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## **THE EFFECTS OF FOOT AND ANKLE MOVEMENTS ON CALF PUMP FUNCTION**

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**Introduction:** The muscles of the leg collectively comprise the calf pump, however the action of each muscle group on calf pump function is not known. Patients with foot or ankle injury or surgery are often advised to perform foot and ankle movements to help prevent deep venous thrombosis. Our aim was to determine which foot and ankle movements were most effective in stimulating the calf pump. **Method:** Nine healthy participants were enrolled in this research and ethics approved prospective study. Participants with a previous history of peripheral vascular disease, varicose veins, deep venous thrombosis or previous foot and ankle surgery were excluded. Each participant followed a standardized protocol of foot and ankle movements, starting with foot in neutral position and the baseline and movement peak systolic velocity within the popliteal vein was measured during each movement. The movements tested were toe dorsi-flexion, toe plantar flexion, ankle dorsi-flexion, ankle plantar flexion.

**Results:** The mean patient age was 34 years (range 28-58), the majority were female (n=6). All movements resulted in statistically significant changes in peak systolic velocity ( $p < 0.05$ ). In order of decreasing peak velocity the exercises which had greatest effect on calf pump function were: Ankle dorsi-flexion (101cm/s), Ankle plantar-flexion (84cm/s), Toe dorsi-flexion (63cm/s), Toe plantar-flexion (59cm/s).

We have shown that all four exercises significantly increased calf pump function. The greatest effect was seen with ankle movements.

**Conclusion:** Toe and ankle flexion and extension exercises significantly increase calf pump function and should be advised for all patients following foot or ankle injury and surgery as this may reduce venous stasis and risk of venous thrombo-embolism.

## **THE EFFECT OF LOWER LIMB CAST IMMOBILISATION ON CALF PUMP FUNCTION**

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**Introduction:** The incidence of deep venous thrombosis (DVT) in patients with lower limb cast immobilization occurs in up to 20% of patients. This may result from altered calf pump function causing venous stasis. Our aim was to determine the effects of below knee cast on calf pump function.

**Method:** Nine healthy participants were enrolled in this research and ethics approved prospective study. Four foot and ankle movements (toe dorsi-flexion, toe plantar flexion, ankle dorsi-flexion, ankle plantar flexion) and weight bearing were performed pre and post application of a below knee cast. Baseline and peak systolic velocity within the popliteal vein was measured during each movement. Participants with peripheral vascular disease, varicose veins, deep venous thrombosis or previous foot and ankle surgery were excluded.

**Results:** The mean patient age was 34 years (range 28-58), the majority were female (n=6). With cast in situ all movements resulted in a statistically significant increase in peak systolic velocity ( $p < 0.05$ ). There was no significant difference in peak systolic velocity at the popliteal vein pre or post cast application.

**Discussion:** This is the first study to examine the effect of a lower limb cast on calf muscle pump function. Despite cast immobilisation, toe and ankle flexion and extension movements significantly increase peak systolic velocity measured at the popliteal vein.

**Conclusion:** Toe and ankle flexion and extension exercises significantly increase calf pump function in patients with below knee cast immobilization. We recommend that all patients treated in below knee cast immobilisation are advised to perform regular toe and ankle exercises to reduce venous stasis and risk of deep venous thromboembolism.

## **WHAT A WEIL WAY TO TREAT A MORTON'S NEUROMA**

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**Introduction:** Morton's Neuroma is routinely treated by excision of the interdigital nerve. . Traditional surgery works by denervation, but the results are variable, and recurrence is common. Multiple Morton's Neuromas present a difficult clinical challenge. MR and ultrasound often demonstrate a normal nerve or an interdigital bursa. Some experts advise division of the intermetatarsal ligament rather than excision. This case series evaluates an alternative method of treatment.

**Methods:** Patients with a clinical diagnosis of Morton's Neuroma, with symptoms only on weight bearing, were treated with division of the intermetatarsal ligaments and Weil's osteotomies. The nerve was not excised. Patients wore a postoperative shoe for six weeks. If radiographs were satisfactory, they returned to weight bearing in a normal shoe. They were evaluated at 12 weeks with AOFAS scoring, as part of the routine clinical pathway.

**Results:** 14 patients were treated with Weil's osteotomy, including one who had recurrence of symptoms following traditional surgery. The mean AOFAS score rose from 71 to 91. No patient had recurrent symptoms after surgery. The patient who had previously been treated with excision of the nerve also had some improvement.

**Discussion:** The success of this surgery in relief of symptoms in this case series raises questions about the pathology, diagnosis and treatment of Morton's Neuroma. Many MR studies find abnormal nerves in asymptomatic patients, and no neuroma in symptomatic patients. Patients have symptoms exacerbated by weight bearing, and nerve compression may play an important part in the pathophysiology. Weil's osteotomy works by decreasing the effective weight bearing in the involved rays. It is particularly useful if symptoms exist in multiple intermetatarsal areas.

**Conclusions:** Multiple Weil's osteotomies are an effective method for treatment of Morton's Neuroma. The basis for the traditional approach of excision of the nerve may be flawed and merits further study.

## **A PROSPECTIVE STUDY ON ULTRASOUND-GUIDED STEROIDS INJECTIONS FOR MORTON'S NEUROMA: DOES THE SIZE OF THE LESION MATTER?**

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**Background:** The aim of this prospective study was to assess the effectiveness of a single ultrasound-guided steroids injection in the treatment of Morton's neuromas and whether the response to injection correlates with the size of neuroma.

**Methods:** Forty three patients with clinical features of Morton's neuroma underwent ultrasound scan assessment. Once the lesion was confirmed in the relevant web space, a single corticosteroids injection was given using 40 mg Methylprednisolone along with 1% Lidocaine.

All scans and injections were performed by a single musculoskeletal radiologist. Patients were divided into two groups based on the size of the lesion measured on the scan. Group 1 included patients with *neuromas* of 5mm or less and Group 2 patients had *neuromas* larger than 5mm. The Visual Analogue Scale (Scale:0 to 10), the American Orthopaedic Foot and Ankle Society score (AOFAS) and the Johnson satisfaction scale were used to assess patients prior to injection and then at 6 weeks, 6 months and 12 months following the injection.

**Results:** Thirty nine patients had confirmed *neuromas*. Group 1 (lesion  $\leq$ 5mm) included 17 patients (mean age, 30 years) (7 males, 10 females) and Group 2 (lesion  $>$  5mm) had 22 patients (mean age, 33 years) (8 males, 14 females). VAS scores, AOFAS scores and Johnson scale improved significantly in both groups at 6 weeks ( $p<0.0001$ ). At 6 months post-injection, this improvement remained significant only in group 1 with regards to all scores ( $p<0.001$ ). At 12 months, there was no difference between both groups and outcome scores nearly approached pre-injection scores. The need for surgical treatment for persistent symptoms was similar in both groups ( $p=0.6$ ).

**Conclusion:** A single ultrasound-guided corticosteroids injection offers generally a short-term pain relief for symptomatic Morton's *neuromas*. The effectiveness of the injection is likely to be more significant and long-lasting for lesions smaller than 5mm.

## **OPERATIVE TECHNIQUE FOR LATE STAGE FREIBERG'S DISEASE: UP TO 4 YEAR FOLLOW-UP**

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**Introduction:** Freiberg's disease is an uncommon condition of anterior metatarsalgia that involves the head of metatarsals. Avascular necrosis of the metatarsal head is thought to arise during puberty. Treatment is usually conservative and operative treatment reserved for cases that do not respond to these measures.

**Materials and Methods:** We retrospectively reviewed a consecutive series of ten patients who presented to our institution who did not respond to conservative methods. These patients were treated surgically with a previously undescribed operative technique involving microfracture of the metatarsal heads and reattachment of the cartilage flap.

**Results:** Mean follow up was 49 post operative months (18-96). Mean pain score at rest and on mobilising was 2.1 (0-3) and 3.1 (0-5) respectively. At 6 months, all 10 patients had reported a satisfactory outcome and return to acceptable activity levels.

**Discussion:** The aim of the treatment for late stage Freiberg's disease is to relieve pain and improve the mobility of the patient by restoring the metatarsophalangeal joint function. Other techniques described involve osteotomies or minimal resection of the base of the proximal phalanx and insertion of metallic spacers which are removed several weeks later. However none has shown to be significantly superior to another. All of our patients reported a significant reduction of pain in their feet and all were able to walk and run almost pain free. There were no reported cases of severe restriction of movement or fixed deformity of the toe.

**Conclusion:** This technique involves a single operative procedure that encourages metatarsal head remodelling and restoration of the joint articular surface. It is advantageous as we have seen remodelling of the metatarsal heads without causing shortening or other anatomical abnormalities in the area.

**DIFFUSION OF INNOVATIONS IN FOOT AND ANKLE SURGERY:  
SCARF OSTEOTOMY – AS AN ILLUSTRATION FOR THE ACCEPTANCE OF NEW  
IDEAS IN FOOT AND ANKLE SURGERY.**

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Introduction: The Z or “scarf” osteotomy was first described by Meyer in 1926 and then by Burutaran in 1976. It was later popularised by Weil in the USA and Barouk in Europe in the 1990’s and is now an accepted technique that forms part of a surgeons’ armamentarium. The theory of Diffusion of Innovations was described by Rogers in 1962 to explain how novel ideas are accepted into practice across different industries, including medicine. It has never previously been used to study the adoption of ideas in foot and ankle surgery.

Methods: This paper uses publication volume as a surrogate marker for adoption, as described previously by the authors. Briefly, a systematic review of the literature was carried out. MESH headings included ‘Hallux Valgus’, and ‘osteotomy’ or ‘SCARF’ or ‘‘Z’ osteotomy’ or ‘bunionectomy’. 2818 publications were identified and the abstracts were reviewed excluding 2699 publications for non-relevance. The data was analysed by year of publication, country of origin, as well as for level of evidence.

Results: There were 120 publications relating to SCARF osteotomy, which when plotted on a graph produced an s shaped curve. 58% of publications came from Europe and 38% from the USA. There was only a single level 1 paper published in 2008.

Discussion: This study confirms that publication volume is a surrogate marker for adoption and that SCARF osteotomy became adopted by the late 2000’s as indicated by the plateau on an s-shaped curve. Post market surveillance has led to a further rise in recent publications indicating that certain issues still need resolving before the laggards adopt this technique. Despite SCARF having been around for more than 80 years, very little high level evidence has been published of its effectiveness. Recommendations are made as to how future innovations should be introduced in foot and ankle surgery.

**LOCAL TOURNIQUET PAIN CONTROL IN FOREFOOT SURGERY:  
A RANDOMIZED STUDY**

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Background: Forefoot surgery is often performed under regional anaesthesia (ankle block) in awake patients, using tourniquet or esmarch bandage to obtain bloodless field. The purpose of this study was to examine the value and need for local tourniquet pain control using local subcutaneous analgesic mixture in patients undergoing forefoot surgery under regional anaesthesia.

We prospectively randomized 56 patients who underwent forefoot surgery under ankle block to receive subcutaneous local anaesthetic mixture under the tourniquet. We checked for local tourniquet pain score (VAS 0-100) and skin condition during and after the procedure. Results: Tourniquet was quite tolerable in both groups, with an average VAS score of 7-21. No difference was observed between groups throughout most of the procedure. No correlation between VAS scores and procedure length or patient's age or gender. Conclusion: Ankle tourniquet is well tolerated by patients without need for local anaesthetics.



## **THE INCIDENCE AND NATURAL HISTORY OF SCAR SENSITIVITY FOLLOWING HALLUX VALGUS SURGERY; ADDRESSING PATIENT'S CONCERNS**

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**Introduction:** Scar sensitivity is a recognised complication of foot surgery. However there is very little published about it. This study looks at the incidence and natural history of scar sensitivity following *hallux valgus* surgery.

**Materials and Methods:** Patients who had open *hallux valgus* surgery from December 2008 to December 2009, with a minimum follow up of 12 months, were contacted. Data regarding scar symptoms, their duration, severity at their worst and interventions undertaken were collected. Patients also completed a Roles and Maudsley patient satisfaction score.

**Results:** 125 patients were contacted with response rate of 84%. 30% of patients had experienced scar symptoms following surgery. Of these, 20% had undertaken some form of non-surgical intervention. The mean duration of symptoms was 16 weeks, and 95% of patients experienced resolution of symptoms. 99% of patients would opt to have the surgery again. Roles and Maudsley score ranged from 1 to 2.

**Discussion:** Nearly one third of patients experienced scar symptoms, however nearly all resolved completely with or without simple treatments. Symptoms were not severe and did not affect satisfaction, function or the decision to have the surgery again. Educating patients preoperatively about scar sensitivity can relieve anxiety and improve the patient experience and they can be advised on simple and effective strategies should this common side effect occur. The results of this study provide the surgeon with valuable information in the consent and education of patients. Also, the fact that nearly all symptom settled within 16 weeks brings into question one of the purported advantages of minimally invasive surgery.

**Conclusion:** Scar symptoms following *hallux valgus* surgery are common, but mild and almost all resolve in time.

## **ARE ROUTINE X-RAYS 6 WEEKS POST SCARF OSTEOTOMY FOR HALLUX VALGUS NECESSARY?**

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**Introduction:** The aim of this study was to assess whether routine X-Rays at six weeks altered the subsequent management of patients who underwent a Scarf osteotomy.

**Materials and Methods:** Between 1997 and 2010, 218 consecutive primary scarf osteotomies of the first metatarsal were performed by two foot and ankle surgeons in a single unit. 71 were combined with an Akin closing wedge osteotomy of the proximal phalanx of the great toe and soft tissue release. Additional osteotomies were performed on the lesser toes in 30 cases. Intra-operative X-Rays were taken. We retrospectively looked at clinic letters for all patients who attended six weeks post operatively and recorded the outcomes following X-Rays.

**Results:** 209 patients were assessed six weeks post operatively with radiographs of the foot. 9 patients were lost to follow up. Four patients (1.9%) were identified as having complications at the osteotomy: recurrence of deformity seen in two patients, delayed union with failure of fixation, and painless hypertrophic non-union.

**Discussion:** Only a very small proportion of patients developed complications at the osteotomy site following a Scarf osteotomy for *hallux valgus*. Both cases of recurrence were diagnosed clinically. Failure of fixation was due to poor patient compliance. No revision procedures were planned for any patients.

**Conclusion:** The senior author no longer requests post-operative X-Rays routinely. We believe that the majority of patients may be safely and successfully assessed clinically following Scarf osteotomy without the need for routine X-Rays.

## **SCARF OSTEOTOMY IN THE MANAGEMENT OF SYMPTOMATIC ADOLESCENT HALLUX VALGUS**

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This study was designed to assess the utility of the scarf osteotomy in the management of symptomatic adolescent *hallux valgus*.

**Methods:** This is a consecutive case series of 30 patients (40 feet) with a mean follow up of 38.2 months (range 6-60 months). The mean age at the time of surgery was 14.2 years (range 10-17 years). American Orthopaedic Foot and Ankle Society scores (AOFAS) were collected at final follow up, along with a rating of the overall satisfaction. Any complications were recorded. Pre and post-surgical radiographic angles were measured (HVA, IMA and DMAA) and analysed using the students 't' test. A second surgeon additionally recorded the angles to measure the inter-rater reliability using the Pearson product moment correlation.

**Results:** The mean AOFAS score at final follow up was 91.2 (range 54-100). 87% of patients were either satisfied or very satisfied with their final outcome. 1 patient has been listed for revision surgery after symptomatic recurrence at 3 years follow up. Pre-op HVA, IMA and DMAA were 35.1, 16.1 and 16.3 respectively. Post-op values were 16.3, 8.8 and 9.0 ( $p < 0.001$  for each). Pearson's r coefficient values demonstrated good inter-rater reliability of measurement.

**Conclusion:** We have presented the results of the largest case series of scarf osteotomies for adolescent *hallux valgus* reported in the literature at this point, as far as we are aware. AOFAS scores at final follow up are comparable to the smaller studies previously reported and provide evidence that good outcomes and high levels of patient satisfaction can be achieved. Early follow up demonstrates a low level of symptomatic recurrence, but longer term data is still required.

## **FAILED HALLUX VALGUS SURGERY**

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Failed *Hallux Valgus* Surgery Aim:

We aim to explore the reasons behind long term failure of *hallux valgus* surgery.

**Patients & Methods:** A series of patients with problems following failed *hallux valgus* surgery presenting to a tertiary referral unit is presented. There were 47 patients with 55 problematic feet, 45 were female. The mean age was 59 years (Range 25-79). The failed bunions were compared to a prospectively collected series of 80 patients with successful 1st metatarsal osteotomies, 40 Ludloff and 40 Scarf osteotomies.

Before the index surgery, all the patients in the failed group, the predominant symptom was pain. Only 53% admitted deformity was an issue. A wide spectrum of procedures were performed, 13 Wilson's, 11 Keller's, 8 Chevron, 3 Bunionectomy, 2 Scarf, 1 Basal and 1 Mitchell's. In 16 patients the original procedure was unknown. The mean time to developing problems was 9.4 years (Range 0-45) with mean time to presentation 13.6 years. (Range 0-47) Radiographs revealed 2/3 of patients had relative shortening of the first metatarsal. Over 80% of x-rays demonstrated evidence of degenerative change. The mean AOFAS score deteriorated with increased shortening.

The failed bunions had statistically significantly different AOFAS pain scores (15.1 vs 31.9  $p < 0.05$ ), function scores (25.02 vs 31.9  $p < 0.05$ ). Additionally, the *hallux valgus* angle was significantly higher (24 vs 11.7  $p < 0.05$ ) although there was no change in DMMA between the two groups (13 vs 7.6  $p > 0.05$ ). There was a significantly higher incidence of first ray shortening (12% vs 0%  $p < 0.05$ ).

**Discussion:** This represents an unusual series, with nothing similar in the literature. Problems following *hallux valgus* surgery do not present for over 10 years. Functional Scores deteriorate with increasing shortening. MTPJ degeneration is common and from our data we are unable to explain why.

## **BIFOCAL METATARSAL AND AKIN OSTEOTOMIES IN THE TREATMENT OF COMPLEX HALLUX VALGUS**

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Introduction: *Hallux valgus* deformity is a common potentially painful condition. Over 150 orthopaedic procedures have been described to treat *hallux valgus* and the indication for surgery is pain intractable to non-operative management.

Methods: A retrospective analysis of the treatment of complex *hallux valgus* with bifocal metatarsal and Akin osteotomies of the first ray performed by the senior author (CC). 22 patients were treated over a three year period from 2008 to 2011, 24 trifocal osteotomies were undertaken. *Hallux valgus* angle (HVA), intermetatarsal angle (IMA) and distal metatarsal articular angle (DMAA) were all measured from pre- and post-operative radiographs. The patients were also clinically reviewed.

Results: The study group consisted of 21 women and 1 man with a mean age of 53 years. The average time to follow up was 19 months. Four cases had undergone previous surgery. Average HVA correction was 26.9 degrees ( $p < 0.0001$ ), average IMA correction was 12.65 degrees ( $p < 0.0001$ ). No patients had post-operative infection and all osteotomies went on to union. All patients reported resolution of pain. Two patients required removal of metalwork and the distal osteotomy angulated slightly in one patient not requiring reoperation.

Conclusion: We demonstrate that bifocal metatarsal and akin osteotomies of the first ray are a safe and effective method of correcting complex *hallux valgus*.

## **MINIMALLY INVASIVE FOREFOOT SURGERY - A CADAVERIC STUDY**

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MIS (minimally invasive surgery) aims to improve cosmesis and facilitate early recovery by using a small skin incision with minimal soft tissue disruption. When using MIS in the forefoot, there is concern about neurovascular and tendon damage and cutaneous burns. The aim of this anatomical study was to identify the structures at risk with the proposed MIS techniques and to determine the frequency of iatrogenic injury.

**Materials and Methods:** 10 paired normal cadaver feet were used. All procedures were performed using a mini C-arm in a cadaveric lab by 2 surgeons: 1 consultant who has attended a cadaveric MIS course but does not perform MIS in his regular practice (8 feet), and 1 registrar who was supervised by the same consultant (2 feet). In each foot, the surgeon performed a lateral release, a MICA (minimally invasive chevron and Akin) procedure for the correction of *hallux valgus*, and a minimally invasive DMO (distal metatarsal extra-articular osteotomy) procedure. Each foot was then dissected and photographed to identify any neurovascular or tendon injury.

**Results:** The dorsal medial cutaneous and the plantar interdigital nerves were intact in all specimens. There was no obvious damage to the arterial plexus supplying the first metatarsal head. No flexor or extensor tendon injuries were identified. There is a significant learning curve to performing the osteotomy cuts in the desired plane. In the DMO, the dissection also revealed some intact soft tissue at the osteotomy site indicating that the metatarsal heads were not truly floating.

**Discussion:** Although there has been concern regarding neurovascular and tendon injury, our findings indicate minimal risk, which is consistent with reports in the literature. This study also reflects the learning curve.

**Conclusion:** We suggest that training on cadaveric specimens may be advantageous, particularly, with regard to the plane of the osteotomy.

## **MINIMALLY INVASIVE CHEILECTOMY: FUNCTIONAL OUTCOME AND COMPARISON WITH OPEN CHEILECTOMY**

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Open *cheilectomy* is an established surgical treatment for *hallux rigidus*. *Cheilectomy* is now being performed using minimally invasive (MIS) techniques. In this prospective study we report the outcome of minimally invasive *cheilectomy* comparing the results with a matched group who had *cheilectomy* using standard open procedure

Methods: Prospective study of 47 patients. 22 patients had MIS *cheilectomy* between March 2009 and September 2010. We compared the outcome with a matched group (25 patients) who had open *cheilectomy*. Functional outcome was assessed using the Manchester Oxford Foot and ankle questionnaire (MOXFQ). The MOXFQ is a validated questionnaire designed to be self-completed and used as an outcome measure for foot surgery. Patients' satisfaction and complications were recorded.

Results: In the MIS group, the median follow up was 11 months (4-23). The median preoperative MOXFQ score was 34/64(23) and the median postoperative score was 19/64 ( $p<0.02$ ). In the open group the median follow up was 17 months (9-27). The median preoperative MOXFQ score was 35/64 and the median postoperative score was 7.5/64 ( $p<0.0001$ ). The metric score of the three domains of the MOXFQ showed statistical improvement in both groups. The improvement didn't reach statistical significance between the open and MIS groups. There were three failures in the open group (Fusion) compared to none in the MIS.

Discussion: There was significant improvement in foot pain, function and social aspect in the MIS group comparable to the open group. In our analysis we didn't account for the learning curve involved in the MIS technique. The MIS procedure has the advantage of small incision and dissection and accordingly less swelling and quicker recovery.

Conclusion: MIS *cheilectomy* is an effective alternative procedure with satisfactory functional outcome and high patient satisfaction.

Results are comparable to the standard open *cheilectomy* with a lower apparent failure rate.

## **SILASTIC IMPLANT ARTHROPLASTY IN TREATMENT OF HALLUX RIGIDUS; EIGHT YEARS FOLLOW UP**

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Background: Short term results of silastic implant of first MTPJ are successful. However reservations exist regarding long term results. The aim of this study is to evaluate long term outcome of silastic implant prosthesis in treatment of *hallus rigidus*.

We reviewed 108 feet in 83 patients who were operated on between 1988 and 2003. Mean age at operation = 55(SD 8.1). Mean follow up = 8.31 years (SD 3.3). Patients were assessed using the American Orthopaedic Foot and Ankle Scoring system (AOFAS). Passive and active arc of motion were measured. To assess patients' satisfaction they are asked if they would repeat the procedure and also using a visual analogue scale (VAS) to express their overall satisfaction with the outcome. All the patients had anteroposterior and oblique views. Radiographs were assessed for loosening and *osteolysis*.

Results: Median AOFAS = 81(IQR =15). Median VAS = 8(IQR=3). Median active arc of motion = 35(IQR 18). Passive arc of motion = 46(IQR=23). No significant difference in results was found in patients with associated *hallux valgus* (p value = 0.6). There was significant correlation between the AOFAS and VAS (Pearson correlation = 0.58, p value <.0001). No correlation was found between AOFAS, VAS and radiological changes (P value =0.8 and 0.9 respectively). In 83 feet (76.9%) patients reported "yes" that they would repeat the procedure and in 22(20.4%) feet patients reported "no". Prosthesis were removed in three feet at three, five and seven years respectively because of persistent pain. Radiologically, 58% showed cyst formation but didn't correlate with functional outcome.

Discussion and Conclusion: This study provides the largest cohort in the literature and the longest follow up. We can conclude that silastic implant arthroplasty is an effective procedure in *hallux rigidus* management with satisfactory functional outcome and high patient satisfaction.



## **PREDICTORS OF PROLONGED LENGTH OF STAY AFTER MAJOR FOOT AND ANKLE SURGERY**

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**Introduction:** Greater length of stay (LOS) after elective surgery results in increased use of health care resources and higher costs. Within the realm of foot and ankle surgery, improved peri-operative care has enabled a vast majority of procedures to be performed as a day surgery. The objective of this study was to determine the peri-operative factors that predict a prolonged LOS after elective ankle replacement or fusion.

**Methods:** Data was prospectively collected on patients undergoing either an ankle fusion or ankle replacement for end-stage ankle arthritis at our institution (2003-2010). In the analysis, LOS was the outcome and age, sex, physical and mental functional scores, co-morbid factors, ASA grades, type and length of operation and body mass index (BMI) were potential peri-operative risk factors. Univariate and multivariate generalized linear regression models with gamma distribution and log link function were conducted.

**Results:** A total of 336 patients were included in the study. The median LOS was 76 hours with interquartile range of 52.5-97. Using regression analysis, we showed aging, female gender, a higher ASA score, multiple medical co-morbidities, rheumatoid arthritis, a lower score in the physical component (PCS) and general health domain (GH) of SF-36, open surgery and an increased length of surgical time were all significantly associated with an increased LOS. Conversely, obesity, the SF-36 Mental Component Score and the date of admission were non-influential of LOS. A predictive model was also developed using these same risk factors.

**Conclusions:** Increased age, female gender, high ASA scores, low SF-36 GH and PCS scores, increased number of medical co-morbidities, rheumatoid arthritis and open surgery were all factors that increased LOS significantly after ankle fusion or ankle replacement. This group of patients may warrant better education and more focused peri-operative care when it comes to designing care pathways and allocating health care resources.

# **LONG TERM FOLLOW UP OF FLEXOR DIGITORUM LONGUS TRANSFER AND CALCANEAL OSTEOTOMY FOR STAGE II POSTERIOR TIBIAL TENDON DYSFUNCTION**

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Introduction: *Flexor digitorum longus* (FDL) transfer and medial displacement *calcaneal osteotomy* (CO) is a well-recognised surgical treatment for stage II posterior *tibial* tendon dysfunction (PTTD). Whilst excellent results are quoted for short and medium term follow-up, the long-term outcome of this procedure is unknown.

Materials and Methods: We reviewed the clinical outcome of patients with a symptomatic flexible flatfoot deformity undergoing this procedure at a mean follow up of 15.3 +/-0.7 years (range 14.4-16.5). We identified 48 patients who underwent surgery by the senior author between 1994 and 1996. We were able to contact 30 patients of whom 20 were available for clinical review. 10 patients participated via telephone interview, and also completed postal questionnaires.

Results: All scores improved significantly from pre-operative to latest follow-up. The mean AOFAS score improved from 48.4 pre-surgery to 90.0+/-13.6 (range 54-100) post-surgery. The pain component improved from a mean of 12.3 to 35.0+/-8.1 (range 20-40). Function score improved from 35.8 to 45.5+/-6.1 (range 30-50). Visual analogue score improved from 7.3 to 1.3+/-2.2 (range 0-6). Seven patients had only fair objective alignment, however six of those were totally satisfied and one satisfied with minor reservations, and all said they would have the surgery again.

The mean SF36 physical component score was 39.8+/-8.4 and this showed significant correlation with the AOFAS score ( $r=0.61$ ,  $p=0.009$ ). Five patients developed further pain unresponsive to analgesia and orthotics and underwent further surgery in the form of *calcaneocuboid* fusion, *talonavicular* fusion or triple fusion at a mean of 5.5+/-4.7 years (range 0.7-11.8) following initial surgery. 25(83%) patients were pain free and functioning well at an average of 15.3 years following surgery.

Conclusion: We believe that FDL transfer and CO provides long-term pain relief and satisfactory function in the treatment of Stage II PTTD

## THE EFFECT OF MEDIAL DISPLACEMENT OSTEOTOMY ON FOOT PRESSURES DURING FLATFOOT RECONSTRUCTION SURGERY

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Introduction: Medial *calcaneal* displacement osteotomy with an FDL tendon transfer is a common method of correcting *pes planus* deformity secondary to grade II *tibialis* posterior dysfunction. There is currently no evidence that calcaneal displacement alters the centre of pressure in the foot from a medial to a more central position as the normal shape is reconstituted.

Materials and Methods: We prospectively evaluated 12 patients undergoing flatfoot reconstruction. Each patient had a preoperative AOFAS hindfoot score, pedobarographs and antero-posterior and lateral radiographs. This was repeated 6 months following surgery.

Results: An angle ( $\alpha$ ) between the central axis of the foot (*calcaneum* to 2nd metatarsal head) and the centre of pressure (COP) was calculated for each patient both pre and post operatively and analysed using the Shapiro Wilk and the Students t test. Pressures directly under the 1st and 5th metatarsal heads and the *calcaneum* were also recorded and the pre and post operative differences analysed. The mean change in  $\alpha$  angle is  $6.1^\circ$  ( $p < 0.01$ ). The mean increase in pressure on the 1st metatarsal head is 460kPa ( $p = 0.08$ ). The pressure changes on the 5th metatarsal head and the *calcaneum* are not statistically significant. The mean AOFAS score increases from 39.2 pre-operatively to 82.8 post-operatively ( $p = 0.0019$ ). The Meary angle improves from a mean of  $12.7^\circ$  to  $5.7^\circ$  ( $p = 0.027$ ) and the *calcaneal* pitch improves from  $15.1^\circ$  to  $18.2^\circ$  ( $p = 0.12$ )

Conclusion: The medial displacement *calcaneal osteotomy* is able to significantly lateralise the centre of pressure in the foot and also increases the pressure under the 1st metatarsal head to more closely represent the parameters of the normal foot. The shape of the foot as judged radiographically and the clinical outcomes (AOFAS) are also improved.

## **IS PHYSIOTHERAPY EFFECTIVE FOR A MID BODY ACHILLES TENDINOPATHY? : A REVIEW OF NON-SURGICAL AND NON-PHARMACOLOGICAL INTERVENTIONS.**

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**Introduction:** Chronic mid body Achilles *tendinopathy* is a common problem. There is no consensus on treatment. The aim of this review was to assess the effectiveness of physiotherapy interventions (non surgical and non pharmacological) for this condition.

**Methods:** A systematic review of the literature was conducted. A search of published and grey literature databases was undertaken (1999- December 2010). Two reviewers independently assessed the studies for eligibility using a strict inclusion and exclusion criteria. All eligible articles were assessed critically using the Pedro score. Data on cohort characteristics, diagnostic criteria, treatment intervention, outcome measures and results was extracted. A narrative research synthesis method was adopted.

**Results:** 209 studies were identified. Nine publications met the review inclusion criteria. Methodological quality was adequate for all nine studies; however, blinding was a limitation for most. Interventions investigated were; Exercises (n=2), Low level laser therapy (n=1), Low energy shockwave treatment (SWT) (n=3), Air cast brace (n=2) and Insoles (n=1). Some evidence exists for eccentric exercises in combination with SWT or Laser. However, contrary to other reviews, eccentric exercises were not found to be superior to other physiotherapy treatments.

**Conclusions:** There is insufficient evidence to determine which method of physiotherapy is most appropriate for a chronic Achilles tendinopathy. Further well designed randomised controlled trials assessing physiotherapy interventions with specific diagnostic criteria and appropriate outcome tools are required to determine the efficacy of physiotherapy for the condition.

## CONGENITAL TALIPES EQUINOVARUS – THE SWANSEA EXPERIENCE OF THE PONSETI REGIME

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**Introduction:** The Ponseti regime was introduced in Swansea in 2003 for the treatment of congenital *talipes equinovarus* (CTEV). The aim of this retrospective cohort study was to compare children treated with this regime with a historical group treated traditionally before then.

**Materials and Methods:** Sixty children (89 feet) were treated with the Ponseti regime between 2003 and 2010. Their notes were compared with notes from 12 children (21 feet) treated between 1995 and 2002. Clinic attendance for serial manipulation and immobilisation (strap/cast) was compared using a two-tailed Mann Whitney U test. Major release surgery was compared using a two-tailed Fisher's Exact test.

**Results:** Children in the historical cohort presented when they were 0-174 days old (median 1 day). They attended 3-35 times (median 22) for serial manipulation and strapping/ plasters. Major release surgery was undertaken on 14 feet (66.7%) when the children were 6-39 months old (median 9 months); 7 had revision surgery. The Ponseti cohort presented when they were 0-73 days old (median 10 days) and attended outpatients 2-19 times (median 7) for serial manipulation and casting. An Achilles *tenotomy* was undertaken in 54 feet (60.7%) when the children were 45-184 days old (median 71 days) and major release surgery in 17 feet (19.1%) when the children were 10-66 months old (median 21 months). Four children had revision surgery.

**Discussion:** There is a significant reduction in outpatient attendances ( $U=1313$ ,  $p<0.0001$ ) for serial manipulation and reduced rate of release surgery ( $p=4.56 \times 10^{-5}$ ) since the implementation of the Ponseti regime. The rate of revision surgery in both groups was not significant ( $p=0.15$ ), although these samples were small.

**Conclusion:** The Ponseti regime is an effective initial treatment for infants with CTEV compared with traditional treatment. It has decreased the number of clinic attendances and the rate of major release surgery.

## **OUTCOME OF STRESS METATARSAL FRACTURES IN PERIPHERAL NEUROPATHIC PATIENTS**

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Background and objective: Metatarsals stress fractures are common in athletes and dancers. Occasionally, such fractures could occur without trauma in peripheral neuropathic patients. There is no published series describing outcome of stress fractures in these patients. This study analyse these fractures, treatment and outcome.

Material and Method: Retrospective study, January 2005 to December 2010. From a total of 324 patients with metatarsal fractures, 8 patients with peripheral neuropathy presented with second metatarsal non-traumatic fractures. Fractures were initially treated in cast for more than three months but failed to heal. Subsequently, this led to fractures of 3rd, 4th and 5th metatarsals.

All patients remained clinically symptomatic due to fracture non-union. Operative treatment with bone graft and plating was used. Post-operatively below knee plaster and partial weight bearing for 12 weeks. Clinical and radiological surveillance continued until bone union.

Results: There were 2 male and 6 female patients, age (24 -83). 22 metatarsals had clinical and radiological union. 1 patient needed 1st *tarsometatarsal* joint fusion along with metatarsals fractures fixation. This patient developed deep infection and required below knee amputation. 2 patients required metalwork removal. Patient's satisfaction score was 8 /10.

Conclusion: Our review suggests low energy metatarsal stress fractures treated non-operatively provide limited success. Timely surgical intervention and internal fixation proved to be a valid treatment option.

## **THE OUTCOME OF STAINSBY PROCEDURE IN TREATING THE RHEUMATOID FOREFOOT**

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Treatment of the rheumatoid forefoot involves resection arthroplasty of the MTP joints of the lesser toes. This can either involve resection of the metatarsal heads or, as described by Stainsby: resection of the proximal phalanx. The Stainsby procedure is a well accepted technique, however despite this there is very little information on the outcome of this procedure.

**Materials and Methods:** 40 rheumatoid patients were treated with the Stainsby procedure, over a five year period. Pre-operatively patients completed a Foot Function Index (FFI) and American Orthopaedic Foot and Ankle Score (AOFAS). The minimum follow-up was 12 months, range of follow-up 12-60 months. At follow-up review patients also completed the FFI and AOFAS. Therefore comparison of pre-operative and post-operative scores was assessed.

**Results:** There was a great improvement in both FFI and AOFAS after the Stainsby procedure, especially in patients who also underwent arthrodesis of the first MTPJ. Statistical analysis of the results is presently being completed and the full results will be discussed at the meeting.

**Discussion:** Treatment of the rheumatoid forefoot involving resection of the metatarsal heads is a well known procedure, with much published literature to support its use. To date there is very little literature to assess the outcomes of performing a Stainsby procedure as an alternative resection arthroplasty.

This study highlights the comparable benefits and results of resecting the proximal phalanx and therefore preserving the metatarsal heads, as described by Stainsby.

## **FOOT AND ANKLE AS A SPECIALTY IS UNDER REPRESENTED IN THE JOURNAL OF BONE AND JOINT SURGERY**

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Introduction: Foot and ankle is a well-established and growing sub specialty in orthopaedics. It accounts for 20 to 25 per cent of an average department's workload. There are two well established foot and ankle specialist journals but for many surgeons the Journal of Bone and Surgery (JBJS) remains the preeminent journal in orthopaedics and a highly sought after target journal for publication of research. It is our belief that foot and ankle surgery is underrepresented in the JBJS. We undertook a study to test this hypothesis.

Methods: We analysed all JBJS (British and American editions) volumes over a 10 year period (2001 to 2010). We recorded how many editorials, reviews, original papers and case reports were foot and ankle related.

Results: of 2197 original papers published in JBJS Br only 114 (5%) were foot and ankle related. Nine out of 181 (5%) case reports, 2 out of 71 (3%) aspects of current management, none of the 51 editorials and only 3 out of 97 (3%) of reviews were foot and ankle related.

In the JBJS American edition 174 out of 2117 original papers (8%), 28 out of 401 (7%) case reports, 4 out of 103 (4%) current concept reviews, 8 out of 115 (7%) instructional course lectures were foot and ankle related.

Of 35 Editors on the JBJS British edition only 2 were dedicated foot and ankle surgeons, one of whom is retired.

Our study reveals that foot and ankle related research accounts for a very small proportion of JBJS publications. Foot and ankle surgery needs to be proportionally represented at the editorial board level to reflect the fast growing interest in foot and ankle conditions and related research.



## **SUTURE FIXATION OF AKIN OSTEOTOMY: CLINICAL RESULTS AND COST ANALYSIS OF A PROSPECTIVE STUDY**

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Akins original description of his osteotomy did not describe the use of any metal work. Today the osteotomy is most commonly held and fixed with either a staple or screw. We describe the results obtained with a simple suture technique. Methods Data was collected prospectively on 125 patients undergoing an Akin osteotomy. *Hallux valgus* (HV) and *intermetatarsal* (IM) angles pre and postoperatively were recorded. Patients were reviewed at 6 week follow up. Cost analysis was also performed comparing different fixation types.

111 of the patients were female and 14 male. The average age at time of surgery was 49 years. 104 cases were in conjunction with *hallux valgus* correction while 21 cases were for *hallux interphalangeus*. The mean preoperative HV angle was 33.3 degrees (range 22 to 53), and the IM angle 13.3 degrees (range 9 to 25). At the 6 week follow up all patients had shown signs of radiological union. The postoperative HV angle was 12.4 degrees (range 7 to 17) and the IM angle 6.4 degrees (range 5 to 11). All patients maintained their correction. There were no complications, infections or fixation problems. All patients were satisfied with their surgery and would have it repeated again. The suture technique was the most cost effective method.

We describe a quick, easy, implant free method of fixing the Akin osteotomy. There is no need for metalwork removal and in today's world of austerity and the current climate of widespread budget constraints we describe a cost effective method which is clinically just as effective as methods requiring a staple or screw.

## **VTE THROMBOPROPHYLAXIS – ARE NICE GUIDELINES CLINICALLY EFFECTIVE?**

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Nice guidelines recommend VTE prophylaxis to patients in below knee casts following foot and ankle surgery following risk assessment. The guidelines are controversial and BOFAS recommendations reiterate the risk factors but highlight poor evidence to support these guidelines. Implementation has been variable dependent on interpretation.

58 patients who underwent hindfoot procedures and were immobilised in a cast were identified. These patients were under the care of two consultants, one of whom anticoagulates with daily enoxaparin and one who does not, providing a de facto case-control design. The patients were followed up to identify those who subsequently suffered a DVT or PE, and the clinical circumstances.

2 cases of VTE events were noted in 58 patients undergoing foot and ankle surgery. Both were elective cases managed postoperatively in cast and treated with prophylactic enoxaparin. Both of these presented to hospital with signs of VTE greater than 6 weeks following surgery after cast removal and discontinuation of enoxaparin. No patients were considered high risk according to NICE guidelines. None of the patients who received no thromboprophylaxis had a clinical DVT.

Within our study group we found that VTE thromboprophylaxis does not influence clinically evident VTE rates. Patients who developed VTE were not considered high risk by definition of NICE guidelines but only at increased risk due to their immobility. The VTE events were initiated while the patients were receiving thromboprophylaxis. The effectiveness of the guidelines in predicting patients who would benefit from chemoprophylaxis is questionable from this study.

NICE guidelines on VTE thromboprophylaxis have been received with some concerns. Although this investigation studied only a relatively small number of patients, it raises issues about the clinical effectiveness of the guidelines in foot and ankle patients.

## **EFFECT OF SURGICAL CARE PRACTITIONER LED MULTI DISCIPLINARY TEAM FACILITATED ANKLE/HINDFOOT PATIENT INFORMATION GROUPS**

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Patient reported outcomes and satisfaction as a measure of service quality is becoming an increasingly important tool in local service assessment as well as a quality indicator within commissioning frameworks. We analyse the introduction of SCP led MDT facilitated patient group meetings addressing the education and preparation of patients listed for ankle and hindfoot surgery at WSH HYPOTHESIS- To identify the outcome benefits to patients from this type of quality initiative. This has been previously demonstrated in other specialities in the trust such as hip and knee replacement resulting in mandatory attendance as part of the care pathway.

Feedback was gathered via a patient questionnaire from 60 patients invited to meetings over an 18 month period. Two groups of patients who have undergone hindfoot/ankle surgery at WSH were compared. Group 1 attended a 1 hour MDT meeting preoperatively designed to educate the patient on all aspects of their surgery from pre assessment through to post operative management. Group 2 did not attend any such meeting whether invited or not.

Results: Group 1 found the meetings beneficial in preparing them for surgery and improved their knowledge of disease, treatment options and recovery. Group 2 felt less prepared with less knowledge of post op limitations, and available support. No significant difference in length of stay was observed.

Recommendations: Additional to their consultant examination, patients undergoing major foot surgery benefit from receiving additional information provided by a mixed group of professionals involved in their care. Physiotherapists and occupational therapists as well as volunteer post operative patients at these meetings provided valuable advice and instruction in preparing for and recovering from this type of surgery.

## BRITISH FOOT AND ANKLE SOCIETY CURRENT PRACTICE SURVEY

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Method: A questionnaire was given to delegates at the British Orthopaedic Foot & Ankle Society (BOFAS) annual scientific meeting 3rd – 5th November 2010. A total of 75 questionnaires were included within the analysis. The questionnaire asked delegates for their most commonly performed procedure for a variety of common foot and ankle conditions.

Results: Which procedure do you most commonly perform?

<i>Hallux valgus</i> mild;	Chevron 60.0% Scarf 28.0%.
<i>Hallux Valgus</i> Moderate;	Scarf 85.3% Chevron 12.0%
<i>Hallux Valgus</i> Severe;	Scarf 65.3% Basal Osteotomy 29.3%
1st MTPJ OA Fusion;	crossed screws 54.7% Plate 26.7%
Lesser toe <i>Metatarsalgia</i> ;	Weil 48.6% BRT 22.8%
Hammer second toe;	PIPJ Fusion 62.7% Oxford Procedure 15%
Tib Post stage 1;	Debridement 60.0% Conservative 24.0%
Tib Post stage 2;	FDL Transfer 76.0% Calc. osteotomy 78.7%
Achilles tendon rupture	Open Repair 61.5% Percutaneous 13.8%

In delegates' normal practice they would fuse an osteoarthritic ankle 90% and perform a Total Ankle replacement 10% of the time. The method of fusion is split 50/50 between arthroscopic and open. Regarding the anaesthetic used for forefoot surgery most are using GA + Regional Block (mean 60%) only occasionally using regional anaesthesia alone (mean 8%) Only 12.3% of delegates have tried minimally invasive [forefoot] surgery (MIS), 17.3% of delegates think they will do more MIS in the future.

The practice of British orthopaedic foot and ankle surgeons is broadly in line with an evidence-based approach. Knowledge of current practice may help trainees make sense of the myriad foot and ankle operations described in the literature.

## **THE SAPHENOUS NERVE IN FOOT AND ANKLE SURGERY: ITS VARIABLE ANATOMY AND RELEVANCE**

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The saphenous nerve is classically described as innervating skin of the medial foot to the first MTP joint and thus is at risk in surgery to the medial ankle and foot. However, it has previously been demonstrated that the dorsomedial branch of the superficial peroneal nerve consistently supplies the dorsomedial forefoot, and therefore previous descriptions of the saphenous nerve maybe erroneous.

We undertook a cadaveric study to assess the presence and variability of this nerve.

21 cadaveric feet were dissected from a level 5 cm above the medial *malleolus*, and distally to the termination of the saphenous nerve. In 16 specimens (76%), a saphenous nerve was present, of which 14 were anterior to the saphenous vein. Two of 16 nerves terminated above the medial *malleolus*. Therefore, only 14 of 21 specimens (66%) had a saphenous nerve present at the level of the medial *malleolus*. In seven of these 14 specimens (50%), the nerve terminally branched before the level of the tip of the *malleolus*. The mean distance reached in the foot was 46mm. Only two nerves reached the forefoot, at 97mm and 110 mm from the ankle joint respectively. At the ankle, the mean distance of the nerve from the *tibialis* anterior tendon was 9mm, and the saphenous vein 1.2mm.

Discussion: Our study shows that the course of the saphenous nerve is highly variable, and when present usually terminates within 40mm of the ankle. Only 10% reach the first MTP joint. These findings are inconsistent with standard surgical text descriptions.

The saphenous nerve is at risk in distal tibial screw placement and arthroscopy portal placement, and should be included in local anaesthetic ankle blocks in forefoot surgery, as a small proportion of nerves supply sensation to the medial forefoot.

## **THE LATERAL RETROMALLEOLAR GROOVE; A CADAVERIC STUDY USING 3D MAPPING**

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Peroneal tendon subluxation although rare, is a commonly misdiagnosed cause of lateral ankle pain and instability. The orientation and depth of the lateral retromalleolar groove is a major contributor to peroneal stability, but is little understood. We attempt to quantify the groove using three directional mapping techniques.

Eight age and sex matched embalmed cadaveric feet were dissected to expose the peroneal tendons and the retro-malleolar groove. A hand held digitiser was used to map the version and inclination of the groove in a 3D virtual environment. The length and depth of the groove and its orientation were calculated using the cartilage boundary and the centroid of the curved surface.

Four male and four female specimens (mean age 80 Yrs) were studied. The groove was noted to be concave in 62%, flat in 25 % and convex in 12.5 %. Flatter grooves were more commonly noted in (2/4) females. There was a significant difference in length and width of the groove between male and female feet. The mean length of the groove in male specimens was 6.2cm (5.4-6.7cm), and in female specimens 5.5cm (4.4-5.9cm). The mean width in males was 5.3mm (5.0-6.1mm) and in females 4.5mm (3.7-5.3mm). There was no significant difference noted in the depth of the groove between male and female feet. The mean depth in males was 2.3mm (0.8-3.1) and in female 2.2mm (0-2.4mm).

Knowledge of peroneal groove geometry in treatment of peroneal tendon instability is important. There appears to be a consistent difference in the anatomy of the groove between the sexes. Although men have longer and wider grooves than women, the depth is the same in both sexes.

## **SHOULD ALL DEFORMED LOOKING ANKLES BE MANIPULATED PRIOR TO X-RAY?**

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Ankle fractures account for 10% of all fractures. Most deformed looking ankles are manipulated in the emergency departments (ED) on clinical judgement in order to improve the outcome and avoid skin complications. It is accepted that significantly displaced ankle injuries with neurovascular (NV) compromise or critical skin should be reduced prior to imaging.

However, is it really possible to understand the injury to an ankle without an x-ray or other imaging? The other possible injuries around the ankle, presenting with swelling and deformity of the ankle region, may include a ligamentous, talar, subtalar, Chopart joint or calcaneal injury. Does the risk of waiting for the imaging outweigh the benefit of manipulation of an undiagnosed injury?

This prospective study involved the analysis of all patients with ankle injuries referred to orthopaedics between November 2009 and February 2010. Results: Over the audited period 100 referrals were identified (43 male, 57 female). The average age was 50.4 years (range 5-89). Only 2% of fractures were open. Manipulation in the ED was performed for 44% of patients. Of these, 39% (17 cases) were manipulated and supported in plaster slab without an initial x-ray; 3 due to vascular deficit, 2 due to critical skin and 12 with no documented reason!

Re-manipulation in the ED as well as definitive open reduction and internal fixation (ORIF) were significantly lower in those patients who had an x-ray prior to manipulation ( $P < 0.05$ ). ORIF was performed in 68% of all patients. Importantly, 80% of ankles manipulated in ED went on to have ORIF which was significantly higher than the 47% in the non-manipulation cohort ( $P < 0.05$ ).

We conclude that taking ankle injury radiographs prior to any attempt at manipulation, in the absence of NV deficit or critical skin, will constitute best practice.

## **DOES PLANTARFLEXION INFLUENCE THE RADIOGRAPHIC MEASUREMENTS OF ANKLE MORTISE**

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Determination of ankle stability is straightforward when the injury involves both the medial and lateral *malleolus*. However it can be challenging when the medial injury involves the deltoid ligament. Radiographic diagnosis of ankle instability highly depends on the measurement of medial clear space. As the shape of talus has been postulated akin to a trapezoid, the medial clear space may be influenced by the portion of talus occupying the mortise. Hence the medial clear space may be influenced by the position of the ankle. We sought to evaluate the impact of ankle plantarflexion and division of the deltoid ligament on the medial clear space.

For the study 10 fresh-frozen cadaveric lower limbs were used. Mortise radiographs were taken at neutral, 15 and 30 degrees of plantarflexion and neutral external rotation. These measurements were repeated after dividing the deltoid ligament. To ensure consistent ankle position, the ankle was placed in a specially constructed rig, which recreated the above positions. The medial clear space and talar tilt were measured. Differences in the means between the groups were determined with the paired 't' test and ANOVA within the groups. Statistical significance was set a p-value of 0.05.

Increasing the plantarflexion from neutral to 30 degrees in both groups resulted in increase in the medial clear space and talar tilt. The mean increase in medial clear space became statistically significant at 30 degrees when compared to neutral. Between the groups there was a significant difference in medial clear space at 30 degrees plantarflexion. Dividing the deltoid ligament also had a significant effect on talar tilt.

Plantarflexion has an influence on the medial clear space in ankle mortise views therefore pre and post ankle fixation radiographs must be interpreted with caution.



## **TIGHTROPE VERSUS SCREW STABILISATION FOR ACUTE INJURIES OF THE ANKLE SYNDESMOSIS**

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The best method of stabilisation of the ankle syndesmosis remains a topic of debate; a relatively recent development is the ankle tightrope - a tensionable fibrewire suture device. Despite over 30,000 successful surgeries reported, evidence supporting its use when compared with screw fixation remains extremely limited. We retrospectively compared two consecutive groups of patients whose syndesmotic injuries were stabilised either with a tightrope or screws. The aim of our study was to compare complications arising after insertion of these devices.

All patients undergoing tightrope stabilisation of the syndesmosis between January 2006 and February 2009 were included as the treatment group. The control group was made up of a similar number of consecutive patients who underwent screw stabilisation between November 2010 and January 2011. Data was obtained through theatre records, case notes and from the local PACS X-ray system. Eighteen eligible cases were identified in the tightrope group compared with sixteen eligible cases treated with screws. Both groups had similar baseline demographics with respect to distribution of age and gender.

Twenty two percent (n = 4) of tightropes were removed secondary to wound breakdown or knot prominence. Other complications included persistent *syndesmotic* widening (n = 2, 11%), knot prominence without removal (n = 1, 5.5%) and *synostosis* (n = 1, 5.5%). In comparison, only 1 patient (6.3%) experienced a complication (pain and decreased RoM) in the control group. A total of 14 screws were removed. Thirteen screws were removed uneventfully. One patient was discharged to another hospital for a planned removal of screw, but was lost to follow-up. The remaining two patients elected not to have their screws removed.

Discussion: Our study demonstrates that in our hands a relatively high complication rate exists with tightrope stabilisation, whereas few problems are seen with screw fixation.

## **EARLY OPERATIVE INTERVENTION FOR ANKLE FRACTURES IN THE PRESENCE OF FRACTURE BLISTERS: A PROSPECTIVE PATIENT SERIES AND REVIEW OF THE LITERATURE.**

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A delay in operative intervention for ankle fracture in the presence of blistering at the operative site is generally considered to reduce problems with soft tissue complications including infection. No evidence exists to show an increased rate of complications. Previous work has characterised two types of blisters clear- and blood-filled. It has been suggested that the presence of a blood-filled blister confers a higher risk of wound healing complications compared with a clear-filled blister.

We present a series of patients who underwent surgery for ankle fracture, in the presence of blisters at the operative site, without any change to standard management of the fracture. We also present a review of the literature.

We prospectively followed six patients who underwent early internal fixation (no delay in surgical intervention) of ankle fracture in the presence of blisters at the operative site. In many cases the surgical incisions were made through the blistered skin. No patients had any additional treatment for their blisters. All patients were treated with the same postoperative protocol.

All six patients with both blister types went on to fracture union with no soft tissue complications and no cases of infection.

This initial observational study supports the treatment of ankle fractures with early internal fixation in the presence of soft tissue blisters at the operative site. It is possible that the stabilisation of underlying skeleton results in better healing of the skin and other soft tissues which is a concept often employed in the management of open fractures. We plan to carry out further prospective work on a larger number of patients as part of a randomized trial to confirm this finding.

## **THE MANAGEMENT OF UNSTABLE ANKLE FRACTURES – DOES OPERATIVE TREATMENT RESTORE NORMAL RADIOGRAPHIC PARAMETERS?**

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The management of unstable ankle fractures is challenging due the difficulty in differentiating between stable and unstable fracture patterns. The aim of our study was to examine our practice and to determine if the operative management of unstable ankle fractures resulted in significantly improved radiographic parameters.

Between June 2008 and December 2008, we identified all skeletally mature patients who were diagnosed with an ankle fracture after having radiographs in the radiology department at our institution. We analysed the case notes and radiographs of these patients retrospectively. The fractures were classified according to the Weber and Lauge-Hansen classification. Radiographs were evaluated for shortening of the fibula, widening of the joint space, or malrotation of the fibula. Three measurements were used to ascertain whether the correct fibular length has been restored - the circle sign, the *talocrural* angle, and the *tibiofibular* (or Shenton) line.

Of 1064 patients who had radiographs, 123 patients sustained a fracture of the ankle. There were 61 females and 62 males, with a median age of 47 years. There were 20 Weber A, 80 Weber B and 12 Weber C ankle fractures. Eleven fractures could not be classified according to the Weber classification. According to the Lauge-Hansen classification there were 44 Supination-External rotation (SER) stage II fractures, 35 Supination-External rotation (SER) stage IV fractures, and 7 Pronation-External rotation (PER) stage III fractures. In the unstable SER stage IV fractures, 30 of the 35 patients had operative treatment and there was no statistically significant difference in the average *Talocrural* angles in the operative (78.9°) and non-operative groups (83.4°). None of the patients with an SER stage IV fracture managed non-operatively had an adequate circle sign compared to 14 of the 30 patients in the operative group who had an adequate circle sign. In the PER stage III fractures 4 of the 7 patients had operative treatment. The average *Talocrural* angle in the operative group was 79.1° versus 75.3° in the non-operative group, with all patients in the operative group having an adequate circle sign compared to none in the non-operative group. The patient numbers in the PER stage III group however were too small to show a statistically significant difference. In 4 patients with unstable fracture patterns, the use of a third tubular plate to bridge a *fibula* fracture without an inter-fragmentary lag screw led to inadequate restoration of fibular length in all cases.

It is important to recognise unstable ankle fracture patterns and, in patients treated operatively, to restore fibular length and rotation. Operative management of unstable SER stage IV and PER stage III ankle fractures can restore normal radiographic parameters. We highlight certain technical pitfalls in restoring fibular length such as the inappropriate use of the semi-tubular plate as a bridging plate.

## **DISTAL TIBIAL PLATES – NOT AN EASY OPTION FOR SURGEON OR PATIENT**

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The treatment of very distal tibial fractures and pilon fractures is difficult. There is a wide variation in the severity of injury and the options for surgical management. Plates and external fixation each have their advantages. This retrospective study looks at complications and technical tips for anterolateral plating.

35 consecutive distal *tibial* platings were evaluated. The AO classification for each fracture was determined and any patient factors affecting outcome. Outcome variables included time to radiological union, infection rate, wound breakdown rate, and joint movement after treatment.

There were 32 anterolateral platings and 3 medial platings. The union rate was 95%. There were two deep infections which required surgical treatment. There were two wound breakdowns, one of which required plastic surgical intervention. Two patients had prominent metalwork, requiring removal. Other complications included deep *peroneal* nerve palsy, stiffness, and vascular compromise. The complication rates were lower for surgeons operating more frequently on these fractures. Two patients subsequently required bone transport and one required an amputation.

The complication rate found was similar to that reported in the literature. The few complications were however very significant for the patient and also for the surgeon as they required bone transport. Complications other than infection occurred in the few cases performed by surgeons low on their learning curve. We present technical tips for surgery. The presence of callus only after mobilisation indicates that union is slow.

Anterolateral plating is a viable option for distal *tibial* fractures, especially 43B fractures. There is a learning curve associated with their use. Complication rates are low overall, but significant consequences can accompany complications. As an alternative to external fixation, distal locking plates are not a pain free option for the surgeon, as well as for the patient.

## **THE MODIFIED BROSTROM PROCEDURE – EARLY RESULTS USING A NEWLY DESCRIBED SURGICAL TECHNIQUE**

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The purpose of this study was to evaluate the early functional outcome of this new modification of the Brostrom-Gould lateral ligament reconstruction using suture anchors and triple breasting of ATFL.

AOFAS hindfoot scoring system was the primary outcome measure used. Between January 2008 and May 2011, data was collected prospectively, pre and postoperatively. Surgery for all patients included ankle arthroscopy plus whatever other minor procedure was indicated and was performed by the senior author. Postoperatively at 3 months and 12 months and in May 2011 patients were asked to attend a research clinic and their scores were obtained.

Anterior drawer laxity and patient satisfaction, activity resumption and complications were some of the other information recorded. A mean follow up of 25 months on 18 ankles is presented which is amongst the longest in the literature for this procedure. Comparing pre and postoperative AOFAS scores revealed a statistically significant mean improvement of 39 points  $p < 0.05$  with mean pre-operative score being 53 and at 25 months being 89. All ankles felt clinically stable on repeated anterior drawer testing. 8 patients had resumed normal pre-injury level of activities (including sports), 8 had some reduction in normal level of activity and 2 did not carry out physical prior to operation. One patient complained of scar tenderness otherwise no complications were noted. 13 patients were extremely satisfied with results of surgery, 4 were very satisfied and 1 was moderately satisfied.

The mid-term results of our modification show it to be safe, reproducible and highly successful in producing clinically and functionally stable ankles with high patient satisfaction. This includes a statistically significant improvement in AOFAS scores. This exceeds the results in the published literature.

## **TALECTOMY AND TIBIOCALCANEAL ARTHRODESIS IN COMPLEX HINDFOOT RECONSTRUCTION: THE TIBIONAVICULAR ARTICULATION**

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Single stage total *talectomy* with *tibio-calcaneal arthrodesis* in adult patients has been rarely reported in the literature. In patients with severe rigid, unbraceable *equinovarus* deformities, *talectomy* can offer excellent correction.

We performed single stage total *talectomy* with *tibiocalcaneal arthrodesis* on 11 feet in 10 patients (6F; 5M) of average age 67 years (range 54 – 77 years). 6 patients had neuropathic deformity, 2 had failed fusion procedures and 2 had severe Rheumatoid hindfoot disease. The fusion was undertaken using a hindfoot nail and screws in 5 patients, plate and screws in 4 patients, a hindfoot nail in 1 and cancellous screws in 1 patient. All patients followed the standard post operative protocol and were reviewed at 2, 6 and 12 weeks and thereafter every 4 weekly till union. All patients were mobilised strictly non weight bearing for the first 6 weeks and thereafter, touch weight bearing was allowed with the leg in a protective cast. Full weight bearing was allowed once the fusion had consolidated.

Fusion was achieved in 7 feet (64%) at an average time of 17 weeks. In 4 patients, non-union persisted but they were pain free at latest review and would not consider further surgery. Average duration of follow-up was 20 months (range 6-24 months). All patients had stiff hindfeet with a jog of movement at the *tibio navicular* articulation. All patients had a stable, plantigrade, braceable foot and were community ambulators. All patients were satisfied with the outcome.

Total *talectomy* with *tibiocalcaneal arthrodesis* is a useful procedure to correct severe rigid *equinovarus* deformities in adults. The *tibionavicular* articulation forms a *pseudarthrosis* and retains a jog of movement. Retention of the head of the talus with *talotibial arthrodesis* is unnecessary. We recommend this procedure as a salvage option in this difficult problem.

## **REHABILITATION FOLLOWING TOTAL ANKLE REPLACEMENT – RESULTS OF PROSPECTIVE PILOT RCT**

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This project highlights the red flags in post-operative rehabilitation of total ankle replacement (TAR) patients managed with two different post-operative rehab regimes.

20 TAR patients were recruited for a pilot RCT between 2008 and 2011; they were randomized to 2 groups (immobilisation in a below knee plaster cast for 6 weeks vs. early mobilisation following TAR); all patients underwent a graded outpatient Physiotherapy program until 12 weeks post-operatively. Assessments included questionnaires, complications, American Orthopaedic Foot and Ankle Score (AOFAS) done pre-operatively, 3 and 6 months after surgery

Results: 20 TARs for OA (13) and PTOA (7) took part in the trial. There were 10 patients in each arm of the study. Mean age 61.2 years; mean BMI was 29.4. Of the plaster group, there was 1 incidence of fracture medial *malleolus* (MM) at 6 weeks after removal of plaster cast, 1 fracture MM at 5 months following walking on the beach, 1 fracture (MM) after completion of outpatient physiotherapy session, and 1 fracture MM of unknown reason at 1 year. Of the early mobilisation group, there was 1 intra-operative fracture of tibia (treated conservatively); 1 fracture MM 6 weeks post-op; 2 fracture MM at 8 weeks post-op. All patients had good clinical outcomes at successive follow up assessments.

Conclusion: These results highlights the need for considering a lighter exercise regime, and re-evaluating patient lifestyle, return to recreational activities and feedback on home exercise programs during planning and execution of each phase of post-operative rehabilitation programs to aid prevention of early fractures in patients following TAR.

## **THE MANAGEMENT OF COMPLICATIONS WITH THE MOBILITY TOTAL ANKLE REPLACEMENT**

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Total ankle replacement (TAR) is increasingly offered as an alternative to ankle fusion for the management of severe ankle arthritis. As with all other types of joint arthroplasty, there are risks involved and complications that occur; these increase with case complexity. We present the complications and management from a single-centre series.

Since 2006, we have performed 150 Mobility TARs with up to 4 years' follow-up. We have excluded 16 that are part of a separate RCT and 10 with less than 3 months' follow-up. 124 TARs were included in our study (117 patients). Three ankles (2.4%) had superficial wound infections treated successfully with antibiotics. One ankle (0.8%) required an arthroscopic washout and debridement but the implant was retained. 11 ankles (8.9%) had a *periprosthetic* fracture: One was intra-operative; 10 were post-operative (2 fixed). Four patients (3.2%) developed CRPS. One ankle required fusion surgery (following subsidence of the *talar* component) with another one pending revision (ligament instability causing implant displacement). No patient had a symptomatic deep vein thrombosis or *thromboembolic* event.

Our figures are comparable with other series. Our complication rate has not changed significantly over time. Our results, at present, suggest that most complications (98%) with the Mobility TAR can be satisfactorily managed without having a detrimental effect on the implant.

There have been proven and promising results with total ankle replacement. However, there is a significant complication rate that must be made clear to the patient via informed consent; the rate still remains higher than for hip and knee arthroplasty.



## **REVISION OF FAILED TOTAL ANKLE ARTHROPLASTY TO FUSION**

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Numerous techniques are used for the fusion of failed TAR. We wish to report our results of the revision of failed TAR to fusion.

Between July 2005 and February 2011 the senior author had performed 20 *arthrodesis* in 19 patients (13 male and 6 female) who had failed total ankle *arthroplasty* (TAR). Their mean age was 63.5 years. All of them had the AES total ankle replacement. (Biomet UK). The mean period from the original TAR to fusion was 51 months (6 to 72). The indication for revision of TAR to fusion was septic loosening in 4 patients and *osteolysis* and or aseptic loosening in 16 cases. Three types of fusion techniques were used.

The mean follow-up was 15 months. All 3 tibiotalar arthrodeses with screws alone fused successfully. Of the 13 patients where the fusion was augmented with an Ilizarov frame, 4 were done for septic loosening. There were 2 non unions of which one was stable without pain and the other required a further revision fusion with a frame and subsequently fused. Of the 9 patients who had a fusion with a frame for osteolysis and or aseptic loosening, there was one non union which was revised to a tibiotalar calcaneal fusion with a hind foot nail. The nail fractured at the level of the posterior oblique screw hole. The patient subsequently developed a relatively pain free non-union of the tibiotalar joint and not required further surgical intervention. The remaining 8 ankles fused at a mean of 5 months. The average time of frame removal was 17 weeks. There was four pin-site infection all of which settled with oral antibiotics. 5 patients had tibiotalar calcaneal fusion with a hind foot nail. The indication for the hind foot nail was significant osteolysis and loss of talar bone stock. The average shortening as a result of the fusion for the failed TAR was 1.5cms.

Our results were comparable to the previous reports of arthrodesis for failed total ankle replacement. We recommend the use of tibiotalar calcaneal fusion with a hind foot nail in the presence of severe osteolysis or accompanying subtalar arthritis. In the presence of good bone stock an ankle fusion supplemented with a circular frame gives a good predictable outcome.

## **METAL IMPLANTATION FOR SECONDARY OSTEOCHONDRAL DEFECTS OF THE TALUS: A PROSPECTIVE STUDY**

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There is no optimal treatment for *osteochondral* defects of the talus after failed primary surgical treatment. To treat these patients, a 15-mm diameter metal implant was developed for the medial *talar* dome. The present study was undertaken to evaluate the clinical effectiveness of the metal implantation technique for *osteochondral* lesions of the medial *talar* dome.

This is a prospective case series. The inclusion criteria were the combination of a large OCD ( $\geq 12$  mm) of the medial *talar* dome, persistent complaints  $>1$  year after treatment, and clinically relevant pain levels. The exclusion criteria were: age  $<18$  years, OCD size  $>20$  mm, ankle osteoarthritis grade 2 or 3, concomitant ankle pathology, and diabetes. The primary outcome measure was the Numeric Rating Scale pain (NRS) rest, walking, running, and stair climbing. Secondary outcome measures were: Foot Ankle Outcome Score (FAOS), American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot score, and clinical and radiographic complications. The Wilcoxon signed ranks test was used to calculate p-values.

Between October 2007 and March 2009 10 patients were included. The median follow-up was 2 years (range, 2–3 years). On preoperative CT scanning, the median lesion size was 15 (range, 12–20)  $\times$  11 (range, 8–14) mm. The NRS rest improved from a median of 3 (0–7) preoperatively to 0.5 (0–2) at final follow-up ( $p = 0.017$ ), NRS walking from 6.5 (4–8) to 1 (0–4) ( $p=0.005$ ), NRS running from 9 (6–10) to 3 (0–10) ( $p=0.024$ ), and NRS stair climbing from 6 (4–8) to 1 (0–7) ( $p=0.012$ ). The FAOS improved significantly on four of five subscales. The AOFAS improved from a median of 70 (47–75) before surgery to 89 (69–100) at final follow-up ( $p=0.008$ ). There were three temporary complications: hyposensibility about the scar in two and a superficial wound infection in one. There were no radiographic complications.

## **DO WEIGHTBEARING FILMS AFFECT DECISION MAKING IN *HALLUX VALGUS* SURGERY?**

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Background: *Hallux valgus* is a complex deformity of the first ray and forefoot, which can be surgically treated by different procedures and *osteotomies*. Preoperative planning includes antero-posterior and lateral plain films. The effect of weightbearing on the results of the standardized measurements is still the subject of debate.

Materials and methods: We evaluated the effect of weightbearing on the results of measurements and decision making by expert evaluators. Twenty one expert foot & ankle surgeons were given weightbearing and nonweightbearing anteroposterior plain foot films of patients with *hallux valgus*. They were asked to measure three standard angles and then to select the most appropriate procedure out of a short list.

Results: Using paired Student T-test, no difference in the angles measured or the procedures chosen was detected between weightbearing and nonweightbearing films.

Conclusion: Although it is generally accepted that decisions regarding the treatment of *hallux valgus* should be based on plain weightbearing films, in this study we established the nonweightbearing films can be reliably used to choose the surgical procedure.

## **ARTHROSCOPIC VERSUS OPEN ANKLE *ARTHRODESIS*: A MULTICENTER PROSPECTIVE CLINICAL OUTCOME STUDY**

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Background: Ankle *arthrodesis* results in significantly improved pain and function for patients with end-stage ankle arthritis. Arthroscopic ankle *arthrodesis* has gained increasing popularity with reports of shorter hospital stays, time to union and equivalent union rates to open *arthrodesis*. However, there remains a lack of good quality prospective data.

Methods: We report a prospective comparative clinical study comparing open and arthroscopic ankle arthrodesis at two institutions with two year follow up. The primary outcome was the Ankle Osteoarthritis Scale and secondary outcomes included the SF-36, hospital stay and radiographic alignment. A power calculation was performed. There were 30 patients in each group.

Results: Both groups showed a significant improvement in AOS and physical component score (PCS) of the SF-36 at one and two years. There was a significantly greater improvement in AOS scores at one year and two years and shorter hospital stay in the arthroscopic group. There was no significant difference in complications, surgical time or radiographic alignment.

Conclusions: Open and Arthroscopic Ankle *arthrodesis* demonstrate a significant improvement in pain and function as measured by the AOS. Arthroscopic *arthrodesis* showed improved outcomes at one and two years and a shorter hospital stay.

## **SPECT-CT TO EVALUATE PAINFUL TOTAL ANKLE REPLACEMENT**

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**Introduction:** Single photon emission computed tomography (SPECT) can be used to create a three dimensional image of a radiopharmaceutical bone scan. This combined with high resolution CT scan (SPECT-CT) with bone windows allows the linking of the information obtained in both investigations. The multiplanar anatomical information provided by CT is therefore linked with the functional, biological information of bone *scintigraphy*. The painful total ankle replacement has a number of potential causes of discomfort including impingement and loose components. Correct identification of the source of pain will assist surgeons in treating the source of the pain while avoiding unnecessary surgery. We present our experience of the use of SPECT-CT to investigate patients with ongoing pain following Total Ankle Replacement (TAR).

**Materials and Methods:** A retrospective analysis of all patients having SPECT-CT for continuing pain following TAR. Scans were requested in addition to plain radiographs, joint aspiration and blood testing. **Results:** A total of 12 patients were identified. The scan proved helpful in all cases. 5 patients showed increased uptake around one or both prostheses signifying loosening which was not apparent on plain films. Gutter impingement was identified in 4 patients. One patient had a talo-navicular non-union, one patient demonstrated sub-talar joint *arthrosis* and one patient showed no bony abnormality but soft tissue impingement at arthroscopy.

**Discussion:** SPECT-CT provides a useful adjunctive investigation in the work-up of the patient with ongoing pain in a TAR, particularly in the cases of component loosening where plain x-rays may be limited. The SPECT-CT assists in the correct anatomical localization of the pain and has assisted in identifying the correct surgical treatment. Disadvantages include cost and availability of scanners.

## **ARTICULAR CARTILAGE WEAR PATTERN IN THE FIRST MTP JOINT: DOES IT CORRELATE WITH SEVERITY OF DEFORMITY & FUNCTIONAL SCORE?**

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It is recognised that as the severity of *hallux valgus* (HV) worsens, so do the clinical and radiological signs of arthritis in the first *metatarsophalangeal* joint.

However, few studies specifically document the degenerate changes. The purpose of this study is to determine if intra-operative mapping of articular erosive lesions of the first MTP joint can be correlated to clinical and/or radiographic parameters used during the preoperative assessment of the HV deformity.

**Materials & Methods:** We prospectively analysed 50 patients who underwent surgery between Jan 2009 & Jan 2010. Patients with a known history of previous first *metatarsophalangeal* joint surgical intervention, trauma, or systemic arthritis were excluded from analysis. Preoperative demographics and AOFAS scores were recorded. Radiographic measurements were obtained from weight bearing radiographs. Intraoperative evaluation of the first metatarsal head, base of the proximal phalanx, and sesamoid articular cartilage erosion was performed. Cartilage wear was documented using International Cartilage Research Society grading.

**Results:** three patients did not have scoring or cartilage wear documentation carried out and were excluded. The mean age was 56 years. The mean *hallux valgus* angle was 31 degrees. The mean IMA was 15 degrees. The mean AOFAS score was 62. Patients with no *inferomedial* (IM) and *inferolateral* (IL) wear had significantly better AOFAS score than patients who had IM & IL wear ( $p < 0.05$ ). Patients who had IM & IL wear had a significantly higher HVA ( $p < 0.05$ ). There was a significant positive correlation between *hallux valgus* angle and AOFAS score. We also found correlation between sesamoid wear and AOFAS score and HV angle.

**Conclusion:** we conclude that preoperative clinical and radiographic measurements can be used to predict the incidence and location of articular erosions in the 1st MTPJ and are helpful in the preoperative assessment of the HV deformity.

## **THE USE OF A PROXIMAL HUMERAL LOCKED PLATE FOR HINDFOOT ARTHRODESIS**

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Locked plates confer angular stability across fusion sites, and as such are more rigid than either screws or intramedullary nails. This gives the advantage of reducing motion to enhance union rates and potentially allowing early weight bearing. The Philos plate (Synthes) is a contoured locking plate designed to fix humeral fractures but which also fits the shape of the hindfoot and provides strong low profile fixation. Its successful use for *tibiototalcaneal* (TTC) *arthrodesis* has been reported.

Our aim was to prospectively evaluate the use of the Philos plate in hindfoot arthrodesis. Twenty-one hindfoot arthrodeses were performed using the Philos plate between Oct 2008 and Jan 2010. Patients were followed up for a minimum of 1 year and had pre-operative and 6 monthly AOFAS hindfoot scores and serial radiographs until union. Overall there were 15 ankle fusions, 5 *tibiototalcaneal* fusions and 1 *subtalar* fusion. At 6 months there were 13 unions and 9 non-unions (4 ankle, 5 TTC) giving a non-union rate of 38% overall and 25% for ankle fusions in isolation. Mean AOFAS scores at 6 months were 74/100 for the union group and 47 for non-unions (chi squared  $p < 0.001$ ). No patient in the non-union group went on to fuse within a year without further surgery. Both groups had similar case mixes including osteoarthritis, AVN of the talus and failed arthroplasty. They also had similar co-morbidities, rates of smokers and bone grafting.

Our conclusion is that the high non-union rates are probably due to the lack of compression conferred across the join by the Philos plate as there is no compression hole and we did not supplement the fixation with a lag screw. We recommend using locked plates for hindfoot arthrodesis only with additional compression.

## **SYNDESMOTIC SCREWS VERSUS TIGHTROPES: WHICH IS BETTER?**

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Ankle fractures are one of the most common bony injuries presenting to the trauma surgeon. The more severe ones result in disruption of the *tibiofibular syndesmosis* and hence worse outcome. The outcome depends on accurate reduction of *syndesmosis*. The two main options in managing these injuries are *syndesmotic* screws or tightrope. The aim of this study is to compare the rate of complications between these two techniques and their radiographic results.

Retrospective data from 62 patients between September 2009 and March 2011 who had fixation of *syndesmosis* was obtained from theatre logbooks. 46 patients had *syndesmotic* screws inserted while 16 had tightrope. The average age was comparable in both groups (51 years v/s 41). 25 of the 46 *syndesmotic* screws inserted were removed. No tightropes had to be removed for any reason. 2 patients with *syndesmotic* screws had wound complications while 1 patient which tightrope insertion had a persistent *diastasis*.

There were no differences in radiological outcome between the two groups with regards to reduction of *syndesmosis* (measured by *talofibular* clear space minus medial clear space) (p-value 0.283). The difference between the *talocrural* angles was also of no significance (p-value 0.344). Our results indicate that tightropes achieve radiologically similar reduction of *syndesmosis* as screws without any significant difference in complications. The need for a second operation is significantly lower with tightrope fixation.



## **CALCANEAL FRACTURE ORIF AT CRAIGAVON HOSPITAL TRAUMA UNIT 2008-2010**

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This is a case series report on the outcomes of patients that have received ORIF of their calcaneal fractures at Craigavon Hospital, Northern Ireland, for the first 2 years since it opened. It is a one surgeon series.

**Methods:** Patients were identified from the theatre logbook. The patient recalled to clinic for interview and examination. Outcome was assessed using The Ankle-Hindfoot Scale devised by the American Orthopaedic Foot and Ankle Society. This was recorded with data for the patient's notes and CT scans. These data included age, date of surgery, mechanism of injury, associated injuries and previous function. The calcaneal fractures were classified according to the Sanders Classification.

**Results:** Sixteen patients identified from the theatre register. Of these patients, 10 patients were contactable and attended for evaluation. The data from these 10 patients was then analysed. There 9 male patients and one female. Time from operation from 9.5 months to 33 months. All patients had fractures classified as Sanders Type IV. All implants were *Variac calcaneal* plates. One patient had metalwork removed at 15 months. All patients had commenced weightbearing at 3 months. Outcome scores ranged from 52- 97 (mean 78.3, median 79). Six of the ten had returned to work at this review. *Subtalar* motion was universally affected.

**Discussion:** This one surgeon case series reflects the current literature on *calcaneal* fractures, in that there is a variation in outcome which is multifactorial. There is also a difficulty in defining a classification system which can reflect outcome. The results of this series suggest that there is a trend of improving outcome scores as time from injury progresses, and that outcome score tends to decrease as age at injury increases.

## **TOTAL ANKLE REPLACEMENT IN PATIENTS WITH/WITHOUT CORONAL PLANE DEFORMITY**

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**Introduction:** There is less literature reporting outcomes following total ankle replacement (TAR) in patients presenting with a coronal plane deformity pre-operatively. This study compares clinical and patient reported outcomes at 1 year between TAR patients with and without coronal plane deformity.

**Methods:** Patients from single centre prospective cohort (132) who underwent TAR between 2006 to 2010 were included. They were divided into 2 groups based on pre-operative coronal plane deformity. Groups 1 and 2 had a coronal plane deformity of  $<10^\circ$  and  $>10^\circ$  respectively.

Assessments included American Orthopaedic Foot and Ankle Score (AOFAS), Foot and Ankle Outcome Score (FAOS), SF-36 (Generic Health Measure) and complications recorded pre-operatively and 3, 6 and 12 months post-operatively.

**Results:** There were 102 ankles (77.2%) in group 1 and 30 ankles (22.7%) in group 2. There was no difference in age and BMI between groups ( $p > 0.05$ ). AOFAS, FAOS and SF-36 scores showed improvement for both groups from pre-op to 1 year ( $p < 0.01$ ) with no difference between groups ( $p > 0.05$ ) at all assessment times; except for mental health scores (SF-36 component) which showed no significant improvement ( $p > 0.05$ ) and no difference between groups ( $p > 0.05$ ). There was no difference in patient satisfaction for overall outcomes, pain relief, improvement in ADL and recreational activities between groups at 1 year ( $p > 0.05$ ). There was no incidence of DVT/PE in both groups. The incidence of peri-prosthetic fractures was 8 (7.8%) for group 1 and 2 (6.6%) in group 2.

**Discussion and Conclusion:** These early results of total ankle replacement demonstrate that patients with  $>10^\circ$  degrees coronal plane deformity had equivalent outcomes to patients with  $<10^\circ$  degrees of coronal plane deformity. Our surgical techniques for correction of deformity are reliable to reduce the requirement of ankle fusion.

## **FANCY FOOT WORK: THE INTRODUCTION ESP FOOT & ANKLE CLINICS**

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This study looked at the effect on referral for surgical opinion of introducing ESP Physiotherapy (1 physiotherapist) and Podiatry (2 podiatrists) clinics on the number of foot and ankle patients who were seen for a surgical opinion and subsequently surgery.

Prior to the introduction of the ESP clinics the number of patients was approximately 1 in every 8 was listed for surgery. At the time of the study the ESP clinics accounted for half of the new patients seen in orthopaedic foot & ankle clinics. The other half was seen by the surgical team (3 surgeons).

Results: In a 2 month period 131 patients were seen in the ESP clinics of these 41 were referred for a surgical opinion (31%).

## **THE LAMBRINUDI TRIPLE ARTHRODESIS**

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Introduction: In 1927, Lambrinudi described a variant triple fusion for the treatment of paralytic “drop foot”. This involved closing wedge *osteotomies* and fusion to correct the deformities predominantly caused by Polio. The eradication of Polio has seen a shift in its use to the correction of other complex hind foot deformities. The technique has relevance in modern Orthopaedics for other neurological and degenerate conditions. There have been few published series of this technique since 1927.

We describe a series of 14 complex corrective triple *arthrodeses* to illustrate the power of Lambrinudis’ concepts. We believe Lambrinudis original description has relevance in terms of modern day complex hindfoot deformity correction.

# CHANGE IN BONE MINERAL DENSITY IN ANKLE AFTER TOTAL ANKLE REPLACEMENT TWO YEAR FOLLOW-UP

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Introduction: There is no published series described change in bone mineral density (BMD) after ankle replacement. We present the results of a prospective study examining the effect of total ankle replacement (TAR) upon local bone mineral density (BMD).

Aim: To design a method and assess the effect of TAR loading on local ankle bones, by analysing the BMD of different area around ankle before and after Mobility TAR.

Methods: 23 patients undergoing Mobility ankle *arthroplasty* for osteoarthritis had pre-operative bone densitometry scans of the ankle, repeated at 1 and 2 years after surgery. BMD of 2 cm<sup>2</sup> areas around ankle were measured. Pre- and post-operative data were compared. Results: Mean BMD within the lateral *malleolus* decreased significantly from 0.5g/cm<sup>2</sup> to 0.42g/cm<sup>2</sup> (17%,  $P > 0.01$ ), at 1 & 2 years postoperatively. Mean BMD within medial *malleolus* decreased slightly from 0.67g/cm<sup>2</sup> to 0.64 g/cm<sup>2</sup> at the same period. However BMD at medial side metaphysis of tibia increased by 7%. There was little increase in BMD in tibia just proximal to implant and at talus.

Discussion and Conclusion: Absence of stress shielding around distal tibia, just proximal to *tibial* component and talus indicates that ankle replacements implanted within the accepted limits for implant alignment, load distal tibia and talus. However, there was stress shielding over the lateral *malleolus* resulting in decreased BMD in lateral *malleolus*. Increase BMD at *tibial metaphysis*, proximal to medial *malleolus* indicates an increase in mechanical stress which may explain occasional postoperative stress fracture of medial *malleolus* or medial side ankle pain.

## **DO PERIPROSTHETIC FRACTURES CHANGE THE OUTCOME IN THE MOBILITY TOTAL ANKLE REPLACEMENT?**

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**Introduction:** The standard practice of uncomplicated total ankle replacement (TAR) involves post-operative immobilisation. Periprosthetic fracture is a well-recognised complication following ankle *arthroplasty*. It occurs predominantly as a stress reaction on the medial *tibial metaphysis* during the post-operative rehabilitation period. Occasionally it occurs during surgery. We present fractures from a single-centre series of Mobility TARs.

**Materials and Methods:** We have 133 TARs with 3 to 48 months' follow-up. 28 patients were excluded for the following reasons: other major procedure performed concurrently (osteotomy or tendon transfer), custom prosthesis, revision surgery, fusion conversions, or patients involved in a separate RCT (n=16). We do not routinely immobilise patients post-operatively but allow partial to full weight-bearing as able. Outcome scores were compared to those without fractures.

**Results:** 105 patients were included in the study. Nine (8.6%) patients sustained a *periprosthetic* fracture with no history of significant trauma. One of these was intra-operative; this was a posterior tibial fracture noticed on post-operative radiographs. The remainder (n=8) were *tibial metaphyseal* stress fractures, all occurring within the first three months, most (n=6) within six weeks. One occurred on the sixth post-op day and was managed in cast. Seven were asymptomatic at diagnosis and managed non-operatively; one was fixed at three months due to radiological medial migration of the talus and one was fixed at seven months due to progression to symptomatic non-union. The remainder united. Between those with and without fractures, there was no significant difference in age (mean 61.4 vs. 62.1, p=0.387), diagnosis leading to *arthroplasty* (OA, RA, PTOA), or outcome scores (12 months: 83 vs. 78, p=0.237)

**Conclusion:** *Periprosthetic* fracture remains a significant complication of total ankle *arthroplasty*. However, in our series, they do not lead to increased morbidity or worse outcome scores than patients without fractures and most can be managed non-operatively.

## **AN ANATOMICAL STUDY COMPARING TWO SURGICAL APPROACHES FOR ISOLATED TALONAVICULAR FUSION**

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Isolated *talonavicular arthrodesis* is a common procedure particularly for posttraumatic arthritis and rheumatoid arthritis. Two surgical approaches are commonly used: the medial approach and the dorsal approach. It is recognized that access to the lateral aspect of the *talonavicular* joint can be limited when using the medial approach and it is our experience that using the dorsal approach addresses this issue. We performed an anatomical study using cadaver specimens, to compare the amount of articular surface that can be accessed, and therefore prepared for *arthodesis*, by each surgical approach. Medial and dorsal approaches to the *talonavicular* joint were performed on each of 10 cadaveric specimens. Distraction of the joint was performed as standard for preparation of articular surfaces during talonavicular arthrodesis. The accessible area of articular surface was marked for each of the two approaches.

Disarticulation was performed and the marked surface area was quantified using a digital Microscribe allowing a three dimensional virtual model of the articular surfaces to be assessed.

This study will provide quantifiable measurements of the articular surface accessible by the medial and dorsal approaches to the *talonavicular* joint.

These data may provide support for the use of the dorsal approach for *talonavicular arthrodesis*.

## **GAIT ANALYSIS OF THE EFFECT OF POSTOPERATIVE REHABILITATION SHOES**

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**Introduction:** Various rehabilitation shoes are prescribed to protect the forefoot following surgery. Patients often complain of discomfort in other areas as a result of the postoperative shoe, including the knee, hip and lower back. This has never been quantified. This study aims to establish the effect on other joints using gait analysis. **Methods** 11 healthy volunteers were investigated using various common types of postoperative shoe. They were studied with gait analysis equipment and the joint motion assessed with commercial software. The effect of commercial devices designed to minimise gait changes by lifting the *contralateral* foot were also evaluated.

**Results:** There was a reduction in knee flexion and extension compared to the *contralateral* leg in all phases of the gait cycle. This was the case with both heel wedge shoes and inflatable air boots. There was also an increase in pelvic tilt during gait with both shoes, which was more pronounced with the air boot. The foot raise device for the *contralateral* foot which is designed to decrease these changes was effective in decreasing gait changes.

**Discussion:** The use of rehabilitation shoes after forefoot surgery is almost universal. Patients are rarely counselled of the risk of joint pain or back pain as a result of the postoperative shoe. Patients with pre-existing back pain or hip pain may have fewer symptoms if they are supplied with an equalising device to raise the other foot.

**Conclusions:** Patients are at risk of initiation or exacerbation of low back pain or lower limb joint pain from the use of postoperative shoes. Patients with a history of back or limb symptoms should be provided with an equalising device for the *contralateral* limb to minimise their discomfort. Patients should be warned of this risk when giving consent. 290 WORDS



## THE INSERTION OF THE PERONEUS LONGUS TENDON – A CADAVERIC STUDY

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**Introduction:** The exact action of the *Peroneus Longus* muscle on the foot is not fully understood. It is involved in a number of pathological processes like tendonitis, *tenosynovitis*, chronic rupture and neurological conditions. It is described as having a consistent insertion to the base of the first metatarsal, but there have also been reports of significant variations and additional slips. Our aim was to further clarify the anatomy of the main insertion of the *Peroneus Longus* tendon and to describe the site and frequency of other variable insertion slips.

**Methods and Materials:** The course of the distal *peroneus longus* tendon and its variable insertion was dissected in 12 embalmed, cadaveric specimens. The surface area of the main insertion footprint and angle of insertion was measured using an Immersion Digital Microscribe and 3D mapping software. The site and frequency of the other insertion slips is also presented.

**Results:** There was a consistent, main insertion to the *infero-lateral* aspect of the first metatarsal in all specimens. The only additional slip was to the medial cuneiform. This did not increase the total footprint.

**Discussion:** The main footprint of the *Peroneus Longus* tendon is on the first metatarsal. There was an additional slip to the medial cuneiform in 33% of our specimens. Although we are unsure about the significance of this additional slip, we hope it will lead to a better understanding of the mechanism of action of this muscle and its role both in the normal and pathological foot.

## ANKLE POSITION AFFECTS THE EXPOSURE OF THE DORSALIS PEDIS ARTERY IN ANKLE ARTHROSCOPY

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**Introduction:** Anterior ankle arthroscopy currently provides the best chance of restricting local anatomy damage during ankle surgery. The anterior working area (AWA) of the ankle is restricted by the *Dorsalis Pedis Artery* (DPA) and the extensor muscle tendons when the procedure is conducted both in *dorsiflexion* and *plantarflexion*. During surgery, iatrogenic damage to the DPA can lead to the formation of a *pseudoaneurysm*, which can be difficult to identify intraoperatively.

Our study investigates whether *dorsiflexion* or *plantarflexion* provides variability in the movement of the DPA to determine the positions at which anterior ankle arthroscopy provides the greatest anterior working area (AWA) without causing vascular damage. The current study expects the distance of the DPA from the inferior border of the medial *malleolus* (IBMM) (ankle joint) to be greater on ankle *dorsiflexion* than in ankle *plantarflexion*.

**Materials and Methods:** Twelve cadaver ankles embalmed with a mixture of phenol and glycerol, allowing greater motion, were dissected to access the DPA. The ankles, while in a distracted position (in accordance with common surgical practice), were forced into *dorsiflexion* from a *plantarflexion* position at 5° intervals. The distance between the IBMM and the DPA was measured at the 5° intervals.

**Results:** The mean amount of ankle flexion achieved was 24.58° (Range = 20-35). All twelve ankles showed positive range of movement (ROM) anteriorly from the IBMM with a mean ROM of 3.58mm (SE = 0.29mm) *dorsiflexion*.

**Discussion and Conclusion:** Anterior movement of the *Dorsalis Pedis* Artery during *dorsiflexion* puts it at a lower risk of iatrogenic damage in a *dorsiflexed* position compared to *plantarflexion*. The increased AWA allows the surgeon more manoeuvrable space, possibly allowing the use of larger diameter surgical instruments.

## **THE EFFECT OF FOREFOOT RECONSTRUCTION ON LOADING IN RHEUMATOID FEET**

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**Introduction:** Forefoot deformities are common in the rheumatoid population and lead to abnormal loading, plantar callosities and *metatarsalgia*. First MTP joint *arthrodesis* with lesser toe Stainsby procedures has become a popular method of reconstructing the rheumatoid forefoot but there is little data that reviews the clinical or biomechanical results of combining the two procedures.

**Materials & Methods:** A prospective observational study was set up to review 10 rheumatoid patients (20 feet) undergoing bilateral first MTP joint *arthrodesis* via a medial approach with Stainsby procedures to all lesser toes via curved incisions with resection of two thirds of the proximal phalanx, repositioning of plantar fat pad, extensor to flexor interposition and temporary stabilisation with k wires. Clinical scoring and dynamic *pedobarograph* pressure measurements were taken pre operatively and at one year post surgery.

**Results:** Nine female and one male patient with a mean age of 60.2 years were reviewed. Pre operatively there were 11 abnormal high pressure areas in 10 feet, reducing to 8 abnormal areas in 6 feet following surgery. Post operatively the mean pressure time integral increased under the first metatarsal and decreased under lesser metatarsals. Following surgery no patient suffered significantly from callosities or *metatarsalgia* and AOFAS scores improved.

**Conclusion:** The post operative pressure time integrals suggest the medial weightbearing column is recreated with a reduction of abnormal pressures under the lesser metatarsal heads. These results show that first MTP joint *arthrodesis* with lesser toe Stainsby procedures reduces the number of abnormal high pressure areas under the forefoot and should be considered for deformity correction in the rheumatoid forefoot.

**THE RULE OF THUMB: A SIMPLE METHOD TO DETERMINE WHETHER SUFFICIENT TRANSLATION CAN BE ACHIEVED WITH DISTAL OSTEOTOMY OF THE FIRST METATARSAL.**

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Introduction: *Hallux valgus* is a common orthopaedic complaint with multiple surgical options. There are many methods available for assessing whether sufficient translation of the first metatarsal can be achieved with a metatarsal translational *osteotomy* alone. None of the current methods take into account the breadth of the metatarsal. With current PACS technology a radiograph can be zoomed to any size and we postulate that by using the surgeon's thumb (or any suitable digit), as a sizing tool, a safe clinical decision can be made concerning whether a translational metatarsal osteotomy alone will provide sufficient correction.

Method: We reviewed the pre-operative radiographs (weightbearing AP) of twenty patients who had scarf and akin *osteotomies* and twenty patients with a deformity too great for scarf and akin osteotomies. The senior author (CC) taught the rule of thumb to one consultant and two registrars (total two registrars and two consultants). The radiographs were blindly randomised and the participants assessed each radiograph and decided whether sufficient translation could be achieved with a translational metatarsal *osteotomy* alone. The process was repeated three months later. Twenty patients were deemed sufficient for intra-user variability and significance based on a recent JBJS(A) article concerning radiographic measurements post proximal crescentic osteotomy (Shima et al. 2009).

Results: Good inter- and intra- user variability was demonstrated and using the rule of thumb is a safe way of determining whether a distal osteotomy alone will provide sufficient correction.

## **CALCANEAL OSTEOTOMY – A COMPARISON OF DIFFERENT FIXATION METHODS**

A. Abbassian, R. Zaidi, A. Guha, N. Cullen, D. Singh

*Royal National Orthopaedic Hospital*

**Introduction:** Calcaneal osteotomy is often performed together with other procedures to correct hindfoot deformity. There are various methods of fixation ranging from staples, headed or headless screws or more recently stepped locking plates. It is not clear if one method is superior to the other. In this series we compare the outcome of various methods of fixation with particular attention to the need for subsequent hardware removal.

**Patients and Methods:** A retrospective review of the records of a consecutive series of patients who had a calcaneal osteotomy performed in our unit within the last 5 years was undertaken. All patients had had their osteotomy through an extended lateral approach to their calcaneus. The subsequent fixation was performed using one of three methods; a lateral plate placed through the same incision; a ‘headless’; or a ‘headed’ screw through a separate stab incision inserted through the infero-posterior heel. Records were kept of subsequent symptoms from the hardware and need for metalwork removal as well as any complications. When screws were inserted the entry point in relation to the weight-bearing surface of the calcaneus was also recorded.

**Results** Sixty-three osteotomies were investigated of which 15 were fixed using a headed screw, 18 using a headless screw (acutrak TM) and the remaining 30 were fixed using a lateral plate. There was a 100% union rate regardless of method of fixation, no patient was investigated or subject to revision surgery for a suspected non-union. Overall 47% of the headed screws, 10% of the headless screws and 9% of the lateral plates were removed to address symptoms that were suspected to arise from the hardware. There was a 10% (3 from 30) rate of wound complication in the lateral plate cohort. In all these cases there was persisting discharge from the extended lateral wound that resolved with dressing and antibiotic therapy alone.

**Conclusions:** Calcaneal osteotomies have a high union rate regardless of fixation method. Fixation using a headed screw is associated with a high rate of secondary screw removal and this is unrelated to the position of the screw in relation to the weight-bearing surface of the calcaneus. Hardware problems are less frequent in the ‘headless’ screw or the lateral plate groups; however in this series, the incidence of local wound complications was higher in the group fixed with a lateral plate.

## **BONE MARROW OEDEMA SYNDROME OF THE FOOT AND ANKLE – IS IT REALLY TRANSIENT?**

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**Introduction:** Bone marrow oedema syndrome (BMES) of the foot and ankle is an uncommon and often misdiagnosed condition. It is usually thought to be a benign self limiting condition, without any *sequelae*. However, it can cause disabling pain for a prolonged period of time.

**Materials and Methods:** We retrospectively reviewed 8 patients with the diagnosis of BMES. There were 6 males and 2 females with an average age of 51 years (38-63 years). All patients had acute onset of severe pain in the foot without any history of trauma. None of the patients had history of excessive alcohol or steroid intake. 5 patients (63%) had bilateral involvement of migratory nature. All patients had characteristic features on MR scans, with involvement of 3 or more bones in the foot.

**Results:** All patients had their limbs immobilised in a below knee cast and asked to mobilise non weight bearing for 6-8 weeks. Thereafter, they were allowed to mobilise with a pneumatic walker, increasing weight bearing as pain allowed. The walker was discarded at an average of 26 weeks. All 8 patients had complete relief of pain after an average of 14 months (4-22 months). All were able to return to their work environment but 2 complained of occasional aching and swelling of their feet, at the end of their shift at work. 2 patients were treated with bisphosphonates and 2 had targeted local anaesthetic injections with good pain relief. None were treated with Iloprost.

**Conclusions:** BMES affecting the foot and ankle is an uncommon condition. Symptoms tend to be prolonged and may result in chronic swelling and aching around the ankle. Symptoms do tend to improve with time with or without intervention.

## **FLEXOR HALLUCIS LONGUS TENDON TRANSFER IN THE MANAGEMENT OF THE DELAYED PRESENTATION OF ACHILLES TENDON RUPTURE**

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**Introduction:** The delayed presentation of Achilles tendon rupture is common, and is a difficult problem to manage. A number of surgical techniques have been described to treat this problem. We describe the use of *Flexor Hallucis Longus* (FHL) transfer to augment the surgical reconstruction of the delayed presentation of achilles tendon rupture.

**Materials and Methods:** Fourteen patients with chronic tendo-Achilles rupture, presenting between April 2008 and December 2010, underwent surgical reconstruction and FHL transfer. Surgery was performed employing standard operative techniques, with shortening of the Achilles tendon and FHL transfer into the calcaneum with a Biotenodesis screw (Arthrex). VISA-A scores were performed pre-operatively and six months post-operatively. Complication data was collected by review of the electronic patient record and direct patient questioning.

**Results:** One patient died of an unrelated cause shortly before outcome scoring, and another patient was excluded because casting in the pre-operative period prevented accurate scoring, although he achieved a good post-treatment score. Analysis was therefore carried out on twelve patients. Eleven of the twelve patients had significant improvement in their VISA-A score, with a mean improvement in score of 30 ( $p < 0.05$ ). There were no significant complications in any of the patients.

**Conclusion:** Our results show that FHL transfer in the management of chronic Achilles tendon rupture is a good, safe and reliable technique. There is excellent improvement in the mean VISA-A score, with no significant complications. Our results support the use of FHL tendon transfer for patients with chronic tendo-Achilles rupture.

## **LEVELS OF EVIDENCE IN FOOT AND ANKLE SURGERY OVER TEN YEARS**

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**Background:** The recent emphasis on using "evidence based medicine" for decision-making in patient care has prompted many publishers to mention the level of evidence of articles in their journals. The "quality" of a journal may thus be reflected by the proportion of articles with high levels of evidence and assist it achieve citations and therefore an Impact Factor.

The purpose of this study was to survey published Foot and Ankle literature to evaluate changes in the level of evidence over ten years.

**Methods:** Articles from Foot and Ankle International, JBJS Br, JBJS Am, Foot and Foot and Ankle Surgery were used. We looked at the years 2000 and 2010 and ranked the articles by a five-point level of evidence scale, according to guidelines from the Centre for Evidence Based Medicine. 498 articles were ranked. Studies of animals, studies of *cadavera*, basic-science articles were excluded.

**Results:** For both years 2000 and 2010 combined, 63.5% of the articles were therapeutic, 25.5% were prognostic, 10.6% were diagnostic, and 0.8% were economic. In 2000 the ratings were 1.3% as Level I, 5.8% as Level II, 11.9% as Level III, 44.7% as Level IV and 36.3% as level V.

In 2010 the ratings were 2.9% as Level I, 9.6% as Level II, 15.4% as Level III, 38.2% as Level IV and 33.8% as level V.

**Conclusion:** The literature in foot and ankle surgery has responded to the demand for more evidence-based medicine with an increase in level I and II papers but the rate of change has been slow. The majority of evidence remains in the level IV and V.



## **PERCUTANEOUS REPAIR OF THE ACHILLES TENDON: A 3-YEAR PROSPECTIVE EVALUATION.**

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The *percutaneous* repair of the Achilles tendon is a cost efficient method of restoring early limb function and may offer reduced risk of re-rupture and wound infection. This technique has been described in the elderly population and elite athletes; we present an evaluation of this technique in a District General Hospital setting. We have prospectively audited the outcome of 56 patients who have elected to have *percutaneous* repair for Achilles tendon rupture from 2009- 2011. The majority were males (44) with mean age of 46 years (range 27-80). Twenty nine patients ruptured the right tendon and 27 the left. 82% (46) of injuries were sustained whilst exercising: e.g. football (22), badminton (7), running (5). All but 2 patients were managed on a Day Case basis and 4 requested general anaesthesia. Patients were immediately weight bearing in a brace following surgery and commenced physiotherapy at 2 weeks.

Functional outcome was measured using a modified Achilles Tendon Rupture Score (ATRS) at 3, 6, 9 and 12 months: 100 score equals maximal limitation. The mean ATRS scores at 3, 6, 9 and 12 months were 53 (7-82), 31 (0-74), 30 (0-67) and 15 (1-52) respectively. We have had 4 complications: 2 sural nerve injuries, 1 poor wound healing and 1 re-rupture at 8 weeks.

Overall complication rate was 7.1%, comparable to other studies. We have shown a good outcome following *percutaneous* Achilles tendon repair. The majority of patients show good restoration of function by 3 months and a minor limitation at 6 months. The majority of the improvement in function occurred between 3 and 6 months following surgery. Two patients reported ongoing *tendinopathic* pain following repair increasing mean scores.

We believe this technique can be introduced in District General Hospitals to give good outcome on a cost effective basis.

## **SPECT –CT IN FOOT AND ANKLE SURGERY**

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**Aim:** Single-photon emission computed tomography is a new imaging modality combining high detail CT with highly sensitive triple phase nuclear bone scanning to help clinicians in diagnosis and management of various conditions. Little has been published about its particular usefulness in foot and ankle pathology. We conducted a prospective study to evaluate the role of SPECT for the same.

**Material and Methods:** Fifty patients were seen in a tertiary referral foot and ankle clinic presenting with a variety of foot and ankle conditions. SPECT-CT was requested when a definitive clinical diagnosis could not be reached after thorough clinical examination and plain radiography. Pathology shown by SPECT-CT was taken as the final diagnosis and interventional surgical management carried out accordingly. Patients were subsequently seen in the follow up clinic to evaluate the outcome of their treatment.

**Results:** In eleven (22%) cases, clinical correlation matched with the findings of the SPECT-CT and no change in treatment was necessary.

However, in 39 patients (78%) findings of SPECT-CT did not correlate exactly with clinical findings and led to a modified treatment plan. Of these 39 patients, 35 (88%) improved after the intervention based on SPECT-CT findings.

**Conclusions:** We found SPECT-CT to be a very useful investigation in complex foot and ankle cases where definite diagnosis after clinical and simple radiographic examination was still somewhat unclear. Our study suggests that SPECT-CT helps clinical decision making and improves outcome.

**EARLY ARTHRITIS OF THE 1ST MTPJ WITHOUT AVN OF THE MT HEAD, AS A COMPLICATION FOLLOWING LENGTHENING SCARF OSTEOTOMY FOR METATARSALGIA AFTER SHORTENING OSTEOTOMY FOR HALLUX VALGUS CORRECTION. A C**

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Numerous procedures have been reported for the *hallux valgus* correction of the great toe. Scarf *osteotomy* is a versatile *osteotomy* to correct varying degrees of mild to moderate *hallux valgus* deformity. It can also be used for lengthening of the 1st ray as a revision procedure to treat *metatarsalgia* in patients who had previous shortening *osteotomy*.

We wish to report a patient who had lengthening SCARF *osteotomy* for the *metatarsalgia* following previous *hallux valgus* correction and developed arthritis of the 1st MTPJ in a short term which required fusion. A 49 year old female patient was seen with pain and tenderness over the heads of the 2nd and 3rd metatarsal of the right foot. She had *hallux valgus* correction 10 years ago with a shortening *osteotomy* of the 1st metatarsal. She developed *metatarsalgia* which failed to conservative management.

She had a lengthening SCARF *osteotomy* for the *metatarsalgia* in 2004. She had good symptomatic relief for two years and then started having pain over the 1st MTPJ. On examination she had limited movements of the 1st MTPJ and tenderness over the *dorsolateral* aspects of the 1st MTPJ suggestive of arthritis. Radiographs of the foot showed healed *osteotomy* with no evidence of AVN of the 1st MT head but features suggestive of osteoarthritis. She had fusion of the 1st MTPJ performed in 2008 for the arthritis following which symptoms resolved.

This case highlights that arthritis of the 1st MTPJ can occur in the absence of an AVN of the metatarsal head and patients need to be warned of this potential complaining when having the lengthening SCARF *osteotomy* for *metatarsalgia* following a previous shortening *osteotomy* of the 1st ray.

## **MINIMALLY INVASIVE CHEVRON OSTEOTOMY; FUNCTIONAL OUTCOME AND COMPARISON WITH OPEN CHEVRON OSTEOTOMY.**

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Introduction: Symptomatic *hallux valgus* is a common clinical problem, current trends is towards minimally invasive procedures. The goal of this study is to evaluate the outcome of minimally invasive chevron *osteotomy*, comparing it with a matched group who had open chevron *osteotomy*.

Methods: Prospective study, 54 patients. MIS group 25 patients between October 2009 and November 2010. Open group 29 patients between Feb 2008 and October 2010. Inclusion criteria included, mild to moderate *hallux valgus*, no previous history of foot surgery, no history of inflammatory arthritis, or MTPJ arthritis. All the operations were performed by the senior author. Functional outcome and pain were evaluated using pre and post operative Manchester Oxford Foot and ankle questionnaire (MOXFQ). IMA and HVA, avascular necrosis and union were assessed. Complications and satisfaction were recorded.

Results: The MIS group with mean age at operation of 55, showed significant improvement in all the domains of the MOXFQ. Walking ( $p < 0.018$ ), foot pain ( $p = < 0.013$ ), social interaction ( $p = < 0.001$ ). The mean HVA and IMA corrections were  $11.8^\circ$  and  $6.3^\circ$ , ( $p < 0.001$ ). The open group with mean age at operation of 55 years showed significant improvement in all domains of the MOXFQ, walking ( $p = < 0.0001$ ), foot pain ( $p = < 0.002$ ), social interaction ( $p = < 0.0001$ ). The HVA and IMA corrections were  $10.5$  and  $5.9$  degrees respectively ( $p = < 0.001$ ). The improvement in MOXFQ and HVA and IMA corrections were not statistically significant between the MIS and open groups.

Discussion and Conclusion: Our results showed that the MIS chevron *osteotomy* is an effective procedure with minimal complications and satisfactory functional outcome, comparable to the open standard chevron *osteotomy*. Larger sample size is required to confirm our findings.

## **RETURN TO TRAINING AND PLAYING FOLLOWING ACUTE LISFRANC INJURY IN ELITE PROFESSIONAL SOCCER AND RUGBY PLAYERS**

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**Introduction:** Lisfranc joint injuries are increasingly recognised in elite soccer and rugby players. Currently no evidence-based guidelines exist on timeframes for return to training and competition following surgical treatment. This study aimed to see whether return to full competition following surgery for Lisfranc injuries was possible in these groups and to assess times to training, playing and possible related factors.

**Material/Methods:** Over 46-months, a consecutive series of fifteen professional soccer (6) and rugby(9) players in the English Premier/Championship, was assessed using prospectively collected data. All were isolated injuries, sustained during competitive matches. Each had clinical and radiological evidence of injury and was treated surgically within thirty-one days. A standardised post-operative regime was used.

**Results:** Follow-up was obtained in all fifteen cases. Eight cases were ligamentous injuries and seven were bony. Time from injury to fixation ranged from 10-31 days. One athlete retired following a ligamentous injury. All remaining fourteen returned to training and full competition. Excluding the retired case, mean return to training time was 20.2 weeks and to full competition was 25.6 weeks. No significant difference existed between the mean return to competition time for rugby (27.8 weeks) and soccer(24.7 weeks). A significant difference existed between the mean return to competition time for ligamentous (23.7 weeks) compared to bony(27.6 weeks) injuries( $p=0.012$ ). Three patients suffered deep *peroneal* nerve sensation loss, two of which fully recovered.

**Discussion/Conclusion:** Return to competitive elite-level soccer and rugby is possible following surgically treated Lisfranc injuries. Return to training can take up to 24 weeks and playing up to 31 weeks, with bony injuries taking longer. To our knowledge this is the largest series of its kind and whilst we recognise it contains small numbers, we feel it provides some guidance on rehabilitative timeframes for those who treat and those who sustain these injuries.  
Evidence Level: 4

## **TRENDS OF ANKLE PAIN FOLLOWING ANKLE ARTHROPLASTY, THREE YEAR FOLLOW-UP STUDY**

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**Background:** Postoperative pain following (Mobility TM) ankle arthroplasty (AA) is recognised problem. This study aimed to determine pattern of postoperative pain following Ankle arthroplasty (AA).

**Materials and Methods:** In prospective observational study 135 patients who had (AA) and follow-up of 12-36 months were included. AOFAS ankle score, patients' satisfaction, SF36 and diagrammatic mapping of postoperative pain among other parameters were collected preoperatively and postoperatively at 3 months, 6 months and the annually. Patients with AOFAS of < 50 with postoperative ankle pain were examined in details.

**Results:** From total of 135 of patients with follow-up of 12 months, (12.5%)17 patients have low AOFAS score and ankle pain, 11(12.5%) of 85 patients with 2 year follow-up and (10.6%),5 of 47 patients with 3 year follow-up. Most of patients with low AOFAS score during first year have improved but 3 patients. Different group patients developed ankle pain during the second and third year. 3 patients of 5, in year 3 follow-up have medial side ankle pain and 2 lateral; similarly there is more medial sided pain during year 2 review (7 /11). There is more medial sided pain noticed during first postoperative year as well. Lateral pain seems to relate with subtalar joints problems. Medial side pain is less understandable, it might be due to tension in medial ankle ligaments. Our study showed improvement in AOFAS score and pain relief associated with medial ligaments release or medial *malleolus* fracture.

**Conclusion:** There are 10- 13 % of low AOFAS scores following Ankle Arthroplasty with ankle pain. There are emerging evidences explaining postoperative ankle pain. Further studies are required in this field.

## **THE EFFECT OF HINDFOOT DEFORMITY ON FOREFOOT BIOMECHANICS IN PATIENTS WITH ANKLE OSTEOARTHRITIS - A PILOT STUDY**

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The relationship between hindfoot and forefoot kinematics is an important factor in the planning of ankle arthrodesis and ankle arthroplasty surgery. As more severe ankle deformities are corrected, improved techniques are required to assess and plan hindfoot to forefoot balancing.

Gait analysis has previously been reported in patients with ankle arthritis without deformity. This group of patients have reduced intersegment motion in all measured angles. We have looked at a small group of patients with hindfoot deformity and ankle arthritis awaiting fusion or replacement.

Using the Oxford Foot Model we have assessed lower limb kinematics with a focus on hindfoot to forefoot relationships. The results of our pilot study are in variance to previous studies in that we have shown that in the presence of hindfoot/ankle deformity, the forefoot range of motion increases. We feel that these data may impact on surgical planning.