOFAS

## FREE PAPERS ABSTRACT DETAILED

### BOFAS Workshops:

**Day:** Thursday, 7<sup>th</sup> March 2024  
**Venue:** Room 2A, Level 3 - ICC Belfast  
International Convention & Exhibition Centre

**Workshop 1** 9:00am - 10:15am Putting evidence behind 3D printed, custom made implants in foot and ankle surgery  
- *Jit Mangwani and Roland Walker*

**Workshop 2** 10:30am - 11:30am The ever-continuing evolution of ankle fracture management, through the guidance of evidence and fragment-specific fixation  
- *Lyndon Mason*

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# FREE PAPER SESSION 1

Wednesday 6th March 2023

## FP1

### Minimally invasive surgery versus conservative treatment for displaced intra-articular calcaneal fractures: A prospective propensity score matched cohort study with 2 year follow up

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**Background:** Optimal management of displaced intra-articular calcaneal fractures remains controversial. The aim of this prospective cohort study was to compare the clinical and radiological outcomes of minimally invasive surgery (MIS) versus non-operative treatment in displaced intra-articular calcaneal fracture up to 2-years.

**Method:** All displaced intra-articular calcaneal fractures between August 2014 and January 2019 that presented to a level 1 trauma centre were considered for inclusion. The decision to treat was made by a multidisciplinary meeting. Operative treatment protocol involved sinus tarsi approach or percutaneous reduction & internal fixation. Non-operative protocol involved symptomatic management with no attempt at closed reduction. All fractures were classified, and the MOXFQ/EQ-5D-5L scores were used to assess foot and ankle and general health-related quality of life outcomes respectively.

**Results:** 101 patients were recruited at a level 1 major trauma centre, between August 2014 and January 2019. Our propensity score matched 44 patients in the surgical cohort to 44 patients in the non-surgical cohort. At 24 months, there was no significant difference in the MOXFQ Index score ( $p < 0.05$ ) however the patients in the surgical cohort had a significantly higher EQ-5D-5L Index score ( $p < 0.05$ ). There was also a higher return to work (91% vs 72%,  $p < 0.05$ ) and physical activity rate (46 vs. 35%,  $p < 0.05$ ) in the surgical cohort despite a higher proportion of more complex fractures in the surgical cohort. The wound complication rate following surgery was 16%. 14% of patients in the non-operative cohort subsequently underwent arthrodesis compared to none of the patients in the surgical cohort.

**Conclusion:** In this study, we found operative treatments were associated with low rates of surgical complication at 2-years and long term pain improvement, facilitating earlier and better functional outcomes for complex injury patterns compared to nonoperative treatment.

## FP2

### The Fracture Ankle Implant Review (FAIR) Study: A national multicentre retrospective review of implants, fixation methods and outcomes in fibula fixation in ankle fractures

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**Background:** In fixation of the fibula in ankle fractures, AO advocate using a lag screw and one-third tubular neutralisation plate for simple patterns. Where a lag screw cannot be placed, bridging fixation is required. A local pilot service evaluation previously identified variance in use of locking plates in all patterns with significant cost implications. The FAIR study aimed to evaluate current practice and implant use across the United Kingdom (UK) and review outcomes and complication rates between different fibula fixation methods.

**Methods:** The study was supported by CORNET, the North East trainee research collaborative, and BOTA. Data was collected using REDCap from 22 centres in the UK retrospectively for a one-year period between 1st January 2019 and 31st December 2019 on injury mechanism, fracture characteristics, comorbidities, fixation and complications. Follow-up data was collected to at least two-years from the time surgery.

**Results:** 1479 ankle fractures which involved fixation of the fibula were recorded; one-third tubular plate was used in 883 (59.7%) cases, a locking plate in 470 (31.8%) cases and other methods in 118 (8.1%) cases. There was significant difference between centres ( $p < 0.001$ ) in implant type used. Other factors associated with implant type were age, diabetes, osteoporosis, open fractures and the presence of comminution. Incidence of lateral wound breakdown and infection was higher in locking plates than one-third tubular plates ( $p < 0.05$ ) in AO44B fractures. There was no significant difference in non-union, fixation failure or removal of metalware.

**Conclusion:** There is significant variation in practice in the UK in implant use for fixation of the fibula in ankle fractures. Potentially unnecessary use of locking plates, where a one-third tubular shows equivalent outcomes, incurs additional cost and may increase the risk of lateral wound complications. We would encourage surgeons with high locking plate usage to evaluate their own unit's practice against this data.

## FP3

### Deltoid ligament reconstruction in ankle fractures – does it prevent pes planus?

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**Introduction:** Deltoid ligament reconstruction (DLR) is an important factor in the consideration of pes planus deformity. There is little evidence in the literature determining whether DLR could mitigate the risk of patients acquiring flat foot postoperatively following deltoid ligament injury

**Aim:** Our objective was to establish if there was a difference in pes planus deformity in patients who underwent DLR during their ankle fracture fixation compared to those who did not.

**Methods:** A retrospective analysis of post-operative weight bearing radiographs was performed of patients who underwent ankle fracture fixation. Inclusion criteria were confirmed deltoid instability presurgery without medial malleolar fracture and post operative weightbearing radiographs at least 6 weeks post-fixation. Patients were categorised into no deltoid ligament reconstruction (nDLR) and having DLR. Radiographic pes planus parameters involved Meary's Angle assessment. Other fracture morphology was classified.

**Results:** A total 723 ankle fractures were screened. 122 patients were included for further analysis. There were 94 patients in the nDLR group and 28 patients in DLR group. The mean Meary's Angle was 15.81 (95% CI 14.06, 17.56) degrees in the nDLR group and -2 (95% CI -3.86, 3.82) in the DLR group. This was statistically significant ( $p < 0.001$ ). There was no significant difference in medial clear space measurements (2.90mm v 3.19mm,  $p = 0.145$ ). There were significantly more pes planus patients in the nDLR than the DLR group ( $p < 0.001$ , 90.5% vs 25%).

**Conclusion:** In this study there was significantly greater pes planus parameters in patients not undergoing DLR. Patients undergoing DLR had on average normal parameters, whilst those not undergoing DLR had on average severe pes planus. The benefits of DLR are not only maintaining ankle stability but maintaining medial arch integrity, and this should be taken into account in a future study on DLR.

## FP4

### Medial Malleolus: Operative Or Non-operative (MOON): A randomised clinical trial of operative versus non-operative management of associated medial malleolus fractures in unstable ankle fracture dislocations

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**Introduction:** Unstable ankle fractures are routinely managed operatively. Due to soft-tissue and implant related complications, there has been recent literature reporting on the non-operative management of well-reduced medial malleolus fractures following fibular stabilisation, but with limited evidence supporting routine application. This trial assessed the superiority of internal fixation of well-reduced (displacement  $\leq 2$ mm) medial malleolus fractures compared with non-fixation following fibular stabilisation.

**Methods & Participants:** Superiority, pragmatic, parallel, prospective randomised clinical trial conducted over a four year period. A total of 154 adult patients with a bi- or trimalleolar fractures were recruited from a single centre. Open injuries and vertical medial malleolar fractures were excluded. Following fibular stabilisation, patients were randomised intra-operatively on a 1:1 basis to fixation or non-fixation after satisfactory fluoroscopic fracture reduction was confirmed. The primary outcome was the Olerud Molander Ankle Score (OMAS) at one-year post-randomisation. Complications and radiographic outcomes were documented over the follow-up period.

**Results:** Among 154 participants (mean age, 56.5 years; 119 women [77%]), 144 [94%] completed the trial. At one-year the median OMAS was 80 (IQR, 60-90) in the fixation group compared with 72.5 (IQR, 55-90) in the non-fixation group ( $p = 0.17$ ). Complication rates were comparable. Significantly more patients in the non-fixation group developed a radiographic non-union (20% vs 0%;  $p < 0.001$ ), with the majority ( $n = 8/13$ ) clinically asymptomatic and one patient required surgical re-intervention for this. Fracture type and reduction quality appeared to influence fracture union and patient outcome.

**Conclusion:** In this randomised clinical trial comparing internal fixation of well-reduced medial malleolus fractures with non-fixation, following fibular stabilisation, fixation was not superior according to the primary outcome. However, 1 in 5 patients following non-fixation developed a radiographic non-union and whilst the re-intervention rate to manage this was low, the future implications require surveillance. These results may support selective non-fixation of anatomically reduced medial malleolus fractures.

## FP5

### Evaluating the utility of plain radiograph and computerised tomography scanning in identifying concomitant foot fractures in patients with unstable Lisfranc injuries

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**Background:** Lisfranc fracture dislocations are uncommon injuries, which frequently require surgical intervention. Currently, there is varying evidence on the diagnostic utility of plain radiographs (XR) and CT in identifying Lisfranc injuries and concomitant fractures. Our aim was to identify the utility of XR as compared to CT, with the null hypothesis that there was no difference in fracture identification.

**Methods:** A retrospective assessment of patients who had sustained a Lisfranc injury between 2013 and 2022 across two trauma centres within the United Kingdom who underwent surgery. Pre-operative XR and CT images were reviewed independently by 2 reviewers to identify the presence of associated fractures.

**Results:** A total of 175 patients were included. Our assessment identified that XR images significantly under-diagnosed all metatarsal and midfoot fractures. The largest discrepancies between XR and CT in their rates of detection were in fractures of the cuboid (5.7% vs 28%,  $p < 0.001$ ), medial cuneiform (20% vs 51%,  $p = 0.008$ ), lateral cuneiform (4% vs 36%,  $p = 0.113$ ), second metatarsal (57% vs 82%,  $p < 0.001$ ), third metatarsal (37% vs 61%,  $p < 0.001$ ) and fourth metatarsal (26% vs 43%,  $p < 0.001$ ).

As compared to CT, the sensitivity of XR was low. The lowest sensitivity for identification however was lateral foot injuries, specifically fractures of the lateral cuneiform (sensitivity 7.94%, specificity 97.3%), cuboid (sensitivity 18.37%, specificity 99.21%), fourth (sensitivity 46.7%, specificity 89.80%) and fifth metatarsal (sensitivity 45.00%, specificity 96.10%).

**Conclusion:** From our analysis, we can determine that XR significantly under-diagnoses associated injuries in patient sustaining an unstable Lisfranc injury, with lateral foot injuries being the worst identified. We advised the use of CT imaging in all cases for appropriate surgical planning.

## FP6

### Surgical management of complex ankle fractures in patients with diabetes: a national retrospective multicentre study

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**Background:** Ankle fractures associated with diabetes experience more complications following standard Open-Reduction-Internal-Fixation (ORIF) than those without diabetes. Augmented fixation strategies namely extended ORIF and hind-foot-nail (HFN) may offer better results, and early weightbearing in this group. The aim of this study was to define the population of patients with diabetes undergoing primary fixation for ankle fractures. Secondly, to assess the utilisation of standard and augmented strategies and the effect of these choices on surgical outcomes including early post-operative weight bearing and surgical complications.

**Methods:** A national-multicentre retrospective cohort study was conducted between January to June 2019 in 56 centres (10 Major-Trauma-Centres and 46 Trauma-Units) in the United Kingdom; 1360 specifically defined complex ankle-fractures were enrolled. Demographics, fixation choice, surgical and functional outcomes were recorded. Statistical analysis was performed to compare high-risk patients with/without diabetes.

**Results:** There were 316 patients in the diabetes cohort with mean age 63.9yrs (vs. 49.3yrs in non-diabetes cohort), and greater frailty score  $>4$  (24% vs. 14% (non-diabetes cohort) ( $p < 0.03$ ); 7.5% had documented neuropathy. In the diabetes cohort, 79.7% underwent standard ORIF, 7.1% extended ORIF and 10.2% a HFN compared to 87.7%, 3.0% and 10.3% in the non-diabetes cohort. Surgical wound complications after standard-ORIF were higher in the diabetes cohort (15.1% vs. 8.7%) ( $p < 0.02$ ) but patients with diabetes who underwent augmented techniques showed little difference in surgical outcomes/complications to non-diabetes, even though early-weight-bearing rates were greater than standard-ORIF.

**Conclusion:** Ankle fractures in diabetes occur in older, frailer patients; whilst lower than expected neuropathy rates suggest a need for improved assessment. Augmented surgical techniques may allow earlier weight-bearing without increasing complications in keeping with modern guidelines in ankle fracture management.

## FP8

### Long term outcomes of a randomized control trial comparing fibular nail with open reduction and internal fixation in patients with unstable ankle fractures

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**Background:** Studies have compared open reduction internal fixation (ORIF) with fibular nail fixation (FNF) and shown reduced wound complications with minimal difference to PROMS in the short term. Our aim is to compare long-term outcomes for unstable ankle fractures at 10 year follow up.

**Methods:** Patients from a previously conducted RCT were contacted at a minimum of 10 years post intervention at a single study centre. Case notes were reviewed, and patient reported outcome measures acquired at 10 years.

**Results:** Ninety-nine patients were included (48 FNF and 51 ORIF). After 10 years 75% (33/44) of patients in the FNF group required no further follow up versus 81% (39/48) in the ORIF group. Radiographically at 2 years post-injury, there was no statistically significant difference between groups for development of osteoarthritis ( $p = 0.851$ ). There was one tibio-talar fusion in each group secondary to osteoarthritis, but no statistically significant difference in overall re-operation rate ( $p = 0.518$ ). Fifty-one percent ( $n = 50$ ) of patients have so far returned patient reported outcome measures at a minimum of 10 years (Fibular nail  $n = 23$ , plate fixation  $n = 27$ ). No significant difference was found between groups for the mean scores of Olerud and Molander Ankle Score (FNF 84.78 vs ORIF 84.07;  $p = 0.883$ ), the Manchester-Oxford Foot Questionnaire (MOXFQ) (FNF 89.54 vs ORIF 96.47;  $p = 0.112$ ), Euroqol-5D Index (FNF 0.88 vs ORIF 0.87;  $p = 0.701$ ) and Euroqol-5D Visual Analogue Score (FNF 77.30 vs ORIF 77.52;  $p = 0.859$ ).

**Conclusion:** The current study illustrates that both methods of treatment result in a satisfactory long-term outcome with no difference in late complications or PROM scores at up to 10 years in patients under 65 years old, although the study is currently under powered.

**Disclosures:** None

## FP9

### A morphological review of medial malleolar fractures – Are there any factors which may predispose to nonunion and malunion?

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**Background:** Many approaches to management of medial malleolar fractures are described in the literature however, their morphology is under investigated. The aim of this study was to analyse the morphology of medial malleolar fractures to identify any association with medial malleolar fracture non-union or malunion.

**Methods:** Patients who had undergone surgical fixation of their MMF were identified from 2012 to 2022, using electronic patient records in a single centre. Analysis of their preoperative, intraoperative, and postoperative radiographs was performed to determine their morphology and prevalence of non-union and malunion. Lauge-Hansen classification was used to characterise ankle fracture morphology and Herscovici classification to characterise MMF morphology.

**Results:** A total of 650 patients were identified across a 10-year period which could be included in the study. The overall non-union rate for our cohort was 18.77% (122/650). The overall malunion rate was 6.92% (45/650). There was no significant difference in union rates across the Herscovici classification groups. Herscovici type A fractures were significantly more frequently malreduced at time of surgery as compared to other fracture types ( $p = .003$ ). Medial wall blowout combined with Herscovici type B fractures showed a significant increase in malunion rate. There is a higher rate of bone union in patients who have been anatomically reduced.

**Conclusion:** The morphology of medial malleolar fractures does have an impact of the radiological outcome following surgical management. Medial wall blowout fractures were most prevalent in adduction-type injuries; however, it should not be ruled out in rotational injuries with medial wall blowouts combined with and Herscovici type B fractures showing a significant increase in malunions. Herscovici type A fractures had significantly higher malreductions however the clinical implications of mal reducing small avulsions is unknown.

## FREE PAPER SESSION 2

Thursday 7th March 2023

### FP10

#### The incidence of VTE in foot and ankle surgery in the UK - UK Foot and Ankle Thrombo-Embolism Audit (UK-FATE)

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**Introduction:** VTE is a possible complication of foot and ankle surgery, however there is an absence of agreement on contributing risk factors in the development of VTE. The primary outcome of this study was to analyse the 90-day incidence of symptomatic VTE following foot and ankle surgery and to determine which factors may increase the risk of VTE.

**Methods:** This was a national, multi-centre prospective audit spanning a collection duration of 9 months (2022/2023). Primary outcomes included incidence of symptomatic VTE and VTE related mortality up to 90 days following foot and ankle surgery and Achilles tendon rupture, and analysis of risk factors.

**Results:** In total 11,363 patients were available for analysis. 5,090 patients (44.79%) were elective procedures, 4,791 patients (42.16%) were trauma procedures (excluding Achilles ruptures), 398 patients (3.50%) were acute diabetic procedures, 277 patients (2.44%) were Achilles ruptures undergoing surgery and 807 patients (7.10%) were Achilles ruptures treated non-operatively.

There were 99 cases of VTE within 90 days of admission across the whole group (Total incidence = 0.87%), with 3 cases of VTE related mortality (0.03%). On univariate analysis, increased age and ASA grade showed higher odds of 90-day VTE, as did previous cancer, stroke, history of VTE, and type of foot and ankle procedure / injury ( $p < 0.05$ ). However, on multivariate analysis, the only independent predictors for 90-day VTE were found to be the type of foot and ankle procedure (Achilles tendon rupture = Odds Ratio 11.62, operative to 14.41, non-operative) and ASA grade (grade III/IV = Odds Ratio 3.64).

**Conclusions:** The incidence of 90-day post procedure VTE in foot and ankle surgery in this national audit was low. Significant, independent risk factors associated with the development of 90-day symptomatic VTE were Achilles tendon rupture management and high ASA grade.

### FP11

#### Forefoot morphotypes in cavovarus feet – a novel classification

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**Background:** The cavovarus foot is a complex 3-dimensional deformity. Although a multitude of techniques are described for its surgical management, few of these are evidence based or guided by classification systems. Surgical management involves realignment of the hindfoot and soft tissue balancing, followed by forefoot balancing. Our aim was to classify the pattern of residual forefoot deformities once the hindfoot is corrected, to guide forefoot correction.

**Methods:** We included 20 cavovarus feet from adult patients with Charcot-Marie-Tooth who underwent weightbearing CT (mean age 43.4 years, 14 males). Patients included had flexible deformities, with no previous surgery. Previous work established majority of rotational deformity in cavovarus feet occurs at the talonavicular joint, which is often reduced during surgery. Using specialised software (Bonelogic 2.1, Disior) a 3-dimensional, virtual model was created. Using data from normal feet as a guide, the talonavicular joint of the cavovarus feet was digitally reduced to a 'normal' position. Models of the corrected position were exported and geometrically analysed using Blender 3.6 to identify anatomical trends.

**Results:** We identified 3 types of cavovarus forefoot morphotypes. Type 1 was seen in 13 cases (65%) and was defined as a foot where only the first metatarsal was relatively plantarflexed to the rest of the foot, with no significant residual adduction after talonavicular correction. Type 2 was seen in 4 cases (20%) and was defined as a foot where the second and first metatarsals were progressively plantarflexed, with no significant adduction. Type 3 was seen in 3 cases (15%) and was defined as a foot where the metatarsals were still adducted after talonavicular de-rotation.

**Conclusions:** We classify 3 forefoot morphotypes in cavovarus feet. It is important to recognise and anticipate the residual forefoot deformities after hindfoot correction as different treatment strategies may be required for different morphotypes to achieve balanced correction.

### FP12

#### Ultrasound-guided infiltration with hyaluronic acid versus corticosteroid for the treatment of Morton's neuroma: a randomised controlled trial

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**Background:** Infiltration is considered the first treatment option for symptomatic Morton's neuroma and can be performed with various medications. The aim of this study was to compare the effects of hyaluronic acid infiltration versus corticosteroid injection in the treatment of Morton's neuroma.

**Methods:** A randomised clinical trial was conducted with 46 patients (50 feet) diagnosed with Morton's neuroma. After randomisation, the control group (CG) received three injections (one per week) of triamcinolone (Triancil®) guided by ultrasound, while the study group (SG) received three applications of hyaluronic acid (Osteonil Plus®). Patients were followed up for six months after the intervention. The primary outcome measure used was the Visual Pain Analog Scale (VAS). Secondary endpoints included patient-reported outcome measures using the American Orthopaedic Foot & Ankle Society (AOFAS) score and complications.

**Results:** Both groups showed significant improvement in VAS and AOFAS scores ( $p < 0.001$ ). The CG showed greater improvement than the SG in the VAS ( $p < 0.05$ ) and AOFAS ( $p < 0.001$ ) variables. Four patients in the CG experienced skin hypochromia at the injection site, while there were no complications in the SG.

**Conclusion:** Ultrasound-guided hyaluronic acid infiltration in Morton's Neuroma proved to be safe, showing improvement in pain and function after six months of follow-up, without major complications, but with a significantly lower improvement when compared to corticosteroid injection. Taking into account cost implications and the potential for longer lasting improvement from viscosupplementation further medium- and long-term studies are needed.

### FP13

#### Arthroscopic subtalar arthrodesis – a large case series of 135 patients

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**Background:** Open subtalar arthrodesis has been associated with a moderate rate of non-union, as high 16.3%, and high rates of infection and nerve injury. Performing this operation arthroscopically serves to limit the disruption to the soft tissue envelope, improve union rates and reduce infection. Our study describes our outcomes and experience of this operation.

**Methods:** Retrospective review of all patients who underwent an arthroscopic subtalar arthrodesis between 2023 and 2008. We excluded patients undergoing concurrent adjacent joint arthrodesis. The primary aim was to report on rates of union. Secondary outcomes included reporting on conversion to open procedure, duration of surgery, infection, and iatrogenic injury to surrounding structures.

**Results:** 135 patients were included in the final analysis. 129 patients (95.5%) achieved union. The median time to fusion was 98 days. All cases were performed through sinus tarsi portals. 38 cases were performed with an additional posterolateral portal. Most cases (107/77%) were performed with 2 screws. 3 cases (2.2%) were converted to open procedures. The median tourniquet time was 86 minutes but available in only 88 (65%) cases. There were 4 (2.9%) superficial infections and no deep infections. 1 patient sustained an injury to FHL and there were no reported nerve injuries.

**Conclusion:** At present this is the largest series of arthroscopic subtalar arthrodeses. We demonstrate that this operation can achieve high rates of union with low rates of infection with an equally low likelihood of needing to convert to an open procedure with modest operative times. In our experience the addition of a posterolateral portal does not appear to increase the incidence of nerve injury and aids in the visualisation of all 3 facets.

## FP14

### Attachment with suture via bone tunnels is comparable biomechanically to single row anchor suture for reattachment of Achilles tendon to bone

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Insertional Achilles tendinitis with considerable degeneration that failed non-operative treatment typically requires tendon debridement and reattachment to bone. It is common practice for tendons to be reattached back with anchor sutures, but this poses a challenge to patients who are not able to afford them. Bony anchorage of tendons may be performed by passing sutures through tunnels, but the strength of repair compared to by using anchors is not known. We investigated the load at clinical and catastrophic failure of these two methods of reattachment. Sixteen paired Achilles tendons along with the calcaneus were harvested from eight fresh frozen cadavers.

Paired randomization was done. For the anchor suture group, two 5'0 anchors with polyethylene #2 sutures were used for reattachment whereas for the suture only group, tendons were reattached to bone using braided polyester #2 sutures via two bony tunnels. All samples were mounted on a materials testing system and preloaded at 50N for 60sec before load to failure at a rate of 1mm/sec. With the assumption that preloading has removed tendon crimp and any subsequent extension is a result of gapping at the repair site, loads at 5mm, 10mm, 15mm, and 20mm of extension were noted as well as the maximal load at failure. We found higher loads were needed to cause an extension of 5 to 20mm in the suture only group compared to the anchor suture group but these data were not significant. On the other hand, the anchor suture group required higher loads before catastrophic failure occurred compared to the suture only group, but this again is not significant.

We conclude that suture only reattachment of the Achilles tendon is comparable in strength with anchor suture reattachment, and this method of reattachment can be considered for patients who do not have access to anchor sutures.

## FREE PAPER SESSION 3

Friday 8th March 2023

## FP15

### Use of TaqMan array to investigate infection in diabetic foot wounds

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**Introduction:** Diabetic foot disease is a major public health problem with an annual NHS expenditure in excess of £1 billion. Infection increases risk of major amputation fivefold. Due to the polymicrobial nature of diabetic foot infections, it is often difficult to isolate the correct organism with conventional culture techniques, to deliver appropriate narrow spectrum antibiotics. Rapid DNA-based technology using multi-channel arrays presents a quicker alternative and has previously been used effectively in intensive care and respiratory medicine.

**Methods:** We gained institutional and Local Ethics Committee approval for a prospective cohort study of patients with clinically infected diabetic foot wounds. They all had deep tissue samples taken in clinic processed with conventional culture and real-time PCR TaqMan array.

**Results:** 50 samples were taken from 39 patients between October 2020 and March 2022. 84% of patient were male, 88% had type 2 diabetes. The ulcers were of variable chronicity prior to sampling (range 1-113 weeks) and mean HbA1c was 67.2mmol/mol. Ulcers were on the heel (3), midfoot (6) and forefoot (41). Minimum follow up was 3 months. 6 ulcers healed, 24 patients were admitted due to foot disease, there were 2 major amputations and 4 deaths.

TaqMan array results were available a mean of 4.3 days earlier than culture results. 9 patients had negative conventional cultures and 8 were negative on array testing. 17 patients had the same organisms detected on culture and array. 16 of these 17 had additional organisms detected by array. The most frequent organisms detected on array that were not detected by culture were Staphylococcus spp., Enterobacter, Pseudomonas and fungi.

**Conclusions:** TaqMan array shows promise in detecting infecting organisms from diabetic foot wounds and providing earlier and more detailed results than standard culture, which may facilitate specific and timely antibiotic therapy.

## FP16

### The OxFAT score: A new score for predicting malignancy in foot and ankle tumours

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**Background:** Masses are not uncommon in the foot and ankle. Most of these masses are benign, often leading clinicians to underestimate their potential for malignancy.

**Methods:** We conducted a retrospective review of our clinical records, on patients with histologically confirmed musculoskeletal tumours of the foot and ankle, treated in a single institution between 2010 and 2019. The maximum diameter of each lesion was determined through MRI or Ultrasound analysis in centimeters. To develop a scoring system we compared the risk of malignancy with five criteria: site (proximal or distal to the first TMTJ), gender, age, composition and the diameter as observed.

**Results:** Our study included 496 patients, of whom 39 (7.9%) were identified as having malignancies. The incidence of malignancy demonstrated an increased propensity among male patients, patients over 50 years of age and lesions located proximal to the TMTJ. A ROC Analysis determined that lesions measuring over 2.85 cm had an increased risk of malignancy, with a PPV of 31.1%, a NPV of 94.2%, a Sensitivity of 0.82, and a Specificity of 0.62. These identified patterns of risk were employed to formulate a scoring system, aimed at facilitating informed clinical judgment in the referral of patients to regional tumor services.

**Conclusion:** The new OxFAT scoring system highlights the importance of lesion size, site, age and gender of the patient in determining the risk of malignancy in lump in the foot and ankle. We propose this new scoring system to aid health care professionals in managing these patients. Based on our results any patient with a foot or ankle mass of less than 2.85cm, an OxFAT score < 4/7 and no malignant or sinister features on MRI or USS can be managed locally with excision biopsy. All other patients should be referred urgently to a Regional Tumour Service.

## FP17

### A 2-stage approach in managing diabetic forefoot ulcers

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**Aim:** Forefoot ulcers in patients with diabetic neuropathy are a result of factors that result in increased forefoot plantar pressures. Progressive hindfoot equinus from contraction of gastrocnemius-soleus-tendo-Achilles complex and progressive plantar flexed metatarsal heads secondary to claw toe deformity results callus at the metatarsal heads which break down to ulceration. The aim is to describe 2-stage treatment pathway for managing these ulcers.

**Methods:** Consecutive patients, who presented with forefoot ulcers since February 2019 were treated with a 2-stage treatment pathway. The first stage of this is an out-patient tendo-Achilles lengthening (TAL). The second stage is surgical proximal dorsal closing wedge metatarsal osteotomy for patients with persistent or recurrent ulcers. Patients were followed for a minimum of 12 months.

**Results:** 112 patients (146 feet) underwent TAL by 3 consultants. Of these, 96 patients were followed for a minimum of 12 months (range 12-36 months). None had infection or wound related problems at the tenotomy sites; complete transection of the tendon was noted in 4 patients (4%) and one-patient developed heel callosity suggestive of over-lengthening.

In 92 patients (96%), the ulcers healed within 10 weeks ( $\pm$  4 weeks). Additional z-lengthening of peroneal longus and tibialis posterior tendons helped in patients with 1st metatarsal and 5th metatarsal head ulcers respectively.

In 12 patients (10%), the ulcer failed to heal or recurred. MRI scan in these patients showed plantar flexed metatarsals from progressive claw toe deformity. The ulcer in this group healed after surgical offloading with proximal dorsal closing wedge osteotomy of the metatarsal/s, with no recurrence at a minimum 12months of follow-up.

**Conclusions:** The described 2-stage treatment pathway results in long-term healing of neuropathic forefoot ulcers, and in 96% of patients, the ulcer healed after the first stage out-patient percutaneous TAL.

## FP18

### Clinical, radiological and patient reported outcomes of Charcot foot reconstructive surgery in a single centre over a follow up period of 1-7 years

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**Introduction:** Surgical reconstruction of Charcot joint deformity is increasingly being offered to patients. In our centre a hybrid type fixation technique is utilised: internal and external fixation. This combined fixation has better wound management and earlier mobilisation in this deconditioned patient group. The aim of this study was to assess clinical, radiological and patient reported outcomes for all patients who underwent this hybrid technique.

**Methods:** This is a prospective observational case series of all patients who underwent surgical reconstruction of Charcot foot deformity in a single centre between June 2017 and June 2023. Patient demographics, smoking status, diabetic control and BMI were recorded. Outcomes were determined from case notes and included clinical outcomes (complications, return to theatre, amputation and mortality) radiological outcomes and patient reported outcomes. The follow up period was 1-7 years post operatively.

**Results:** 42 reconstructions were included. At the time of surgery the mean age was 59.1 years (29 - 91 years), average HbA1c was 65.2 (33-103); this did not correlate with return to theatre rate. 4 procedures were internal fixation alone (9.5%), 3 external fixation alone (7.1%) and 35 were combined fixation (83.3%). At most recent follow up 7 patients were deceased (16.7%), 2 patients had ipsilateral amputations, 2 had contralateral amputations. 11 patients had issues with recurrent ulcerations. Excluding refreshing of frames and operations on the contralateral side, 17 patients (40%) returned to theatre. We aim to present a detailed analysis of the rate of post-operative complications, return to theatre, radiographic outcomes and patient reported outcomes.

**Conclusions:** This is the largest UK based case series of hybrid type Charcot joint reconstructions and shows that hybrid fixation is a viable option for patients undergoing Charcot joint reconstruction. To best confirm findings and determine which patients have the best post-operative prognosis a larger multi-centre study is required.

## FP19

### Association between weightbearing CT and MRI findings in progressive collapsing foot deformity

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**Background:** Weightbearing computed tomography scans allow for better understanding of foot alignment in patients with Progressive Collapsing Foot Deformity. However, soft tissue integrity cannot be assessed via WBCT. As performing both WBCT and magnetic resonance imaging is not cost effective, we aimed to assess whether there is an association between specific WBCT and MRI findings.

**Methods:** A cohort of 24 patients of various stages of PCFD (mean age 51±18 years) underwent WBCT scans and MRI. In addition to signs of sinus tarsi impingement, four three-dimensional measurements (talo-calcaneal overlap, talo-navicular coverage, Meary's angle axial/lateral) were obtained using a post processing software (DISIOR 2.1, Finland) on the WBCT datasets. Sinus tarsi obliteration, spring ligament complex and tibiospring ligament integrity, as well as tibialis posterior tendon degeneration were evaluated with MRI. Statistical analysis was performed for significant (P<0.05) correlation between findings.

**Results:** None of the assessed 3D measurements correlated with spring ligament complex or tibiospring ligament tears. Age, body mass index, and TCO were associated with tibialis posterior tendon tears. 75% of patients with sinus tarsi impingement on WBCT also showed signs of sinus tarsi obliteration on MRI. Of the assessed parameters, only age and BMI were associated with sinus tarsi obliteration diagnosed on MRI, while the assessed WBCT based 3D measurements were, with the exception of MA axial, associated with sinus tarsi impingement.

**Conclusion:** While WBCT reflects foot alignment and indicates signs of osseous impingement in PCFD patients, the association between WBCT based 3D measurements and ligament or tendon tears in MRI is limited. Partial or complete tears of the tibialis posterior tendon were only detectable in comparably older and overweight PCFD patients with an increased TCO. WBCT does not replace MRI in diagnostic value. Both imaging options add important information and may impact decision-making in the treatment of PCFD patients.

## FP20

### Single-stage, combined, ortho-plastics treatment of severe calcaneal osteomyelitis with large soft tissue defects – long term follow up

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**Background:** Calcaneal osteomyelitis remains a difficult condition to treat with high rates of recurrence and below knee amputation; particularly in cases of severe soft tissue destruction.

**Aim:** Assess the outcomes of combined ortho-plastics treatment of complex calcaneal osteomyelitis.

**Methods:** A retrospective review was performed of all patients who underwent combined single stage ortho-plastics treatment of calcaneal osteomyelitis (2008- 2022). Primary outcome measures were osteomyelitis recurrence and BKA. Secondary outcome measures included flap failure, operative time, complications, length of stay.

**Results:** 33 patients (16 female, 17 male, mean age = 54.4 years) underwent combined ortho-plastics surgical treatment for BACH "complex" calcaneal osteomyelitis with a median follow-up of 31 months (s.d. 24.3). 20 received a local flap, 13 received a free flap. Fracture-related infection (39%) and diabetic ulceration (33%) were the commonest causes. 54% of patients had already undergone at least one operation elsewhere.

There were seven cases of recurrent osteomyelitis (21%); all in the local flap group. One patient required a BKA (3%). Recurrence was associated with increased mortality risk (OR 18.8 (95% CI 1.5-227.8), p=0.004) and reduced likelihood of walking independently (OR 0.14 (95% CI 0.02-0.86), p=0.042).

Local flap reconstruction (OR 15 (95% CI 0.8-289.6), p=0.027) and peripheral vascular disease (OR 39.7 (95% CI 1.7-905.6), p=0.006) were associated with increased recurrence risk.

Free flap reconstruction took significantly longer intra-operatively than local flaps (443 vs 174 minutes, p<0.001), but without significant differences in length of stay or frequency of out-patient appointments.

**Conclusion:** Single stage ortho-plastic management was associated with 79% eradication of infection and 3% amputation in this complex and co-morbid patient group. Risk factors for failure were peripheral vascular disease and local flap reconstruction. Whilst good outcomes can be achieved, this treatment requires high levels of in-patient and out-patient care.

## FP21

### What happens after failed total ankle replacement?

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**Aims:** Retrospective review of a consecutive series of 1,168 total ankle replacements (TAR) performed at Wrightington, to analyse modes of failure and clinical outcomes following TAR failure.

**Methods:** All patients undergoing TAR between November 1993 – June 2019 were collated (4-25 year follow-up; mean 13.7 years). 6 implants were used (300 STAR, 100 Buechal Pappas, 509 Mobility, 118 Zenith, 41 Salto and 100 Infinity). 5 surgeons, all trained in TAR, performed the surgery. Modes of failure were collated and clinical and radiological outcomes recorded for the revisional surgery following failure of the TAR.

**Results:** 156 (13.4%) TARs failed (47STAR 15.6%, 16BP 16%, 77Mobility 15.1%, 6Salto 14.6%, 10Zenith 8.5% and 0Infinity 0%). Mean time to failure 5.8 years (0.1- 21.4 years). The 4 most common modes of failure were 44.9% aseptic loosening, 11.5% gutter pain, 10.9% infection and 10.3% recurrent edge loading. 50 underwent conversion to tibiototalcalcaneal (TTC) fusion with nail with 9 (18%) failing to fuse. 31 underwent revision TAR with 2 (6.5%) subsequently failed. 22 underwent ankle fusion with 10 (45%) failing to fuse. 21 underwent polyethylene exchange of which 8 (38%) had further poly failure. 20 (12.8%) were managed conservatively, 2 (1.3%) required below knee amputation and 6 were listed but lost to follow-up. 81 of the 1168 (7%) consecutive cohort were lost to follow-up.

**Conclusion:** 13.4% of the TAR cohort have failed at average follow-up 13.7 years. There was no difference in failure modes across the implant designs. Whilst the fixed bearing has the shortest follow-up, it may be performing better as there have been no failures so far. Prior to October 2016, most revisions were to fusion (TTC 18% failure rate, ankle 45% failure rate), whereas post 2016, 57% patients elected for revision TAR (6.5% failure).



P17

**Bone tumours of the foot & ankle: an analysis of 131 cases**

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P18

**Moderate and severe coronal plane deformity corrected with the Infinity ankle prosthesis**

H. Tribe<sup>1</sup>, K. Pearce<sup>1</sup>, H. Fraig<sup>1</sup>, H. Taylor<sup>1</sup>

<sup>1</sup>University Hospitals Dorset, Bournemouth, United Kingdom

P19

**Achilles tendon ruptures and venous thromboembolism - UK Foot and Ankle Thrombo-Embolic Audit (UK-FATE)**

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P20

**Anterior translation post anterior pilon fixation. Are we missing something?**

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**POSTERS**  
**ABSTRACT DETAILED**

## P1

### The importance of pre-operative CT imaging in posterior malleolus fixation and clinical outcomes

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**Background:** The treatment of ankle fractures with associated posterior malleolar fractures remains controversial. The aim of this retrospective study was to establish the importance of pre-operative CT imaging to identify fracture morphology and characterise die-punch fragment size and position. We aim to present clinical outcomes including infection, rates of revision and incidence of radiographic evidence of post-operative arthritis.

**Methods:** We reviewed 323 consecutive patients from a trauma database of all ankle fractures managed in a trauma and orthopaedic department between January 2019 and December 2020. A total of 66 patients had posterior malleolus fractures. Imaging was reviewed using CareStream and data recorded using Excel.

**Results:** The mean age of patients was 52 years (range, 15-86 years). There was a 3:1 female to male preponderance. The majority of fractures were Lauge-Hansen SER (79%) with the remainder being 18% PER and 3% SAD. The posterior malleolar fragment was fixed in 70% of patients. 91% were fixed through a posterolateral approach using either a locking plate (65%), 1/3 tubular plate (7%), or posterior to anterior screws (20%). 9% were fixed using anterior to posterior screws.

Die-punch fragments were identified in 88% with a mean size of 8mm (range, 2-19mm). The majority were largest on the axial (36%) or sagittal (33%) plane.

Only one patient (1.5%) had a post-operative infection requiring further surgery. 6% patients had metalwork removal due to irritation. 1 patient (1.5%) underwent revision for failure. 14% patients developed radiographic changes of osteoarthritis (89% Kellgren and Lawrence grade 1, 11% grade 3).

**Conclusion:** Die-punch fragments are common and therefore the use of pre-operative CT imaging is necessary to allow their identification to allow anatomic reduction. Utilising a posterior approach to fix these fractures comes with a low risk of infection 1.5% and low rates of failure 1.5%.

## P2

### Preoperative anxiety and depression are associated with poorer patient-reported outcome following total ankle replacements

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**Introduction:** Patients with pre-operative anxiety/depression have been shown to have inferior patient reported outcome measures (PROMs) in major joint arthroplasty. There is some evidence to show that patients with anxiety/depression have inferior SF36, AOFAS and VAS scores following total ankle replacements (TAR). However, these outcomes are not validated for ankle surgery. The aim of this study is to investigate the effect of anxiety/depression on PROMs using the Manchester-Oxford Foot Questionnaire (MOXFQ) following TAR.

**Methods:** This is a retrospectively reviewed cohort study using prospectively collected PROMs data from a single centre from 2012 to 2023. Anxiety/depression was assessed using the EQ-5D-3L. MOXFQ was used to assess outcome after TAR. Questionnaires were completed by patients pre-operatively and 1-year post-operatively. MOXFQ between patients with and without anxiety/depression were compared using two-tailed T-test with significance taken at  $p < 0.05$ .

**Results:** 113 primary TARs were available for analysis. Mean follow-up time was 3.0 years (SD 2.5). Pre-operatively, 78(69.0%) patients reported no anxiety/depression, 35(31%) reported moderate/severe anxiety/depression. There is significant difference between pre-operative MOXFQ scores for patients with and without anxiety/depression ( $84.2 \pm 12.9$  vs  $71.7 \pm 13.2$  respectively,  $p < 0.001$ ). This significance persisted in post-operative MOXFQ scores (patients with anxiety/depression =  $42.0 \pm 31.1$ , patients without anxiety/depression =  $23.3 \pm 23.8$ ;  $p = 0.001$ ). The improvement in MOXFQ before and after TAR was significant for both groups at  $p < 0.001$ . There were no significant difference between the two groups ( $p = 0.249$ ) when considering the degree of change from pre- to post-operative MOXFQ scores.

**Conclusion:** This is the first study assessing the effect of anxiety/depression on an ankle surgery-specific PROM after TAR. Our results agree with previous literature in suggesting that PROMs are modulated by baseline mental health state in TAR patients. However, both groups report similar improvement in PROMs after TAR, and this should be considered when counselling patients pre-operatively.

## P3

### Long-term follow up of TAR in patients with juvenile idiopathic arthritis

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**Background:** Juvenile idiopathic arthritis (JIA) is a chronic immune-mediated arthropathy characterised by its early-onset and multi-joint involvement. Ankle arthritis secondary to JIA is functionally debilitating. In those patients with end-stage disease, the surgical options include ankle arthroplasty or fusion. Total ankle replacement (TAR) has the perceived advantage of maintaining ankle-hindfoot movement in a patient group with widespread joint involvement.

**Methods:** We performed a single centre study of all patients with JIA receiving a TAR since 2000. The primary outcome measure was revision surgery. Secondary outcome measures included radiographic evidence of failure and PROMS.

**Result:** 26 TAR (12 Mobility and 14 STAR) were performed in 17 patients with JIA (mean age 40.4 years; range 21-63). There was radiographic evidence of failure in 50% of TAR. Typically TAR failed with total talar collapse. 31% of TAR were surgically revised to fusion in all but one case. The 10 and 15 year survival rates were 70% and 30%, respectively.

Radiographic failure was associated with a raised MOXFQ score (median = 43) compared to patients with normal TAR radiographs (median = 33.5) and those that underwent revision (median = 35.5).

Despite 77% of TAR for JIA remaining painful, 86% reported an improvement in pain post-TAR and 71% would recommend the operation to a friend/family member with the same condition. In a global assessment of joints, 48% rated it as "one of their better joints".

**Conclusion:** TAR in the context of JIA is associated with high rates of radiographic failure (including talar collapse), high revision rates and poor MOXFQ scores. However, patient satisfaction from this treatment remains high in the context of their global joint disease.

## P5

### Does the underlying cause of arthritis affect the outcome of total ankle replacement? A 10 year follow up study

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**Background:** Total ankle replacement (TAR) is gaining popularity as a treatment option for end stage arthritis. We analysed whether the underlying pathology leading to the arthritis has any bearing on patient reported or clinical outcomes.

**Methods:** Patient-reported outcome measures (PROMs) for TAR performed from 2006 to 2010 by a single surgeon were reviewed. This included WOMAC score, SF-36 and patient satisfaction scores. Data was collected preoperatively and post-operatively at 1, 2, 5 and 10 year. The indications for TAR were obtained by review of clinical notes and radiographs and these included osteoarthritis (OA), inflammatory arthritis (IA), pilon fracture (PF), ankle fracture (AF), and post-traumatic arthritis without previous fracture (PTOA).

**Results:** PROMs were available for 156 TARs: 81 (51.9%, mean age 65.29) for OA, 28 (17.9%, mean age 65.29) for AF, 23 (14.7%, mean age 64.28) for IA, 11 (7%, mean age 55.01) for PF, and 13 (8.3%, mean age 51.08) for PTOA. At 1 year WOMAC score showed significant worsening pain and stiffness on PTOA group ( $p = 0.023$ ,  $p = 0.001$ ) and worse general health and vitality for the IA group ( $p = 0.0025$ ,  $p = 0.005$ ). At 5 years The PTOA group showed significant worsening stiffness ( $p = 0.048$ ), social and emotional domains ( $p = 0.004$ ,  $p = 0.029$ ) and worsening pain, return recreational activities and surgery dissatisfaction ( $p < 0.05$ ,  $p = 0.032$ ,  $p = 0.023$ ). At 10 years 50% of IA patients were unhappy with return to ADLs but no other difference were found between groups. There was a higher revision rate at 10 years in the PTOA group with 30.7% of patients being revised (4/13) compared to other groups (OA-6.17%, AF-3.57%, IA-4.35%, PF-9%)

**Conclusion:** Similar outcomes in all groups were seen at 10 years but higher revision rates were present in PTOA group. In patients with PTOA careful consideration and counselling is needed prior to proceed with TAR.

P6

### Chevron vs transverse cut comparison in minimally invasive hallux valgus correction. Does the osteotomy affect outcome?

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**Background:** There has recently been a move to utilising distal transverse osteotomies (META) rather than chevron osteotomies (MICA) during minimally invasive hallux valgus surgery (MIS HV). The aim of this study is to investigate if there are any differences in union rates or clinical outcomes between these two techniques.

**Methodology:** A retrospective comparative analysis of a single surgeon research registry containing prospectively collected patient reported outcomes for patients undergoing MIS HV. Patients with minimum two year follow up were divided into two cohorts based on which osteotomy technique was used. Outcome measures were union rates and clinical outcomes (assessed using the Manchester-Oxford Foot Questionnaire, a validated outcome measure).

**Results:** Between 2014-2018, 292 feet underwent MICA and between 2019-2021 228 feet underwent META. The symptomatic delayed union rate was higher in the META cohort compared to the MICA cohort (4.4% vs 1.5%) but not statistically significant (p=0.07). The revision for non-union rate was also higher in the META cohort compared to the MICA cohort (2.6% vs 1.2%) but not statistically significant (p=0.30). There was no statistically significant difference between the two cohorts in any of the MOXFQ domains at final follow up (p>0.05).

**Conclusion:** There was a higher, but not statistically significant, rate of symptomatic delayed union and revision for non-union in patients undergoing MIS HV with a transverse osteotomy compared to those treated with a chevron osteotomy.

P7

### 7 to 9 year survivorship of 106 fixed bearing total ankle replacements

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We report the mid-term outcomes of a prospective series of fixed bearing total ankle replacements (TAR), from two non-designer centres. The primary aims were to assess survivorship and adverse events, including complications and re-operations. The secondary aims were to assess functional and radiological outcomes.

Data was collected prior to surgery and at annual follow up appointments, for patients operated on between March 2014 and December 2016. Implant survivorship, complications, reoperations and patient reported outcome scores (PROMS) were collected. Radiological data was also collected.

102 patients, comprising 106 TAR, were included in the study. Mean age at implantation was 68 years (range 42 to 89). Mean follow up time was 98 months (range 83 to 113). 4 patients were lost to follow up and 12 patients died. Mean age at the time of surgery for the 12 deceased patients was 84 years and the mean follow up time was 59 months.

12 patients received further surgeries; 8 revision TAR, 3 biopsy and grafting of talar cysts, and 1 capsular release. The reasons for revision surgery were unexplained pain (5 patients), proven deep infection (1 patient), tibial subsidence (1 patient) and instability (1 patient). Mean time to revision surgery was 43 months (range 15 to 82). Current survivorship of the cohort is 91% (82 of 90 TAR).

15 patients suffered complications of surgery. 7 patients exhibited delayed wound healing without deep infection, 6 patients sustained intra-operative medial malleolar fractures and 2 patients were diagnosed with chronic regional pain syndrome.

Radiolucencies were seen in 35% of patients. MOXFQ and EQ5D-5L PROMS showed significant post-operative improvements (p < 0.01).

6 to 9 years represents the longest follow up of this fixed bearing TAR to date. Survivorship is high and significant improvements in disease specific, and general health, PROMS were observed.

P8

### A medium term review of the outcomes of talar osteochondral lesions treated with matrix associated stem cell transplantation

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**Introduction:** Osteochondral lesions (OCLs) of the talus are a challenging and increasingly recognised problem in chronic ankle pain. Difficulties associated with treating OCLs include lesion location, size, chronicity and problems associated with potential graft harvest sites. Matrix associated stem cell transplantation (MAST) is described for larger lesions >15mm<sup>2</sup> or failed alternative therapies. This cohort study describes a medium term review of the outcomes of talar lesions treated with MAST.

**Methods:** A review of all patients treated with MAST by a single surgeon was conducted. Preoperative radiographs, MRIs and FAOS outcome questionnaire scores were

conducted. Intraoperative classification was undertaken to correlate with imaging. Postoperative outcomes included FAOS scores, return to sport, revision surgery/failure of treatment and progression to arthritis/fusion surgery. Unpaired t test on SPSS, p<0.05.

**Results:** 58 MAST procedures in 57 patients were identified in this cohort. The mean follow up was 5 years. There were 20 females and 37 males, with a mean age of 37 years (SD 9.1). 22 patients had lateral OCLs and 35 medial OCLs. 32 patients had previous surgery and 25 had this procedure as a primary. 15 patients had one failed previous surgery, 9 patients had two, four patients had three previous surgeries and three patients had four previous surgeries. 12 patients had corrective procedures at the time of surgery. Complications: 3 patients went on to have an ankle fusion, 5 had additional arthrofibrotic debridements, 1 patient had a repeat MAST procedure, 1 patients had removal of osteotomy screws for pain, and there were 2 wound complications one at ankle and one at the iliac crest donor site.

**Conclusion:** MAST has demonstrated positive results in lesions which prove challenging to treat, even in a " failed microfracture" cohort. RCT still lacking in field of orthobiologics for MAST.

Longer term follow up required to evaluate durability

P9

### Silastic joint arthroplasty for end stage Hallux Rigidus - a joint preserving alternative

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**Aim:** Osteoarthritis of the first metatarsophalangeal joint affects one in three people over the age of 65 years. Arthrodesis remains the gold standard but it has its own complications. It is associated with adjacent joint arthritis, transfer metatarsalgia and up to 10% non-union rate. The aim of this study was to analyse the outcome of double stemmed silastic joint arthroplasty (Wright-Medical, Memphis, Tennessee, USA) for end stage Hallux Rigidus.

**Methods:** This retrospective analysis included 117 consecutive 1st MTPJ silastic arthroplasties done between January 2016 to February 2023 for end stage Hallux rigidus. There were 77 females and 40 males with a mean age of 65 years (46-82 years). Radiological and clinical assessments were performed, and patient reported outcome measure data (PROMS) and Visual Analogue Scale (VAS) scores were collected pre and post operatively.

**Results:** Findings showed 99.1% survivorship following a silastic joint arthroplasty with a mean follow up of 5 years (6 months-7 years[LN1]). The MOXFQ score improved from a mean of 81 (59.8-100) to 13 (0-57). The mean VAS scores improved from 7.2 (5-10) to 1.5 (0-7) postoperatively. Five patients were lost to follow up. Two patients developed deep infection and one required revision. The other patient with infection was lost to follow up. In total 10 patients (8.9%) developed complications, out of which 8 patients responded to simple treatments.

**Conclusion:** Results have shown good to excellent outcomes following a silastic arthroplasty of the first metatarsophalangeal joint for the treatment of end stage hallux rigidus. The survivorship at a mean follow- up of 5 years was 99.1%. As historically reported, we did not see any soft tissue reaction or progressive osteolysis in any of our patients. It provides comparable and predictable outcomes to joint fusion for end stage arthritis.

## P10

### A Novel method for reconstructing complex diabetic foot wounds using Biodegradable Temporising Matrix (BTM)

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**Introduction:** Diabetic foot attack (DFA) is a complication in patients with diabetes and one of the main causes of non-traumatic amputations. Biodegradable Temporising Matrix (Novosorb BTM) is a synthetic matrix that helps the organisation of the extracellular matrix and generation of new tissue over complex wounds with exposed tendon and bone.

**Methods:** The aim of this prospective study was to evaluate the efficacy of BTM in the reconstruction of wounds after debridement for DFA. Eight patients with complex diabetic foot wounds (exposed fascia, tendons, bone) had an initial debridement and application of negative pressure wound therapy, followed by BTM reconstruction. Mean age of the cohort was 60 years (Range 45-74) and had BTM reconstruction after partial foot amputations, ray amputations and trans metatarsal amputations. Time to healing, infection rate and incidence of subsequent procedure was analysed.

**Results:** All 8 patients had successful BTM integration with the tissues. Six patients achieved complete wound healing at a median time of 18 weeks. Two patients (25%) underwent a second procedure with skin graft for final wound coverage at 3 months. There were no infections or re-ulceration in our cohort at a mean follow up of 10 months (2-30).

**Conclusion:** Our experience suggests that BTM is a safe and effective treatment for coverage of complex wounds after debridement for DFA. In larger wounds, skin graft speeds up wound coverage, while in small to moderate wounds BTM is a single stage procedure with superior aesthetic and functional outcomes.

**Keywords:** diabetic foot attack, wound coverage, dermal matrix, diabetic foot ulcer

## P11

### Radiological medial safe zone - Protecting the posterior tibial tendon during ankle or pilon fracture fixation

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**Background:** The surgical treatment of pilon and posterior malleolar fractures can risk damage to the posterior tibial tendon. The lateral safe zone has been confirmed previously to prevent syndesmosis incisura encroachment, however the risks to the tibialis posterior tendon medially has not been investigated.

Our aim in this study was to identify the fluoroscopic safe zone medially, to prevent inadvertent injury to the tibialis posterior tendon during both direct and indirect fixation techniques.

**Methods:** A cadaveric study was performed using 9 fresh frozen cadaveric specimens. A medial posteromedial approach was performed on each specimen to expose the tibialis posterior sheath. A flexible wire was placed down the lateral aspect of the tibialis posterior sheath as a radio opaque marker. Fluoroscopic imaging was performed in the anteroposterior and lateral position to identify a medial safe zone.

**Results:** In all specimens, the wire was located medial to a vertical line corresponding to the articular surface (the medial safe zone line) of the medial malleolus on anteroposterior imaging. On lateral imaging, the radiopaque marker followed the medial malleolus obliquity and continued to correspond to 30% of the posterior plafond.

**Conclusion:** This study demonstrated that a medial safe zone fluoroscopic landmark is unambiguous in localizing the tibialis posterior sheath and that any metal work medial to this line is likely to be at risk of damaging the tibialis posterior tendon. The lateral radiograph showed that any anteroposterior screw could involve the tibialis posterior sheath even if the penetration is only 70% across the tibial width.

**Clinical relevance:** This article describes a radiographic and clinical safe zone for fixation and hardware placement during open reduction internal fixation (ORIF) of PMFs. This information will assist surgeons in avoiding posterior tibial hardware placement.

## P12

### The patient and surgical factors specific to patients not receiving anticoagulation when undergoing foot and ankle surgery in the UK - UK-FATE Audit

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**Introduction:** Although the rate of VTE after foot and ankle surgery is low, there are multiple factors influencing the risk for individual patients. Furthermore, there are no clear guidelines on which patients may benefit from chemical thromboprophylaxis (CTP). Our aim was to assess patients not treated with chemical thromboprophylaxis when undergoing foot and ankle surgery, to report on their specific patient and surgical risk factors for VTE.

**Methods:** This was a multi-centre, prospective, national audit of patients undergoing foot and ankle surgery (including Achilles tendon ruptures) from 68 participating UK centres. The study was from 1st June 2022 and 30th November 2022, with a further 3-month follow up. Data on a total of 13,569 patients was submitted. Following data cleansing, 11,363 patients were included for further analysis.

**Results:** CTP was not given in 3,717 (32.71%) patients. The overall VTE rate in patients without prophylaxis was 0.36% (13 cases) versus 1.1% (86 cases) in patients given CTP (Odd's ratio 3.18, p<0.001). Overall, 2,876 elective patients (56.5%), 551 trauma patients (11.5%), 148 acute diabetic foot patients (37.2%), 142 Achilles rupture patients (13.1%) did not receive CTP, with VTE rates 0.1%, 0.5%, 0.0%, and 4.2% respectively (Odd's ratio 38.2 for Achilles ruptures, p<0.001). In patients not receiving prophylaxis, a smaller proportion had increased surgical urgency (20.7% vs 59.7%, p<0.001), were non-weightbearing (8.5% vs 74.3%, p<0.001), or required post-operative splintage (24.5% vs 79.7%, p<0.001) compared to those not receiving CTP.

**Conclusion:** Patients not receiving CTP in this audit had a low incidence of VTE. Without adjustment for variables, this is lower than patients given prophylaxis. However, these patients represent a curated group considered lower risk - including less urgent surgery, early weightbearing and lack of post-operative splinting. Despite these factors Achilles tendon ruptures were associated with a significantly higher VTE rate.

## P13

## P13

### Soft tissue sarcomas of the foot and ankle: a 12 year Sarcoma Centre experience

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**Introduction:** Soft tissue sarcomas of the foot and ankle are a rarely encountered condition. We report a 12 year experience at a Sarcoma Centre.

**Methodology:** A retrospective review of prospectively gathered electronic database was performed from January 2011 to December 2022. Of 265 referrals, 14 (5%) sarcomas (7 males, 7 females) were identified. Excel and R was used for analysis.

**Results:** Mean age at diagnosis was 42 (range 10-80) years. Eleven of these had a clear history of pain documented. Duration of reported symptoms ranged widely from 4-60 (mean 20) months. Five diagnoses were unexpected following excision performed elsewhere.

Synovial Sarcoma was most frequently identified (6), followed by Clear Cell Sarcoma (2). Others observed were Sarcoma NOS (2), Low Grade Fibromyxoid Sarcoma (1), Leiomyosarcoma (1), Myxofibrosarcoma (1) and Extraskelatal myxoid chondrosarcoma (1). The most common location was the midfoot (6), followed by the ankle (4) and hindfoot (4). No forefoot lesions were identified.

Most lesions were high (9) or intermediate (4) grade; One was low grade. One patient had metastases at referral following local excision elsewhere and underwent palliative chemotherapy. Primary surgical treatment modalities included below knee amputation (6), ray amputation (2), limb salvage surgery (6). Three patients underwent adjuvant radiotherapy. No significant difference was observed between limb salvage and amputation groups.

Overall survival at 2 years was 78%; 5 year survival was 69%. Two patients developed local recurrence and subsequent metastases. A further three patients developed metastases without local recurrence. The presence of local recurrence or metastases conferred a poor prognosis (p=0.021).

**Conclusion:** Soft tissue sarcomas of the foot and ankle are rare. The history of a painful lesion should raise clinical suspicion. Long duration of symptoms is not necessarily reassuring. Development of local recurrence or metastases is a poor prognostic sign and may inform patient discussion.

P14

### Pedal medial artery calcification score as a prognostic marker for the success of surgical intervention in diabetic foot disease

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**Aim:** Medial artery calcification (MAC) has been strongly associated with diabetes and has been linked to an increased risk of complications of diabetes such as amputation, as well as overall mortality. Scoring systems for grading the severity have recently been developed and used to show that MAC can be linked to worse outcomes in diabetic foot ulceration (DFU) treatment. Our primary aim was to investigate for a causal link between severity of pedal medial artery calcification (pMAC) and the success of surgical interventions in the treatment of DFU. Our secondary aim was to compare pMAC and traditional vascular studies used in the pre-operative assessment for surgical interventions in DFU.

**Method:** A single-centre retrospective observational study was performed for all patients who had undergone debridement or amputation for DFU between October 2019 and March 2023. Subjects were given a pMAC score using the Ferraresi classification. Doppler ultrasound studies were also recorded to assess for the presence of peripheral artery disease (PAD). Any further surgeries on the affected limb were recorded, as were outcomes based on available follow-up data.

There was a significant variation in the proportion of AF and TAR with the ratio of AF:TAR varying more than two-fold. The number of patients that underwent surgery was 19.2% lower in 2022 compared to 2017 (2242 v 2774).

Expressed as a percentage of total volume of cases, the proportion of TAR performed for end stage arthritis was significantly higher in 2022 than in 2017 (31.0% v 26.3%, p<0.001)

**Results:** 0 limbs were identified. 73% had no pMAC, 16% had moderate pMAC and 11% had severe pMAC. Limbs with pMAC were more likely to need multiple surgeries (no pMAC – 37%, moderate pMAC – 55%, severe pMAC – 50%), with amputation twice as likely (42%, n=8) vs the no pMAC group (20%, n=10). 74% of the groups with pMAC had no indicators of PAD in the legs.

**Conclusion:** Our study suggests a worse prognosis for DFU with increasingly severe pMAC and worse outcomes from DFU-related surgery with increasingly severe pMAC. Vascular studies were often very inconsistent and few patients had vascular studies distal to the ankle. Pedal MAC has the potential to be an important prognostic indicator for DFU-related surgery.

P15

### Short to medium term functional and radiological outcomes and complication rates for Intra-articular Calcaneum fracture fixation done using Sinus Tarsi Approach

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**Introduction:** The extensile lateral approach for calcaneum fracture fixation has high complication rates of about 25%-30%. Sinus Tarsi approach is a minimally invasive surgical technique for fixing calcaneal fractures with minimal wound complications.

**Aim:** The study is to access the Short to Medium term Functional and Radiological outcome and complication rates for Intra-articular Calcaneum fracture fixation using Sinus Tarsi Approach.

**Materials & Methods:** Retrospective study of 27 patients with intra-articular displaced Calcaneum fractures fixed using Sinus Tarsi approach from 2015 - 2022. All patients had pre-operative radiographs, CT scans and appropriate DVT prophylaxis. We used Sanders classification and Pre and post operative Bohler's angle measurements. The functional outcome was measured using MOxFQ scores and looked at complications rates including Sub-Talar fusion rates.

**Results:** Our study had a male to female ratio of 4:1 with mean age of 48 years (22 - 79) with 1 to 8 years follow up. Ten patients were active smokers. The mean pre operative Bohler's angle was 9.41 +/- 8.2, achieved post operative Bohler's angle was 27.5 +/- 5 with an improvement in the Bohler's angle of 18 +/- 3.5, which is statistically significant (P value < 0.0001). The mean MOxFQ score is 55.93 ( 27.8 - 78.3). We had one patient with wound infection requiring implant exit. 8 patients had radiological evidence of arthritis but none required fusion. Most patients were able to return to their pre injury occupation apart from 5 patients.

**Conclusion:** Minimally invasive Calcaneal fracture fixations using sinus tarsi approach has shown significant restoration of Bohler's angle with minimal complication rate. Although 30% of patients has got mild to moderate arthritis, none of the patients needed revision in a short to medium term follow up. Patients had fair to good functional outcome with good radiological outcome and less revision rates.

P16

### Weight bear then discharge: A safe management strategy for isolated Weber B lateral malleolus fractures – outcomes of 658 patients

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**Background:** Myriad protocols exist for the evaluation of isolated Weber B lateral malleolus fractures that demonstrate a congruent tibiotalar joint on initial radiographic evaluation. Manual stress, gravity stress and weight-bearing radiographs, all at various timepoints, may be employed to identify those injuries that develop significant talar shift but consensus is elusive. This study outlines a safe and reproducible protocol for such injuries, utilising a removable orthosis, immediate weight bearing and standard supine radiographs.

**Method:** A retrospective analysis of a prospective trauma database was analysed to identify patients with an isolated Weber B ankle fracture with adequate presentation radiographs demonstrating a congruent mortise. Patient records and radiographs were evaluated a minimum of 5 years after initial presentation to determine ankle stability, complications, and the burden on outpatient services.

**Results:** Between 2014 and 2016, 657 patients were referred to the specialist trauma clinic from the emergency department. Of the 657, 52 patients had inadequate ED radiographs to determine ankle congruity. At the two-week assessment, 11 of the 52 demonstrated talar shift and required intervention. Therefore 646 patients demonstrated ankle congruity at two weeks after weight bearing. No patient demonstrated talar shift at the six-week assessment. Average number of follow up appointments was 2.4 with 3.5 radiographs. Our new treatment protocol advocates discharge after a single orthopaedic assessment after two weeks of weight bearing. This protocol will reduce outpatient appointments and radiographic series by 58% and 43% respectively.

**Conclusion:** This study supports immediate weight-bearing of Weber B ankle fractures with a congruent mortise in an orthosis. Follow up beyond two weeks is unnecessary and our protocol offers a safe means of significantly reducing the outpatient burden.

P17

P17

### Bone tumours of the foot & ankle: an analysis of 131 cases

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**Background:** Bone tumours are a broad group of conditions that may present to foot and ankle surgeons. They range from benign problems requiring only reassurance, to rare but potentially life-threatening conditions. In this study we summarise the typical features of bone tumours of the foot and ankle. By doing so we aim to help medical professionals identify and triage lesions at the earliest possible opportunity.

**Methods:** A retrospective review of cases presenting to a specialist bone tumour unit was undertaken. Inclusion criteria were primary bone tumours, both benign and malignant, metastases and haematological cancers. Excluded were tumour mimickers such as infection. Data on patient demographics, presentation, investigations including histology and subsequent management were collected.

**Results:** 131 cases were included between 25th March 2010 and 23rd February 2023. Mean follow up was 15 weeks. There were 99 benign lesions and 32 malignant lesions. The most common benign lesions were enchondroma, osteochondroma and osteoid osteoma. Malignant lesions included 9 cases of metastasis, 6 cases of lymphoma and 17 primary malignant bone tumours. This latter group comprised 9 chondrosarcomas, 4 Ewings sarcomas and 4 osteosarcomas. Surgery was the mainstay of treatment for malignant primary bone tumours. There were 4 deaths with a 1 year survival of 87.5% and 3 year survival of 75%.

**Conclusion:** Thankfully the majority of bone tumours of the foot and ankle are benign however the morbidity and mortality associated with malignant lesions is high. A delay in diagnosis may compromise management options or lead to an avoidable death. A high index of suspicion and early discussion with a tumour centre is recommended.

P18

### Moderate and severe coronal plane deformity corrected with the Infinity ankle prosthesis

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Selected ankle arthroplasty implants have been shown to be suitable for patients with end-stage ankle arthritis and significant coronal plane deformity. The outcomes using the Infinity prosthesis in this patient group are currently unknown. Our aim was to evaluate the outcomes of patients undergoing ankle arthroplasty using the Infinity prosthesis with a preoperative coronal plane deformity of 10-20 degrees (moderate) and 20 degrees or greater (severe).

We identified patients who had undergone a primary ankle arthroplasty from 2014 to 2022. From the total of 103 patients, 25 patients had a moderate deformity (10-20 degrees) and four patients had a severe deformity (>20 degrees). Of these patients, 17 (59%) patients had a varus deformity and 12 (41%) had a valgus deformity. The mean age was 72 years. Mean length of follow-up was 34 (range 12-71) months.

The mean preoperative coronal plane deformity was 15.84 (range 10.4 to 29.7) degrees. The mean immediate post-operative deformity was 1.8 (range 0.2 to 6.5) degrees. The mean deformity at final follow-up was 3.8 (range 0.3 to 12.5) degrees. The difference between preoperative deformity and final correction was statistically significant ( $p < 0.0001$ ). There was no significant difference between initial and final postoperative correction, nor between the moderate and severe groups. Overall, recurrence of coronal plane deformity occurred in 3 patients (10.3%). Manchester-Oxford Foot Questionnaire scores and visual analogue scale scores were recorded at final follow-up and the scores were equivalent to previously published data. Correction of the coronal plane deformity was achieved by using intraoperative soft-tissue balancing, including lateral ligament reconstruction in three patients. Tibial bone cysts were seen in two patients, leading to tibial tray subsidence in one patient.

Stable correction of moderate and severe coronal plane deformity in end-stage ankle arthritis can be reliably achieved with the infinity prosthesis using only soft-tissue balancing procedures.

P19

### Achilles tendon ruptures and venous thromboembolism - UK Foot and Ankle Thrombo-Embolic Audit (UK-FATE)

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**Introduction:** Although VTE rates are considered low after foot and ankle surgery, Achilles tendon ruptures have a higher reported incidence of VTE. However, there is an absence of agreement on contributing risk factors in the development of VTE and whether thromboprophylaxis is required. Our aim was to assess specific patient and surgical factors in patients with Achilles tendon ruptures developing VTE.

**Methods:** This was a multi-centre, prospective, national audit running from 1st June to 30th November 2022, with a further 3-month follow-up period. All foot and ankle operations and Achilles tendon ruptures were included, from 68 contributing UK centres. Primary outcomes included symptomatic VTE up to 90 days following Achilles tendon rupture treatment and VTE related mortality up to 90 days following treatment.

**Results:** There were 808 Achilles tendon ruptures which underwent conservative management (74.40%) and 278 which underwent surgery (25.60%). The VTE incidence in conservatively treated Achilles ruptures was 4.08% compared to 2.52% in surgically treated ruptures, although the difference was not statistically significant ( $p=0.232$ ). There were no VTE related mortalities.

There was no significant difference between those who were weightbearing and those who were not ( $p=0.152$ ), and no significant difference between those treated in plaster compared to those treated in a boot ( $p=0.652$ ). The VTE rate was no different in those with and without anticoagulation ( $p=0.627$ ) and the duration of anticoagulation was similar between groups. There was no difference in number of comorbidities or ASA grade between the groups. There was a slightly higher average age in the VTE group (54.35 vs 48.20 years,  $p=0.003$ ).

**Conclusion:** The incidence of symptomatic VTE in Achilles tendon ruptures is high compared to other foot and ankle diagnoses. Apart from age, this study could not identify any obvious factors which increase the risk of VTE following Achilles tendon ruptures.

P20

### Anterior translation post anterior pilon fixation. Are we missing something?

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**Introduction:** Anterior pilon fractures are uncommon injuries to the ankle. Fixation of the fracture is commonly undertaken, however concomitant injury to the anterior talofibular ligament (ATFL) is not commonly addressed. There are no current studies assessing talus translation in anterior pilon fractures.

**Objective:** To assess incidence of persistent talus anterior translation in pilon fractures affecting the anterior plafond.

**Methods:** A retrospective analysis of a prospectively collected database in a major trauma centre was undertaken to establish eligible patients. All patients with pilon fractures with anterior components undergoing reduction and fixation were included. Intraoperative and weightbearing postoperative radiographs were assessed for fracture reduction and anterior talus translation. The Topliss Classification was used for pilon type characterisation.

**Results:** A total of 23 patients were identified who could be included in the study. The mean age of patients included in the study was 37.70 years (95% CI 31.74, 43.65). All patients were judged to be anatomically reduced. No patients underwent ATFL reconstruction. There were 13 patients (56.50%) with persistent anterior talus translation. There was no significant difference in persistent talar anterior translation ( $p=.708$ ) between coronal type (58.82%) or sagittal type (50%) pilon fracture as categorised by the Topliss classification.

**Conclusions:** Over half the patients in this study with pilon fractures with an anterior component had persistent anterior talus translation post fixation despite being anatomically reduced. The fracture mechanism to sustain an anterior pilon is likely to injure the ATFL. Ligamentous reconstruction should be considered in anterior pilon fracture types to try and prevent persistent anterior talar translation.