

P1

The effect of different intermetatarsal angles upon first metatarsophalangeal joint stress: a finite element study

F. Reisse¹, R. Mootanah^{1,2}, O. Morgan^{1,3}, B. Russell^{1,4}, J. Mazzella⁵, J.T. Deland², S.J. Ellis², J. Baxter², H.J. Hillstrom^{1,2},

Medical Engineering Research Group

¹Anglia Ruskin University, Chelmsford, United Kingdom,

²Hospital for Special Surgery, New York, United States,

³University of Brighton, Brighton, United Kingdom,

⁴Mid Essex Hospital Services NHS Trust, Chelmsford, United Kingdom,

⁵Ecole des Mines d'Albi-Carmaux, Albi, France

Introduction: Osteoarthritis (OA) of the first metatarsophalangeal joint (MTPJ) is the most common form of degenerative joint disease in the foot, affecting 35-60% of adults over 65 years (Wilder et al., 2005). Different foot structures have been associated with an increased incidence of OA of the first MTP joint (Hillstrom et al 2014). An increased Intermetatarsal Angle (IMA) is a common deformity of the foot, but its relationship to joint stress of the first MTP joint and subsequent development of osteoarthritis remains unknown. The aim of this study is to assess how an increased intermetatarsal angle affects the joint stress of the first MTP joint, using finite elemental analysis.

Methods: Radiological images of an asymptomatic 55 year-old male were acquired and segmented to create accurate 3D representations of the hallux. These were then exported to ABAQUS V6.12-2 (HKS, USA). Vertical forces of 110 N and 150 N were applied to the distal phalange and the sesamoid bones, respectively, to simulate propulsion (Hillstrom et al., 2013). The model was then modified with virtual IMA, ranging from 7° to 30°, to acquire peak stress measurements in the first MTPJ.

Results: The model, simulating a well-aligned toe, had a peak stress value of 1.11 MPa in the proximal phalange cartilage and 0.89 MPa in the first metatarsal cartilage. Compared to the well-aligned toe, IMA angles of 15°, 20°, 25° and 30° resulted in an increase in peak stress by 20.79%, 155.9%, 326.4 and 391.1%, respectively, in the proximal phalange base cartilage, and 67.4%, 189.2%, 307.1% and 362.1%, respectively, in the first metatarsal head cartilage.

Conclusion: This study indicates a substantial rise in peak joint first MTPJ stress as the IMA of the foot increase. This could help surgeons make informed decisions on addressing IMA deformity before the onset of osteoarthritis.

P2

Finite element modelling of radial shock wave therapy for plantar fasciitis

Z. Alkhamaali¹, M. Solan², S. Cirovic³

¹Saudi Food and Drug Authority, Planning and Follow up, Riyadh, Saudi Arabia,

²Royal Surrey County Hospital, Orthopaedic Surgery, Guildford, United Kingdom,

³University of Surrey, Biomedical Engineering, Guildford, United Kingdom

Introduction: Therapeutic use of shock wave therapy is emerging as a method of choice when treating persistent cases of plantar fasciitis. In spite of the apparent effectiveness and widespread use, the understanding of the mechanisms through which shock waves promote healing is unclear. The aim of this study to gain a better understanding of the mechanical stimuli that this method produces using computer modelling.

Methods: Finite element models of a shock wave source and of the foot were constructed to simulate shock wave therapy. The model of the shock wave source was based on the geometry of an actual radial shock wave device. The foot model was based on the geometry reconstructed from MRI images of a volunteer. Simulations were conducted of a single and of two successive shock wave pulses administered to the foot.

Results: A standing stress wave is generated in the applicator of the device using ballistic method. This wave is transmitted into the soft tissue in the form of pressure waves that propagate in all directions. The magnitude of the pressure generated at the surface of the soft tissue is up to 8.5 MPa, which is consistent with published data from in-vitro experiments. The negative pressure at the plantar fascia reaches values of over 1.5 MPa, which should be sufficient to generate cavitation in the tissue. The results also show that multiple shock wave pulses may have a cumulative effect in terms of strain energy in the foot.

Conclusions: The results support the hypothesis that cavitation-induced micro-trauma leading to neo-vascularisation may be one of the mechanisms that enhance the healing process. Energy accumulation from successive shock wave pulses has not been mentioned before and it may point to a potential new healing mechanism.

P3

Does the size of Morton's neuroma predict early failure of corticosteroid injection and the need for surgery?

D. Mahadevan¹, A. Nanda¹, N. Whybra¹, S. Gaba¹, J. Mangwani¹
¹University Hospitals of Leicester, Leicester, United Kingdom

Introduction: Corticosteroid injection is one of the standard interventions in the management of Morton's neuroma (MN). Published literature has suggested that corticosteroid injections were less efficacious in larger lesions. The purpose of this study was to investigate whether the size of the neuroma was also a predictor for early surgery.

Methods: The hospital database was used to identify all patients that had received an ultrasound-guided corticosteroid injection for MN between Jan 2009 and Sept 2013. Theatre records were then checked to identify cases that had subsequently undergone surgical excision of the neuroma. A comparative analysis was performed between the patient groups that had surgery with those who did not.

Results: A total of 110 feet were treated with corticosteroid injections for MN. Male to female ratio was 1:4 with a mean age of 55 years. Both feet were equally affected and 10 patients had bilateral involvement. 32 feet had ipsilateral neuromas; 23 of which were symptomatic. 22 feet had undergone surgical excision of the neuroma (20%) at a mean follow-up of 27 months (6- 62 months) following the injection. The mean time lag between injection and surgery was 20 months (4- 49 months). Binary logistic regression analysis was performed adjusting for age, gender, size of neuroma and presence of ipsilateral neuromas. The size of MN was not a predictor for subsequent surgery (10.7 ± 3.2 mm in surgical group vs. 10.1 ± 3.9 mm in non-surgical group; $p=0.319$). Younger patients (< 50 years) had a higher rate of requiring surgical excision after treatment with injection.

Conclusion: Twenty-percent of MN treated with corticosteroid injections required surgical excision at an average follow-up of 2 years. There was no relationship between the size of neuroma and the need for subsequent surgical excision. Age (< 50 years) was the only predictor for surgery.

P4

Single-photon emission computed tomography in painful total ankle replacements

L. Mason¹, J. Wyatt¹, A. Molloy¹
¹University Hospital Aintree, Liverpool, United Kingdom

The use of Single-photon emission computed tomography (SPECT) imaging in foot and ankle surgery has been developing over recent years. Its use in identifying unexplained pain in the foot and ankle has been described, where other imaging modalities have failed. The investigation of a painful TAR is difficult, often not delineating a definitive cause. Our aim in this study was to investigate the use of SPECT imaging in painful TARs.

Methods: We performed a retrospective analysis of SPECT imaging, performed for painful TARs in our department between October 2010 and March 2014. Clinical information was gathered from the patient's notes and all other relevant imaging was reviewed for the presented cases.

Results: There were 15 patients identified who had undergone SPECT imaging for a painful TAR. The mean age was 63.1 years, with a male/female sex ratio of 2:3 and a minimum time of surgery to imaging of 18 months. Of the 15 patients, 14 were positive for increased osteoblastic activity in relation to the periprosthetic area, in keeping with implant loosening. The most common finding was tracer activity in relation to the talar component in 13 cases. Tracer activity localized to the tibial component in 5 cases. In all but 1 case (where the tracer to the tibial component alone), there was no evidence of loosening on the plain radiographs. Infection was ruled out by using Indium labeled white cell scan in addition.

Conclusion: The SPECT scan was very useful in identifying aseptic loosening in painful TARs, which was not seen on other imaging modalities. The talus was the most common site for loosening. Because of the curvature of the talus, diagnosis of loosening is most challenging with other imaging modalities, including CT. The scan cannot however rule out infection, and therefore additional investigations are required.

P5

Is there a need for prophylactic antibiotics in lesser toe fusion surgery using K-wires? A prospective randomised controlled trial

J. Mangwani¹, R. Benson¹, A. Gulati¹, M. Cichero¹, D.M. Williamson¹
¹Great Western Hospital, Swindon, United Kingdom

Problem: K-wires are commonly used in lesser toe fusion surgery. A recent survey of British Orthopaedic Association members has demonstrated lack of consensus on the use of prophylactic antibiotics for this procedure. There is paucity of evidence-based guidelines on this subject and the decision depends on the surgeon's individual preference.

Design: Prospective randomised controlled trial.

Material and methods: 100 adult patients undergoing toe fusion surgery that required K-wires to be left in-situ for 4-6 weeks were randomly allocated into those who received prophylactic antibiotics (Group 1, n=48) and those who did not (Group 2, n=52). Patients were followed up regularly and during each visit K-wire insertion sites were investigated for signs of pin tract infection according to the modified Oppenheim's classification. The regional ethics committee approved the study.

Results: The mean age of Group 1 was 58.0 (SD 17.5) and Group 2 was 62.7 years (SD 14.7). Group 1 had four (8.3%) and Group 2 had two (3.8%) patients with Diabetes. Three patients (6.8%) in Group 1 and one patient (1.9%) in Group 2 developed signs of infection, which required treatment by oral antibiotics. None of the patient required premature removal of k-wire. There were no features suggestive of osteomyelitis in any of the patients.

Conclusions: This study demonstrates that overall infection rate in lesser toe fusion surgery is low and using prophylactic antibiotics does not reduce the incidence. There is a risk that inappropriate use of antibiotics may contribute to the development of antibiotic resistance and it adds to healthcare costs.

P6

A modern biothesiometer compared to the gold standard

J.D. May¹, M.W. Morris¹

¹Chesterfield Royal Hospital Foundation Trust, Trauma and Orthopaedics, Chesterfield, United Kingdom

Introduction: Current screening methods for the detection of neuropathic limbs include, history and clinical examination coupled with specific tests. The current gold standard as quoted by NICE guidelines is to test patients with diabetes annually using a 10g Semmes-Weinstein monofilament. This study compares a standardised vibration function on a mobile phone (biothesiometer) against a 10g monofilament and a tuning fork, in the detection of diabetic peripheral neuropathy.

Methods: The study was conducted in outpatients at Chesterfield Royal Foundation Trust. The study comprised of a control group of patients, a group of medically well patients with a lower limb injury and a group of patients with peripheral diabetic neuropathy. Patients completed a questionnaire on their medical history and were tested with a 10g monofilament, a tuning fork and the vibration function on the iPhone 4S using the NeurAppathy App. Patients had several points of skin tested. Finger pulp, patella, lateral and medial malleoli, heel, 1st and 5th metatarsal heads.

Results: 61 patients were recruited to this study, 21 control, 19 lower limb injury and 21 to the neuropathy groups. The control group could feel 420 of 441 tests(95%), the injury group could feel 349 of 399 tests(87%) and the neuropathy group could feel 216 of 441 tests(48%) $p < 0.001$. The most accurate location was the head of the first metatarsal at 0.86. The accuracy of the tuning fork was 0.77, monofilament 0.79 and the modern biothesiometer 0.88.

Conclusion: The modern biothesiometer is an accurate test in the screening of diabetic peripheral neuropathy. This study suggests that the most accurate of the locations tested is the 1st metatarsal head. An injury to the lower limb does affect the patients sensation so screening should be done on the contralateral limb.

P7

Outcomes for low intensity pulsed ultrasound devices for achieving union in established non-unions following elective surgery in the foot and ankle

I.S. Moores¹, C. Marquis¹, A. Bing¹, S. Hill¹, N. Makwana¹, P. Laing¹

¹Robert Jones and Agnes Hunt Hospital, Oswestry, United Kingdom

Introduction: National Institute for Health and Clinical Excellence (NICE) in January 2013 approved the use of low intensity ultrasound devices for the conservative treatment of fractures with delayed or established non-union. Coughlin et al have shown the benefit following subtalar arthrodesis at successfully improving union rates even in those patients predicted to be high risk of a nonunion.

The aim of our study is to report the outcomes of the use of low intensity pulsed ultrasound on union rates in elective foot and ankle surgery.

Methods: A retrospective review of all patients treated with low intensity pulsed ultrasound (EXOGEN ultrasound bone healing system) following established nonunion. Patient demographics, original diagnosis, treatment, length of non-union, time to union and any complications were recorded. Data were analysed in excel.

Results: Thirteen patients were identified, 8 male and 5 female, mean age 54 (range 39-73). Forty-six percent of patients smoked. Mean length of non-union prior to application of EXOGEN was 11 months (range 5-20 months). Nine patients successfully achieved union, with a mean time to clinical and radiological union of 4.6 months after application of the EXOGEN (range 2-8 months). Four patients failed to achieve union with the EXOGEN giving a 31% reoperation rate. Of those requiring revision surgery, there were 3 subtalar fusions, which failed to heal and 1 MTPJ fusion, which had failed to unite. All have subsequently healed following revision surgery with bone graft. There were no complications relating to the use of the EXOGEN device.

Conclusion: Reported non-union rates of 0-36% for subtalar and triple arthrodesis highlight that challenge in managing non-unions. This study shows that there is an increasing role for the use of low intensity pulsed ultrasound as a safe and effective adjunct to achieve clinical and radiological union in established non-unions and avoiding revision surgery.

P8

Trifocal osteotomy for the correction of severe hallux valgus deformity

A. Bhosale¹, C. Quah¹, A. Mustafa¹, M. Tseng¹, A. Pillai¹

¹University Hospital of South Manchester, Orthopaedics, Manchester, United Kingdom

Introduction: Hallux Valgus is a complex deformity. Symptomatic Hallux Valgus (HV) can be treated with metatarsal osteotomy combined with proximal phalangeal osteotomy. This configuration may be suitable for the moderate deformities. However, it might not be enough to treat severe deformities. We present our series of patients treated with tri-focal osteotomies to correct severe HV deformities.

Methods: We treated patients with severe HV deformity using trifocal osteotomies- basal 1st metatarsal osteotomy, distal 1st metatarsal chevron osteotomies and proximal phalangeal Akin osteotomy. Our outcome measures included—radiological values and validated Patient-Reported Outcome Measures- EQ-5D and Manchester Oxford Foot Questionnaire (MOxFAQ) scores, as a part of PROM 2.0 DoH national initiative.

Results: Our study group consisted of eleven patients with 14 operated feet (three bilateral), with a mean age of 60.3 (45.1-82.9) years. The mean pre-operative Hallux Valgus Angle of 48.4° (38°-53.3°) was corrected to 16.5° (8°-28°). The Inter-Metatarsal Angle was corrected from mean 19.7° (13.5°-27.2°) to 7.8° (6°-10.2°). Inter-Phalangeal Angle was corrected from mean 10.6° (7°-17.4°) to 7.6° (4°-10°). There were no wound problems or non-unions. The mean follow-up was 9 (6-12) months.

Descriptive Index component of EQ-5D rose from median score of 0.635 (0.089-0.72) to 0.74 (0.42-1.0), wherein score of 1.0 indicates the best possible health. The EQ-5D Visual Analogue Score rose from median of 53.8 (15-80) to 88 (75-98), where-in 100 is the best score.

All three components of the MOxFAQ score also improved (100 is the worst score); Forefoot pain (from 73.6 to 40), Walking and Stability (52.4 to 31), and Social interaction (65.1 to 40.7).

Conclusion: Trifocal osteotomies are safe and can provide a good correction of severe HV deformities with high patient satisfaction and no procedure related complications.

P9

Lower limb venous blood flow with ankle joint immobilisation

J.D. Craik¹, A. Clark¹, J. Hendry¹, A.H. Sott¹, P.D. Hamilton¹

¹Epsom & St Helier University Hospitals NHS Trust, Epsom, United Kingdom

Below knee cast immobilisation is associated with the development of deep vein thrombosis secondary to venous stasis. The effect of weightbearing in a below knee cast or pneumatic walking boot on lower limb venous blood flow was investigated.

Blood flow was measured from the popliteal vein of the right leg in ten healthy volunteers during non-weightbearing and weightbearing exercises before and after ankle joint immobilisation.

There was no significant reduction in venous blood flow measurements when fully weightbearing in a neutral cast or pneumatic walking boot compared with full weightbearing without immobilisation. However, a significant reduction in venous blood flow was observed whilst full weightbearing with the ankle immobilised in equinus and with partial weightbearing exercises (50% body weight).

These results suggest that cast immobilisation alone should not be regarded as a risk factor for the development of deep vein thrombosis without an appreciation of the position of the ankle joint and weightbearing status.

P10

Histological evaluation of calcaneal tuberosity cartilage - a proposed donor site for osteochondral autologous transplant for talar dome osteochondral lesions

M. Ballal^{1,2}, M. Lutz^{1,2}, R. Deol^{1,2}, C. Pearce^{1,2}, P. Hamilton^{1,2}, J. Calder^{1,2}

¹Chelsea & Westminster Hospital, London, United Kingdom,

²Fortius Clinic, London, United Kingdom

Osteochondral Autologous Transplant (OATs) as a treatment option for Osteochondral lesions (OCLs) of the talar dome frequently uses the distal femur as the donor site which in some cases is associated with donor site morbidity. Some studies have described the presence of hyaline cartilage in the posterior superior calcaneal tuberosity. We aimed in this cadaveric study to histologically evaluate 12 osteochondral plugs taken from the posterior superior calcaneal tuberosity and to compare them to 12 osteochondral plugs taken from the talar dome.

In the talar dome group, all samples had evidence of hyaline cartilage with varying degrees of GAG staining. The average hyaline cartilage thickness in the samples was 1.33 mm. There was no evidence of fibrocartilage, fibrous tissue or fatty tissue in this group. In contrast, the Calcaneal tuberosity samples had no evidence of hyaline cartilage. Fibrocartilage was noted in 3 samples only. We believe that the structural differences between the talus and calcaneum grafts render the posterior superior calcaneal tuberosity not a possible donor site.

We conclude that we were not able to demonstrate a suitable donor site from the calcaneal tuberosity for OATs in OCL of the talus.

P11

Trainer vs trainee: clinical outcome of primary total ankle replacement. Can learning curve be included during training?

K.L. Devalia¹, R. Jayasree², S. Malik³

¹NHS, Trauma & Orthopaedics: Freeman Hospital, Newcastle upon Tyne, United Kingdom,

²Newcastle University, R & D, Newcastle, United Kingdom,

³Freeman Hospital, T & O, Newcastle upon Tyne, United Kingdom

Introduction: Total Ankle replacement (TAR) is technically demanding; has a shallow learning curve with best results being achieved with the surgeons' experience. Complications appear to be a function of the surgeon's familiarity with the procedure. Learning curve can significantly be improved if senior trainees or fellows are given opportunities to perform this procedure during their training.

Aim: To investigate whether learning curve could safely be introduced within the training rotation.

Methods: A prospective study of 149 TAR was undertaken to investigate an association between surgical outcome and the grade of the operating surgeon. We had two distinct groups comparing the senior surgeon series (110) against the trainee series (39). The primary outcome measure was the change in the AOFAS scores. Secondary outcomes included the rate of revision and length of hospital stay.

Results: All scores improved at one year in both the groups including AOFAS, WOMAC, SF-36 and satisfaction scores. No significant difference was noticed in AOFAS scores ($p=0.176$), length of stay ($p=0.08$) or complication rates ($p=0.076$) between the two groups. The incidence of intra-operative fractures was higher in trainee group (4/39; 10.25%) compared to senior surgeon series (2/110; 1.85%). There were five revisions in trainee series, two for deep infection, two for instability and one for aseptic loosening. This was significantly higher (12.8%, $p=0.005$) compared to senior surgeon series (1.8%).

Conclusion: The outcome observed in our trainee series is comparable to the published results of TAR during the surgeon's initial learning curve. The study provides the evidence that TAR can safely be performed by appropriately trained surgeons in training. A closed senior supervision is vital during the initial learning curve to improve surgical technique and the outcome. The trainees however should not be allowed to perform complex TAR until they are experienced to reduce the revision rate.

P12

Can we safely broaden the indications for total ankle replacement?

K.L. Devalia¹, G. Chuter², J. Ramaskandhan³, M.S. Siddique³

¹NHS, Trauma & Orthopaedics, Newcastle upon Tyne, United Kingdom,

²Freeman Hospital, Newcastle, United Kingdom,

³Freeman Hospital, T & O, Newcastle, United Kingdom

Introduction: The recommended indications for total ankle replacement (TAR) are limited, leaving fusion as the only definitive alternative. As longer-term clinical results become more promising, should we broaden our indications for TAR?

Methods: Our single-centre series had 130 Mobility TARs with minimum 36 months' follow-up. They were divided into two groups. 'Ideal' group included patients with all of the following criteria: age >60y, BMI < 30, talar tilt < 10°, non-diabetic and non post-traumatic osteoarthritis (PTOA). 'Complex' group included patients without any of these criteria. We compared AOFAS scores, patient satisfaction, patient-reported outcome scores and complications between both groups.

Results: Overall, there were significant improvements in AOFAS ($p < 0.001$), WOMAC ($p < 0.001$) and SF-36 scores ($p < 0.001$) from pre op to one year and at three years for the whole group. Significant improvements were seen in the following fields: physical function, role physical, bodily pain ($p=0.000$), vitality ($p=0.015$) and social function ($p=0.043$). No significant difference was seen in scores from pre-op to three years between two groups based on age, diagnosis, BMI, Diabetic status and difference in talar tilt. Patients > 60y reported better satisfaction with pain relief ($p=0.005$) at one year. Patients with BMI less than 30 had significantly better satisfaction scores for return to activities of daily living (ADL) at one year ($p=0.005$). Younger (age < 60 years; $p=0.014$) and slimmer patients (BMI < 30; $p=0.018$) had significant overall satisfaction scores at one year. At three years from surgery, no significant difference was seen in any of the subgroups ($p > 0.005$)

Conclusion: The results of univariate analyses showed that diabetic status, talar tilt, age, BMI and diagnosis did not have any significant effect on outcome scores from pre-op to three years ($p > 0.05$). We believe the indications for TAR can be widened safely in all the subgroups without further morbidity.

P13

A systematic review investigating the incidence of venous thrombo-embolism (VTE) in foot and ankle surgery

R. Freeman¹, J.D. Calder¹, E.D. Arverud², P. Ackermann³

¹Fortius Clinic, London, United Kingdom,

²Danderyd Hospital, Orthopaedic Department, Stockholm, Sweden,

³Karolinska Institute, Orthopaedics, Stockholm, Sweden

Introduction: The use of chemical prophylaxis against venous thrombo-embolism (VTE) following foot and ankle surgery is contentious. It is essential to understand VTE incidence in this group to make informed decisions regarding prophylaxis. We reviewed the literature to identify relevant studies and pooled the data to estimate VTE incidence.

Methods: A PRISMA compliant systematic review of the literature was performed using the AMED, EMBASE, HMC, MEDLINE, BNI and CINAHL databases. All relevant studies were assessed using the CASP tool by two independent reviewers to exclude poor quality studies. Disagreement was resolved independently by the senior author. A narrative report of the results and meta-analysis of the relevant sub-groups was performed.

Results: The search gave 372 studies of which 52 were duplicates, in total 320 abstracts were reviewed. From this 28 papers were analysed with 6 excluded. Of the remaining 22 studies 8 were against prophylaxis, 7 for and 7 equivocal. The pooled results for studies using clinical assessment of VTE show an incidence of 0.7% (95% CI 0.5-0.9%) for no prophylaxis (n=87,888) and 2% (0.7-3.2%) for prophylaxis (n=18705). When VTE is assessed radiologically the incidence for no-prophylaxis (n=993) is 16.3% (9.9-22.7%) and the prophylaxis group (n=697) is 16.4% (7.6-25.2).

Discussion: There is a wide discrepancy between the rates of VTE depending on the method of assessment. Regardless of the assessment method chemical prophylaxis doesn't appear to affect the rate of VTE. The rate of clinically apparent VTE following foot and ankle surgery despite not using prophylaxis is less than 1%. The background rate of VTE is estimated at 0.05% and risks from chemical prophylaxis include bleeding (1.95%) and Heparin Induced Thrombocytopenia (0.2%). Overall study quality was poor and further randomised studies would be welcomed, however on the available evidence chemical prophylaxis for foot and ankle surgery cannot be recommended.

P14

Outcomes of people with diabetes admitted to hospital with ankle fractures - a single centre experience over 5 years

O.M. Vrielink¹, J. Thomas², C. Gooday², D.T. Loveday³, K. Dhataria²

¹University of Groningen, Groningen, Netherlands,

²Norfolk & Norwich University Hospital NHS Trust, Norwich, United Kingdom,

³Norfolk & Norwich University Hospital NHS Trust, Orthopaedic, Norwich, United Kingdom

Introduction: Ankle fractures are common injuries, with an incidence of 3.6:100/year. Treatment protocols for ankle fractures are well established. However, despite previous data to show that people with diabetes are at greater risk of developing complications, including delayed bone-healing, impaired wound-healing and infection; no specific protocols exist for this group. The aim of this project was to look at complications of ankle fractures in patients with diabetes treated in hospital.

Methods: A retrospective analysis of patients presenting between 2008-12 with a diagnosis of diabetes and an ankle fracture treated in hospital. Clinic records were examined to determine the complications after ankle fracture treatment.

Results: 84 cases met the criteria of diabetes and ankle fractures. Seven patients were excluded because they were lost to follow up. The mean age at presentation was 67.4 year (SD 15.2). Twelve patients had type 1 diabetes. Mean HbA1C was 63 mmol/mol (SD 20.8). 36% of patients had CKD stage 3-4 and 4.5% CKD stage 5. Retinopathy was present in 25% of cases. However, our data showed almost no correlation between treatment time HbA1C, GFR, CKD, retinopathy, and age but only with different consultants.

59% of patients were treated with ORIF, the rest were treated with a cast. The mean duration of treatment until discharge from clinic was four months (SD 5.3).

A third of patients had a complication - 13 patients had wound complications; eight bone healing problems and one patient developed a charcot foot leading to a below knee amputation. Eventually, 94% of fractures healed (clinically or radiologically).

Conclusion: Our data confirm high complication rates in patients with diabetes who sustained an ankle fracture. Treatment time differed among orthopedic consultants which highlights the need for further research, in particular with a longer follow-up period, aiming to develop a diabetes specific treatment protocol.

P15

Modified Robert Jones procedure for managing clawing of lesser toes in Pes cavus

H. Kovilazhikathu Sugathan¹, D. Sherlock¹

¹Southern General Hospital, Orthopaedics, Glasgow, United Kingdom

Introduction: Pes cavus is a complex foot deformity in which surgical correction remains challenging. The literature offers no clear evidence on managing clawing of the lesser- toes in Pescavus.

Aim: To assess the long term functional outcome of modified Jones procedure for correction of lesser- toe clawing in pescavus.

Method: The surgical principles and techniques used were similar to those of the modified Jones procedure described for the great toe. Extensor tendons transferred to metatarsal neck and IP joint fused. We reviewed case notes and completed the Bristol Foot Score, the modified American Orthopaedic Ankle & Foot Society Mid-foot score, and a patient satisfaction questionnaire through telephone interviews.

Results: We treated lesser-toe clawing in 11 feet from 8 patients (5 women, 3 men). Mean age of the patients at the time of surgery was 30 y (range 10 y to 58 y). Causes of pes cavus were Marfan syndrome, polio, spina bifida, spinal dysraphism, type 2 hereditary sensorimotor neuropathy and idiopathic. Mean duration of clinical follow up was 7 y (range, 6 months to 17 y). At the final clinical review, all 11 feet had good outcome. 6 feet had minor complications. The mean Bristol Foot Score was 27 and the mean Modified AOAFS Mid Foot Score was 76 indicating excellent results. Half of the patients had mild persistent foot pain but all were satisfied with the outcome.

Conclusion: Modified Jones Procedure for correcting lesser-toe clawing provides high patient satisfaction in spite of the few minor complications and late symptomatic relapses.

P16

Minimally invasive lesser toe surgery: a safe and effective alternative to open surgery

T. Holme¹, K. Gallagher¹, S. Ridgers¹, A. Sott¹

¹Epsom & St Helier University Hospitals NHS Trust, London, United Kingdom

Introduction: Minimally invasive forefoot surgery is thought to benefit patients over traditional open surgery with reduced soft tissue dissection and potential for faster recovery time and reduced soft tissue complications. There is limited data in the literature to support this claim for minimally invasive lesser toe surgery. We present a case series of consecutive patients undergoing minimally invasive lesser toe surgery and their post-operative outcomes.

Methods: 20 consecutive patients underwent isolated minimally invasive lesser toe surgery from 2011-2014, performed by the senior author (AS). Each patient completed a nurse specialist assisted Manchester-Oxford Foot Questionnaire (MOXFQ) and a visual analog scale for pain (VAS) pre operatively and 4-6 weeks post operatively. The average patient age was 68 years (range 34-91). All patients had local anaesthesia with minimal sedation if required.

Results: Mean MOXFQ scores were 34 (range 24-54) pre-operatively, and 7 (range 0-15) post-operatively. Mean VAS scores were 7 (range 4-8) pre-operatively, and 1 (range 0-2) post-operatively. No complications were identified at follow up.

Conclusions: Minimally invasive lesser toe surgery is a safe and effective alternative to open surgery. Although there is a learning curve to the use of minimally invasive surgical equipment, the benefits for the patient make this a worthwhile technique in lesser toe surgery.

P17

Uptake of paper patient related outcome forms in an orthopaedic department

L. Mason¹, J. Fountain¹, C. Kerin¹, A. Molloy¹

¹University Hospital Aintree, Liverpool, United Kingdom

With one of the main factors of the 2013 'White paper Equity and Excellence' being transparency in outcomes, the collection of data may ultimately determine how a hospital is judged. As a foot and ankle department we have strived to collect patient related outcome (PROM) data on a consultant led paper based system for all referred patients with elective foot and ankle problems. This study aimed to assess the level of capture we achieved over a year period.

Methods: We analysed the outcome database and compared it to patient referrals and operations performed from June 2013 to June 2014. This data was compared to other surgeons within the department also collecting PROM data.

Results: There were 335 new elective foot and ankle patients presenting to the senior author. Of these, preoperative PROM data was collected for 327 (97.6%). Within the study period, 288 patients underwent surgery, although only 122 patients had reached 6 months follow up during the time studied. The 6 months PROM data collection was poor, with only 20 (16.4%) completing scores.

In comparison, two knee surgeons within the department who collect PROMS data on a limited number of procedures, have preoperative data collection of 100% and 91.1% with a consultant led paper based system. At 6 months their follow up data collection is 54% and 59% with a paper postal collection service.

Discussion: Isolated processes for the collection of PROM data are inefficient. Whether data is collected on all patients or on a limited amount of operations, data collection rates are poor, thus providing little meaningful data. The collection of data is important for reducing health inequalities, allowing international comparisons and is helpful for revalidation. We are now progressing to electronic capture and a more robust collection framework, for which additional human resources are essential.

P18

Minimally invasive surgery for early hallux valgus deformity: is metatarsal osteotomy required?

A.H. Mirza¹, H. Prem¹

¹The Royal Orthopaedic Hospital NHS Foundation Trust, Birmingham, United Kingdom

According to NICE the available evidence on the use of minimally invasive surgery (MIS) for Hallux valgus is "limited and inconsistent".

The minimally invasive technique usually involves osteotomy of the first metatarsal in order to restore function and morphology to the first ray. This may not always be necessary.

Our aim was to determine the success of metatarsal-sparing surgery using MIS techniques, in cases with minimal or no subluxation at the first metatarsophalangeal joint (MTPJ).

A prospective audit was performed between May 2010 and August 2013 and included data for 24 consecutive MIS Bunionectomy & Akin procedures in 19 patients with a mean age of 34.8 years. Follow-up period ranged from 6 months to 44 months. Pre and post-op AOFAS scores were examined and radiological indices of inter-metatarsal angle (IMA) and hallux valgus angle (HVA) were compared. Tibial sesamoid subluxation was also recorded according to a documented measurement scale.

AOFAS scores increased from a mean of 59 (range 34-86) to a mean of 89 (range 74-100) ($p < 0.0001$).

Mean HVA decreased from 21 to 15 degrees ($p < 0.0001$) whilst mean IMA decreased from 12.3 to 9.4 ($p < 0.0001$). Tibial sesamoid position was also significantly improved.

There were no infections or non-unions. One patient required removal of prominent metalwork at 13 months.

This case series suggests that with careful patient selection, metatarsal osteotomy is not necessary for correction of hallux valgus if there is no significant subluxation at the metatarsophalangeal joint. The deforming forces of the flexors and extensors are corrected by the Akin osteotomy. Furthermore, these cases are technically less challenging to perform by MIS techniques and may be performed earlier in the surgeon's learning curve.

P19

The diabetic orthoplastics team: changing the paradigm in managing complex diabetic foot in the United Kingdom

V. Curral¹, P. Vas², V. Kavarthapu¹, N. Cavale³, M. Edmonds²

¹King's College Hospital, Orthopaedics, London, United Kingdom,

²King's College Hospital, Diabetes, London, United Kingdom, ³King's College Hospital, Plastics, London, United Kingdom

Introduction: The burden of complex diabetic foot disease, including Charcot arthropathy, is increasing. Results are often less than ideal, because the resultant tissue loss is difficult to treat, despite most UK centres having multidisciplinary diabetic foot teams. We report on our inpatient diabetic orthoplastics team (DOPT), which was set up, based on our existing complex trauma management model, to provide combined input in complex cases.

Methods: A retrospective review was performed of 24 months' inpatient activity since inception of the DOPT, using medical notes and a referral database compiled by the plastic surgeons. Referral indications and outcomes, including length of stay, were assessed.

Results: A total of 44 inpatients with 60 inpatient episodes were managed by the DOPT. The majority of referrals were either complex Charcot patients or those with post-operative, slow/non-healing wounds (32% and 31% respectively). 38% received a skin graft; 12% had combined orthopaedics/plastics procedures and 3% received microsurgical free flaps. A further 47% of the episodes received advanced wound management support. After the index procedure, 50% healed completely, while 30% remained stable or improved; a further 50% of these underwent a second procedure. The mean inpatient stay was reduced by eight days, compared to before the DOPT.

Conclusions: The DOPT facilitates wound management and surgical procedures in complex diabetic foot disease and adds in plastic surgical experience. We therefore suggest that tertiary care diabetic foot centres should consider the development of such teams.

P20

1ST MTPJ Arthrodesis using dome shaped reamers and low profile dorsal plate

F. Alvi¹, S.K. Garg¹

¹Royal Lancaster Infirmary, Trauma and Orthopaedics, Lancaster, United Kingdom

Introduction: Numerous methods exist for arthrodesis of the first metatarsophalangeal joint. K-wires, staples, plates and various combinations have all been used with varying fusion rates. We present the clinical and radiological results of arthrodesis of the 1st MTP using dome shaped reamers and a low contact profile titanium dorsal plate with interfragmentary screw.(Hallu-Fix).

Methods: Prospective study from April 2005 to March 2014. Patients were assessed clinically and radiologically. Pain scores, satisfaction survey, fusion rate and complications were recorded.

Results: 151 MTPJ fusions in 138 patients. 13 Bilateral, 12 revision fusions (tertiary referrals). 74 Right, 77 Left. 83 Female, 55 Males. Mean age 60 yrs range (29-85). Two developed non-union. One Deep infection requiring removal of metalwork and successful revision. 149 went on to fusion (98% fusion rate). Mean time to fusion 8 weeks, range (6 - 24). One developed CRPS settled at 3 months. One developed web space pain, settled with exploration and debridement. Four plate removals for prominent metalwork. Four minor numbness post op. Pain scores VAS, Pre-op Mean 8, range (6-10). Post-op Mean 2,range (0-4).

Conclusion: 1st MTPJ fusion with Hallu-Fix plate gives good results. The Hallu-Fix system of using dome shaped reamers and a low profile dorsal plate gives high fusion rates, stability and patient satisfaction. In most cases plate removal is not required. This technique is versatile, surgeon friendly and gives good fixation and reproducible results. We recommend its use.

P21

Predicting the outcome after ankle fracture fixation: what really is important? Six year follow-up of 182 patients operated on at a single centre

V.I. Roberts¹, J.S. Nichols¹, J. Mangwani¹

¹University Hospitals of Leicester, Department of Trauma and Orthopaedics, Leicester, United Kingdom

There is paucity of data on long-term outcome of ankle fractures treated with surgery. The aim of this study was to assess variables affecting long-term outcome of this common injury treated with open reduction internal fixation (ORIF).

Patients who underwent ORIF of ankle fractures were identified using hospital logbooks. Pre-operative radiographs were reviewed to establish type of fibular fracture; involvement of malleoli; and syndesmotic injury. Post-operative radiographs were reviewed to identify adequacy of reduction with respect to restoration of fibular length and restoration of the mortise using Pettrone's criteria. The surviving cohort was sent Lower Extremity Function Score (LEFS), Olerud-Molander Ankle Score (OMAS) and a self-administered questionnaire at a minimum of six years after the fixation.

182 patients underwent ORIF in the study period. Male: Female ratio was 1:1 with an average age of 47 years. The majority of fibular fractures were Danis-Weber type B, followed by type C fractures (124, 54 respectively). Medial malleolus was involved in 63% of cases; greater than 25% of posterior malleolus in 24% of cases; and disruption of syndesmosis in 31%. The overall malreduction rate was 24% (10% had inadequate fibular length; 11% inadequate Pettrone's criteria; 3% were inadequately reduced based on both criteria).

Malreduction was associated with the development of radiographic osteoarthritis in 4 of the 44 cases.

The LEFS and OMAS scores showed a trend towards poor function with malreduction; however the scores were notably lower in patients who had presented with a fracture dislocation and in patients with posterior malleolar fracture.

The adequacy of the operative reduction does affect patient function. The severity of initial injury to the ankle, however, has a much more pronounced effect on a patient's long-term function irrespective of accuracy of reduction.

The findings of this study help in counselling patients about long-term prognosis of this injury.

P22

The long-term outcomes of forefoot surgery for rheumatoid arthritis patients

N. Dodia¹, A. Bhosale¹, S. Haque¹, A. Pillai¹

¹University Hospital of South Manchester, Manchester, United Kingdom

Background: Painful forefoot deformities in patients with Rheumatoid Arthritis (RA) commonly need surgical corrections.

We report long-term results of patients undergoing forefoot surgery for RA; using Patient Reported Outcome Measures (PROMs).

Methods: This retrospective study involved consecutive patients with rheumatoid arthritis, who needed surgery for painful forefoot deformities. The data collection included demographics, type of surgery, medications for RA and, and the functional status. We used a Manchester Oxford Foot Questionnaire (MOxFAQ), a validated PROM. The MOxFAQ gives a score from 0-100; higher scores indicate poorer outcomes.

Results: This group included 19 patients, with 28 operated feet, with a median age of 54 years. Eighty-nine percent patients were on regular Disease Modifying Anti- Rheumatic Drugs (DMARDs). Surgical procedures included Stainsby procedure, MTPJ arthrodesis, Fowler procedure, Scarf, Akin osteotomies. At a median follow up of 6 (2-12) years, the median MOxFAQ score was 78 (20-86) points, with better results in patients having surgery after 2008 than those before 2008 {28 (9-80), and 81 (65-87), respectively; $p=0.02$ }. Superficial wound infection was noticed in two feet (7%), which settled with oral antibiotics. Twelve feet (43%) needed further operations for disease progression at a median time of 3 (1-5 years). None of the patients needed any re-operation for the primary surgery.

Conclusion: Surgery in forefoot deformities can provide a good long-term functional benefit in RA, with carefully controlled disease progression by judicious usage of the DMARDs. A multi-disciplinary team approach involving orthopaedic surgeon, rheumatologist and functional therapists is vital in these group of patients.