



# BRITISH ORTHOPAEDIC FOOT & ANKLE SOCIETY

**Annual Scientific Meeting**



**4<sup>th</sup> - 6<sup>th</sup> November 2009**  
**Beaumont House, Windsor**

## PROGRAMME - at a glance

### Wednesday

- 09.05 Symposium: Pes cavus
- 11.00 Coffee, biscuits, trade exhibition
- 11.30 Free papers 1
- 12.30 Guest Lecture: Tumours of the foot and ankle
- 13.00 Lunch and trade exhibition
- 14.00 Symposium: Hindfoot arthrodesis
- 16.15 Tea, cake, trade exhibition
- 16.45 Free papers 2
- 18.00 Adjournment

### Thursday

- 08.00 Coding and Joint Registry
- 09.00 Symposium: The Adult Flat Foot
- 10.30 Coffee, biscuits, trade exhibition
- 11.00 Case discussions on Adult Flat Foot
- 11.00 Problem cases: X-ray discussion
- 11.00 Workshops (*Depuy, Ortho Solutions, Synthes*)
- 13.00 Lunch and trade exhibition & Workshop (*EJO*)
- 14.15 Guest Lecture: MRI of forefoot disorders
- 14.45 Symposium: Metatarsalgia
- 16.00 Tea, cake, trade exhibition
- 16.30 Free papers 3
- 17.45 Eponymous names around the foot & ankle
- 19.15 Cocktail reception - Old Chapel, Beaumont House
- 20.00 The BOFAS Annual Dinner, Hanover Suite

### Friday

- 08.30 Website discussion
- 09.00 Hallux rigidus
- 09.30 Symposium: Lesser toes
- 10.45 Coffee, biscuits, trade exhibition
- 11.15 Guest Lecture: Iatrogenic Nerve injuries
- 11.45 Free papers 4
- 13.00 Lunch and trade exhibition
- 14.00 BOFAS AGM
- 15.30 Close





# BRITISH ORTHOPAEDIC FOOT & ANKLE SOCIETY

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**4<sup>th</sup> – 6<sup>th</sup> November 2009**

## Welcome



Foot and ankle surgery had been called a Cinderella sub-speciality only 2 decades ago; it turns out that it was a sleeping beauty which has been kissed! Our speciality and our society are both expanding very rapidly and over 300 delegates are expected at our annual scientific meeting in 2009. I have chosen Beaumont House because it has a large enough conference room, adequate facilities for our sponsors from industry and enough rooms to accommodate most of us on-site. We remain a very sociable society and our annual meeting is the ideal opportunity to share a meal and a drink with our old buddies and make new friends.

Organising our annual meeting has become a major undertaking since the days when 40 people met at the local postgraduate centre and I would like to thank all who have helped me - they are too numerous to mention individually here. A special thank you goes to Viv Geary who has put together an exciting program for our partners with visits to Windsor Castle, Eton and the Savill Gardens planned.

Regrettably, the scientific committee was only able to accept a quarter of the abstracts submitted for podium presentation, with another quarter accepted for poster presentation. The quality of scientific research undertaken by junior members of our expanding sub-speciality is impressive and needs to be nurtured. The scientific and education committees have continued to encourage our colleagues from the allied professions to attend our annual meeting and have put together a multidisciplinary day where we can learn from each other.

It is with great pleasure that I welcome you to our meeting in 2009 and hope that the meeting has something of interest and educational value for every delegate. I would like to thank our distinguished faculty of invited speakers and chairpersons who have generously agreed to share their wealth of knowledge and experience. We have arranged lectures, symposia, workshops and case discussions on pes cavus, hindfoot arthrodesis, adult flat feet, hallux rigidus, metatarsalgia, lesser toe disorders, tumours, nerve injuries to name but a few. Early bird symposia on the ankle arthroplasty register, coding and the website will complement the science of our meeting. We also have a lecture on the history behind some of the eponymous names in foot and ankle surgery.

Royal Windsor and Runnymede are deeply anchored in history but I hope that you and take away a renewed sense of camaraderie within our society – which has a bright future ahead.

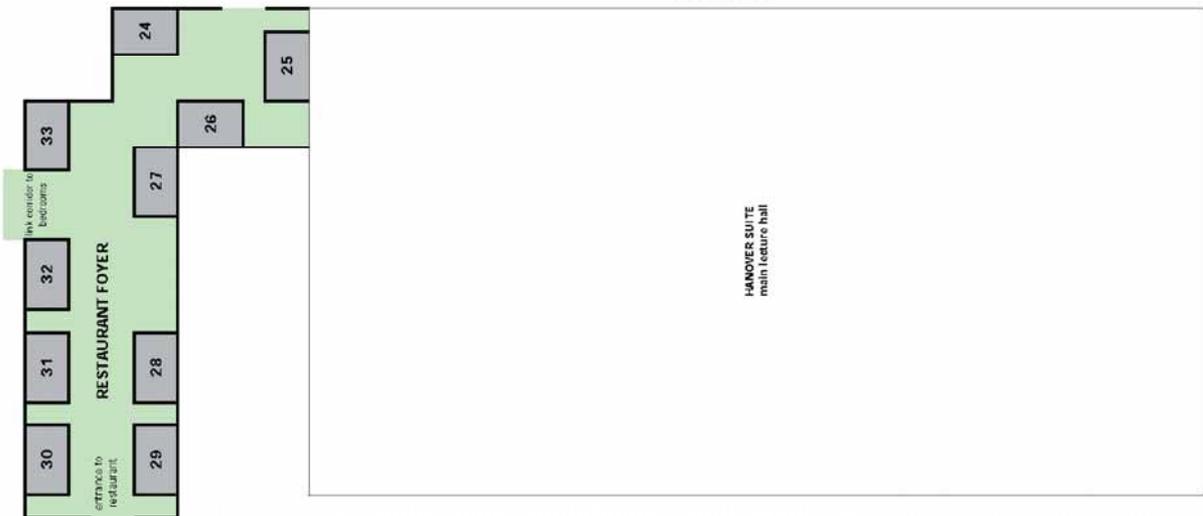
**Dishan Singh**  
President BOFAS

# Beaumont House

Lecture hall - Hanover Lounge

Trade exhibition areas – Hanover Suite, Beaumont Suite & Restaurant Foyer

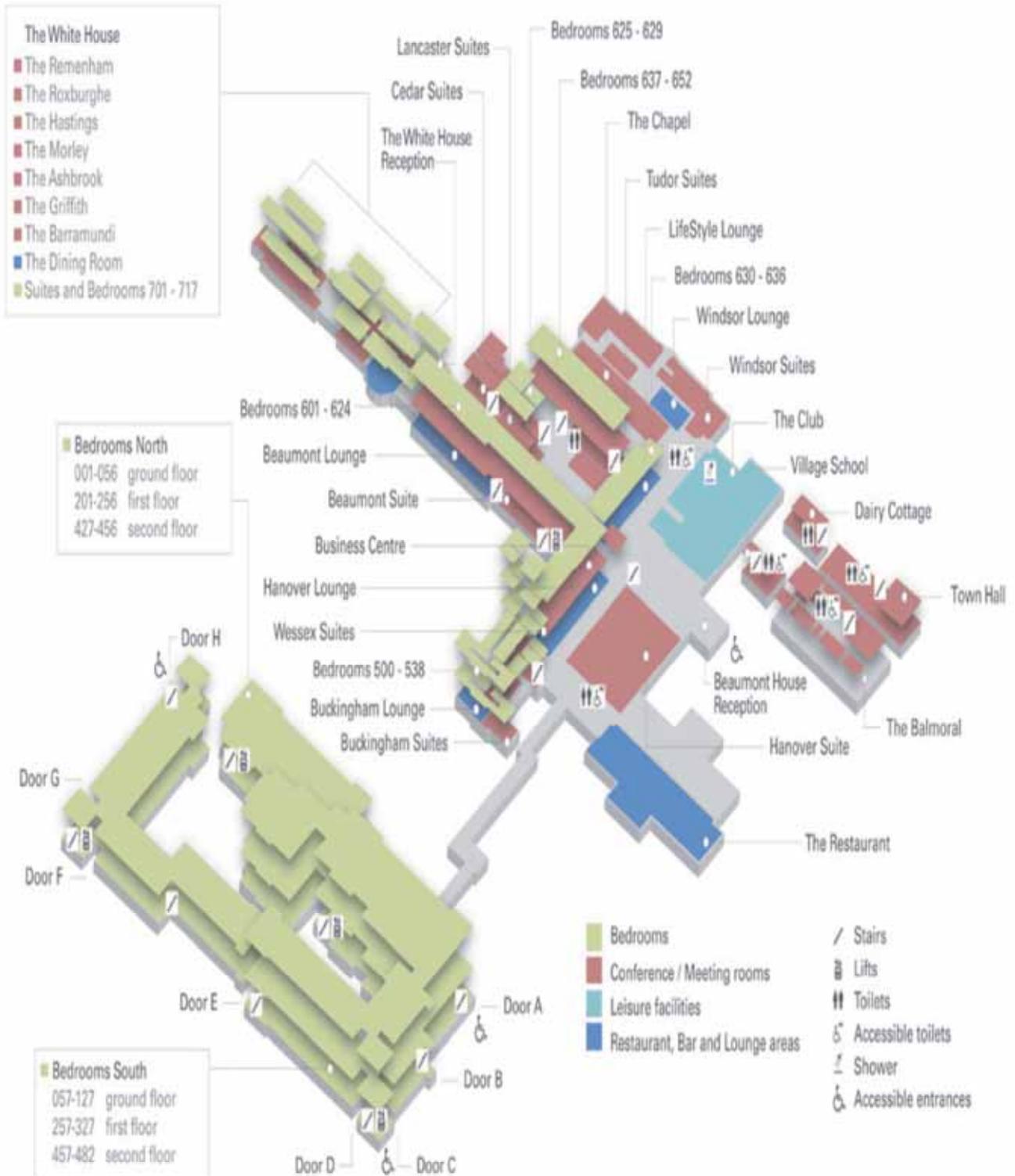
## TRADE EXHIBITION AREAS



### LOCATION OF TRADE STANDS

Stand No.	Location	Company Name
1	Hanover	Accumed
2	Hanover	Artifex
3	Hanover	Artifex
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# Beaumont Estate Site Plan



# **PARTNERS' PROGRAMME**

## **Wednesday - 4<sup>th</sup> November**

Depart at 9.30am

Morning Visit to Windsor Castle with a Blue Badge Guide

Lunch Carluccio's

Afternoon Further sightseeing & shopping

Evening Corporate hospitality

## **Thursday - 5<sup>th</sup> November**

Depart at 9.30am

Morning Visit to the "Savill Garden" with guided tour of plant collections

Lunch Leiths in the new award winning Savill Building

Afternoon Further exploration of the garden, visits to the gallery and, weather permitting, a walk in Windsor Great Park.

Evening The BOFAS Annual Dinner

## **Friday - 6<sup>th</sup> November**

Depart at 9.30am

Morning Walking tour of Eton & visit to Eton College

Lunch Gilbeys and at 13:30 an hour's guided visit to Eton College.

Afternoon Guided visit to Eton College

Finish 15.00



# BRITISH ORTHOPAEDIC FOOT & ANKLE SOCIETY

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4<sup>th</sup> – 6<sup>th</sup> November 2009

## Programme

## PROGRAMME

Wednesday, 4<sup>th</sup> November

08.00 Registration

09.00 Welcome by Mr Dishan Singh, President BOFAS

### Symposium: Pes cavus

Chairmen: Mr P Cooke & Mr S Hepple

- |       |                                      |                  |
|-------|--------------------------------------|------------------|
| 09.05 | Anatomy & biomechanics of hindfoot   | Jan Louwerens    |
| 09.25 | Conservative management of pes cavus | Michael Stephens |
| 09.40 | Surgical management of pes cavus     | Wolfram Wenz     |
| 10.10 | Case discussions                     | All panel        |
| 11.00 | Coffee, biscuits & trade exhibition  |                  |

### Free Papers

Chairmen: Mr S Henderson & Mr A Henderson

- |       |   |  |
|-------|---|--|
| 11.30 | The epidemiology of foot injuries in professional rugby union<br><b>Pearce C, Brooks J, Kemp S, Calder J</b><br>Basingstoke and North Hampshire NHS Foundation Trust  |  |
| 11.37 | Static and dynamic analysis of foot structure in athletes sustaining Jones stress fractures<br><b>Nyska M, Ifthach H, Gideon M, Moshe A</b><br>Meir Medical Centre, Israel                                  |  |
| 11.44 | Operative treatment of stress fractures of the fifth metatarsal in elite professional footballers<br><b>Tansey C, Parsons S, Hodkinson J</b><br>Wrightington Hospital, Wigan                                |  |
| 11.51 | Ankle arthroscopy: is pre-operative marking of the superficial peroneal nerve important?<br><b>Suzangar M, Rosenfeld P</b><br>St Mary's Hospital, London  |  |
| 11.58 | Early results of posterior ankle arthroscopy for hindfoot impingement: experience from a District General Hospital<br><b>Sandiford N, Weitzel S</b><br>St Mary's Hospital, Sidcup                           |  |
| 12.15 | Is there a learning curve in foot and ankle surgery?<br><b>Walton R, Theodorides A, Molloy A, Melling D</b><br>University Hospital Aintree  |  |
| 12.12 | Patient satisfaction in foot and ankle surgery – the most useful patient reported outcome measure?<br><b>Oddy MJ, Jones S, Flowers MJ, Davies MB, Blundell CM</b><br>Sheffield Teaching Hospitals NHS Trust |  |
| 12.19 | Proximal medial release of the gastrocnemius in the treatment of recalcitrant plantar fasciitis<br><b>Abbassian A, Kohls-Gatzoulis J, Solan M</b><br>Royal Surrey County Hospital, Guildford                |  |
| 12.26 | Major complications following foot and ankle surgery – analysis using national hospital episode statistics<br><b>Jameson S, James P, Oliver K, Townshend D, Reed M</b><br>Northumbria Healthcare NHS Trust  |  |

## Guest Lecture

Chairman: Mr J Angel

12.33 Tumours of the foot and ankle Prof Tim Briggs

13.00 Lunch and trade exhibition

## Symposium: Hindfoot arthrodesis

Chairmen: Mr K Hariharan & Mr M Davies

14.00 Biology of bone regeneration Prof David Marsh

14.15 How to achieve union Dishan Singh

14.25 How to assess union Michael Coughlin

14.35 Arthroscopic versus open arthrodesis Ian Winson

14.50 Discussion

15.10 Hindfoot arthrodesis and tendon transfer Michael Stephens

15.20 Arthrodesis with external fixation Sunil Dhar

15.30 Correction of severe hindfoot deformity Wolfram Wenz

15.50 Discussion/ cases

16 15 Tea, cake & trade exhibition

## Free Papers

Chairmen: Mr M Hennessy & Mr M Davies

16.45 Coding issues in foot and ankle surgery

**Barrie JL, Taylor P**

East Lancashire Foot and Ankle Service

16.52 HRG4 codes – does surgeon input improve coding accuracy and optimise trust income in foot and ankle surgery.

**Dunning M, Taylor H**

Royal Bournemouth Hospital

16.59 The importance of getting coding right in foot and ankle surgery. An audit of current practice in our unit

**Hamilton P, Piper-Smith J, Singh S, Jones I**

Guy's Hospital, London

17.06 Arthroscopic and open ankle fusion in haemophiliacs - a tale of two cities

**Butler M, Cooke PH, Dheerendra S, Goddard NJ, Goldberg A, Sharp RJ, Ward NJ**

Nuffield Orthopaedic Centre, Oxford

17.13 Pinching from the Shoulder? Use of PHILOS plate or blade plate as a fixed angle device for complex Tibiotalar and Tibiotocalcaneal Fusion

**Pradhan R, Rosenfeld PF**

St Mary's Hospital, London

17.20 Hindfoot arthrodesis: effect of early weight bearing on union rate. One to six-year follow-up

**Hajipour L, Allen PE**

Leicester General Hospital

- 17.27 **A comparison of two night ankle-foot orthoses used in the treatment of plantar fasciitis.**  
**Attard J, Singh D, Cullen N, Gemmell E, Cooper K, Smith K**  
Royal National Orthopaedic Hospital, Stanmore
- 17.34 **Radiological diagnosis of degenerate change of the subtalar joint: a study comparing the reported degree of osteoarthritis in a plain radiograph when compared with a CT scan**  
**Day M, Topliss CJ**  
Swansea Hospital, Morriston
- 17.44 **The Use of Thrombophylaxis for Total Ankle Replacements**  
**Townshend D, Lovell B**  
The Freeman Hospital, Newcastle upon Tyne
- 17.51 **The distal branches of the sural nerve and their relationship to the bony landmarks of the lateral part of the foot**  
**Baird EJ, Fogg QA, Clayton RAE, Sentil Kumar C, Patterson P**  
Glasgow Royal Infirmary
- 17.58 **Popliteal nerve block for hind foot surgery in a DGH setting**  
**Sampathkumar K, Irby S, Williamson D**  
Great Western Hospital NHS Foundation Trust, Swindon
- 18.05 **Adjournment**
- 19.00 **Corporate Hospitality**

## Thursday, 5<sup>th</sup> November

08.00 Registration

### Early Bird Symposium

Chairman: Mr F Robinson

08.00 Coding

Trish Allen

08.30 Joint registry

Paul Cooke & Andy Goldberg

### Symposium: The Adult Flat Foot

Chairmen: Mr S Henderson & Mr C Walker

09.00 Anatomy and pathology

Hans Trnka

09.15 Classification, Clinical Disability

Steve Parsons

09.30 Orthotic management

Jim Barrie, Kerry Longrigg  
& Tracey Middleton-Duff

09.45 Management with physiotherapy

Ingrid Traynor

10.00 Surgical management

Michael Coughlin

10.15 Discussion

10.30 Coffee, biscuits & trade exhibition

### Breakout Sessions

11.00 Case discussions on adult flat foot  
Chairmen: Mr D Singh & Mr F Robinson

Multidisciplinary approach  
**Venue: Hanover Suite**

Panel as morning session

11.00 Problem cases: Xray discussion  
**Venue: Buckingham 4**

Trish Allen, Paul Cooke  
& Alistair Henderson

11.00 Workshops

	<b>Depuy</b>	<b>Orthosolutions</b>	<b>Synthes</b>
<b>Time/Room</b>	<b>Wessex 10 &amp; 11</b>	<b>Wessex 4 &amp; 5</b>	<b>Windsor 7</b>
11.00 –12.00	Distal Tibia plating - Nick Harris	Foot plating - Nick Geary	IM nailing - Ian Winson (1 hour)
11.30 - 12.00		IM nailing - Bob Sharpe	
12.00 - 13.00	Distal Tibia plating - Nick Harris	Foot plating - Nick Geary	IM nailing - Ian Winson (1 hour)
12.30 - 13.00		IM nailing - Bob Sharpe	

13.00 Lunch and trade exhibition, **Aircast Workshop (Wessex 6)** & Poster viewing

## Guest Lecture

Chairman: Mr D Singh

14.15 MRI of forefoot disorders Paul O'Donnell

## Symposium: Metatarsalgia

Chairmen: Mr A Sakellariou & Mr S Bendall

14.45 Metatarsalgia with callosities  
Case discussions Jan Louwerens  
Nilesh Makwana & panel

15.15 Metatarsalgia without callosities  
Case discussions Hans Trnka  
Matt Solan & panel

16.00 Tea, cake & trade exhibition

## Free Papers

Chairmen: Mr B Harries & Mr D Robinson

16.30 Ultrasonography in the diagnosis of ankle and foot fractures presenting to the emergency department  
Canagasabay MD, Callaghan M, Carley S  
Manchester Royal Infirmary

16.37 Radiographic evaluation of the distal tibiofibular syndesmosis  
Shah AS, Kadakia AR, Tan GJ, Karadsheh MS, Sabb B  
University of Michigan Hospitals

16.44 Ankle Tightrope syndesmosis fixation: a review of 38 cases.  
Gadd RJ, Storey PA, Davies MB, Blundell CM  
Sheffield Foot and Ankle Unit

16.51 Pragmatic treatment of fractures of uncertain stability: clinical features and risk of displacement  
Akhtar S, Fox A, Barrie J  
East Lancashire Foot and Ankle Services

16.58 A prospective comparison study assessing a patient centered home therapy program for unstable ankle fractures  
Martin R, Hartlet R, Rajagopalan S  
Poole Hospital

17.05 Preliminary results of closed reduction of intra-articular calcaneal fracture with Ilizarov frame  
El-Mowafi H, Refai M  
Mansoura University Hospital, Egypt

17.12 Association between glycosylated hemoglobin and the risk of lower extremity amputations in diabetes mellitus – review and meta-analysis  
Adler A, Erqou S, Lima TAS, Robinson AHN  
Cambridge University Hospitals NHS Trust

17.19 Long term dynamic function of tibialis posterior tendon following Cobb procedure and Rose calcaneal osteotomy for pes planus  
Malek IA, Sumroo T, Fleck R, Siddique M.  
Freeman Hospital, Newcastle upon Tyne

17.26 Management of early tibialis posterior dysfunction by structured physiotherapy  
Dhukaram V, Hyde AK, Best A  
University Hospital Leicester



## Friday, 6<sup>th</sup> November

08.00 Registration

08.30 Website discussion

Nick Geary

### Guest Lecture

Chairman: Mr C Walker

09.00 Hallux rigidus

Michael Coughlin

### Symposium: Lesser toes

Chairmen: Ms B Scammell & Mr J Ritchie

09.30 Claw toes and hammer toes

Jan Louwerens

09.40 Instability of the metatarsophalangeal joint

Michael Coughlin

10.00 Iatrogenic floppy lesser toe

Jim Barrie

10.10 Case discussion

Nick Cullen & panel

10.45 Coffee, biscuits & trade exhibition

### Guest Lecture

Chairman: Mr N Cullen

11.15 Nerve injuries of the foot & ankle:  
the neglected orphan

Prof Rolfe Birch

### Free Papers

Chairmen: Ms P Allen & Prof N Maffulli

11.45 The basal opening wedge osteotomy for hallux valgus: does it work?

Shah AB, Parmar R, Ormerod G, Barrie J, Zubairy AI, Shah AB  
East Lancashire NHS Trust

11.52 The treatment of the hallux valgus with a percutaneous chevron osteotomy

Vernois J  
Sussex Orthopaedic NHS Treatment Centre

11.59 Early experience with a minimally invasive modified chevron & Akin osteotomy for hallux valgus

Redfern D, Gill I, Harris M  
Brighton & Sussex University Hospitals

12.06 Hammer toe correction: a comparative study of K wire versus bioabsorbable fixation

Malek I, Torres P, Soomro T, Siddique M  
Freeman Hospital, Newcastle upon Tyne

12.13 Relationship between functional foot orthotic use and ankle proprioception

Akrawi H, Bolland BJ, Healey M, Savva N, Bowyer GW  
Southampton University Hospitals NHS Trust

12.20 Comparison of 1st MTPJ fixation between Hallu-fix plate and ACE screws

Cheung W, Robb C, Prem H  
Royal Orthopaedic Hospital, Birmingham

- 12.27 **Imaging plantar plate tears in lesser metatarsophalangeal joints: MRI vs ultrasound arthrography**  
**Barrie J, Khan S, Enion D, Dodds N**  
East Lancashire Foot and Ankle Service
- 12.34 **Lesser Metatarsophalangeal Instability: A cohort study of clinical features and outcomes**  
**Peck CN, MacLeod A, Barrie J**  
East Lancashire Foot and Ankle Service
- 12.41 **Proximal interphalangeal joint fusion with Stay Fuse**  
**Fazal MA, Williams RL**  
Princess Grace Hospital, London
- 12.48 **The plantar approach to the foot: a new surgical approach for tarsometatarsal joint surgery**  
**Clayton R, Mullen M, Baird E, Patterson P, Fogg Q, Kumar S**  
Department of Orthopaedic Surgery, Glasgow Royal Infirmary and Department of Human Anatomy, Glasgow University
- 12.55 **Results of tarso-metatarsal joint fusion using a low profile locking plate**  
**Kulkarni A, Soomro T, Siddique M**  
The Freeman Hospital, Newcastle upon Tyne
- 13.02 **Lunch & trade exhibition**
- 14.00 **BOFAS Annual General Meeting**
- 15.00 **Travelling Fellowship Reports**  
Chairmen: **BOFAS Education Committee**
- Amit Amin  
Michael Karski  
Anthony Perera
- 15.15 **Prizes for best papers and best posters**  
Chairmen: **BOFAS Scientific Committee**
- 15.25 **Handover to Mr Sunil Dhar, President Elect**
- 15.30 **Close**



# **BRITISH ORTHOPAEDIC FOOT & ANKLE SOCIETY**

**Annual Scientific Meeting**

**Invited Speakers' Abstracts**

# **Anatomy & biomechanics of hindfoot**

**Jan Willem Louwerens**

Chief Foot and Ankle Service

St. Maartenskliniek

Nijmegen, The Netherlands

This presentation will focus on the normal functional anatomy and at the same time a bridge will be made towards the consequences regarding the pathophysiology and also the treatment options of the cavovarus foot. Thus, the title of this presentation might better be "Functional Anatomy of the Hindfoot". And, to be more precise, "in relation to Pes Cavus" should be added.

A number of theses have been published at the University of Leiden in The Netherlands under supervision of the anatomist professor Anthony Huson in the period 1960 – 1985 concerning the functional anatomy of the hindfoot. These describe and examine the coupling between the lower leg and the talus, the so-called "Tarsal Mechanism". Understanding of this mechanism can help to understand the changes of the hindfoot and also the operative treatment options in patients with cavovarus deformity. The key joint to correct is the talonavicular joint. When this joint is too stiff correction of alignment is best performed by means of tarsal fusion. Realignment can most often be achieved without any resection of bone or with minimal resection reducing the joints through translation and rotation.

Not only the tarsal mechanism, but also the tarsometatarsal mechanism and the metatarsophalangeal mechanism are of importance. In fact in patients with CMT most often the primary changes involve the forefoot and midfoot. Deformity of the forefoot has an impact on the hindfoot and conversely correction of hindfoot deformity should most often be combined with correction of the midfoot and forefoot.

The role of the typical muscle imbalance in patients with CMT in creating cavovarus deformity is discussed, as well as the use of tendon transfers. The plantar aponeurosis has a role in the above-mentioned mechanisms and from a functional anatomic point of view cutting this structure has a doubtful place in reconstructive surgery of the cavovarus foot.

# Conservative management of pes cavus

## Michael M Stephens

Associate Clinical Professor & Consultant Orthopaedic Surgeon  
Mater Misericordiae University Hospital, Cappagh National Orthopaedic Hospital &  
Children University Hospital, Dublin, Ireland

### Introduction

The goals of treatment are to normalise ground reaction to the sole of the foot, having a foot in good alignment by improving the hindfoot to forefoot relationship based on a neutral subtalar joint position in midstance and to retain range of movement. The degree of correction is dependent on the degree of flexibility of the deformity. When the deformity is fixed accommodative orthoses are required which may have to extend to below the knee with significant associated neurological deficits.

### Normal Foot Alignment

Assessment is made of the relationship of the forefoot to the hindfoot with the talo-navicular joint in the neutral position i.e. where it should be in midstance of the gait cycle. In this position the relationship of the hindfoot to the forefoot is assessed. In the pes cavus with the heel in the neutral position there is forefoot valgus, forefoot is everted in relation to the hindfoot. Its flexibility is assessed by the Coleman block test and the forefoot is assessed to clearly document the driving force of the heel varus. This can be either:

- (1) A plantar flexed first ray
- (2) A forefoot valgus.

The former has the typical tripod weight bearing with callus underneath the first and fifth metatarsal heads and at the heel. For the latter there is still callus at the heel but there is a diffuse callus across the whole forefoot.

### Management

Control of the heel is therefore undertaken by using an orthotic insole device that controls the forefoot. In the case of the plantar flexed first ray it is a lateral forefoot post with a "cut out" for the first ray and for a forefoot valgus or eversion it is a lateral forefoot wedge. The heel cannot be controlled by a lateral wedge to bring it out from varus because the heel just slides off the wedge. Further control of the heel can be aided by the use of a heel cup. In this way the arc of movement of the subtalar joint is moved from a pure inversion range to a combined inversion and eversion range. This management is standard treatment for the flexible or partially flexible deformity.

When there is a complete fixed rigid and uncorrectable deformity the insole has to be accommodative and should incorporate shock absorption as these are all stiff. If there are secondary changes in the ankle joint which tends to go into inversion then an inner iron and outer T strap will give stability to the ankle.

When there is a severe neurological deficit, for example, with a dropped foot and no dorsiflexion an insole will not be appropriate but the orthotic device will have to extend up to behind the knee in the form of an ankle foot orthosis (AFO) with the foot plate adjusted appropriately to the forefoot position.

# Surgical management of pes cavus

**Wolfram Wenz**

Head of the Division of Paediatric Orthopaedics and Foot Surgery  
University of Heidelberg, Germany

The cavus-foot is characterized by increased plantar flexion of the forefoot and midfoot in relationship to the hindfoot.

Charcot-Marie-Tooth disease (CMT) is the most common cause of cavovarus foot deformity. A 2006 study reported that 116 of 148 children (78%) (mean age, 10 years; range, 3 to 18 years) with bilateral cavovarus deformity had CMT.

The cavovarus foot is one of the most perplexing and challenging of all foot deformities and may prove to be one of the most difficult conditions to treat.

Patients with CMT most commonly present for treatment because of ankle and foot deformities and weakness, painful callosities, difficulty with shoe wear, and ankle instability. The foot deformity in CMT is characterized by a combination of hindfoot varus (subtalar), forefoot equinus (cavus), and plantar flexion of the first metatarsal, which can result in forefoot valgus.

The signs of distal wasting and a proximal sparing pattern of muscular atrophy are typical characteristics of the disease and result in an “inverted champagne bottle” appearance in the lower limbs. Typically, symmetric bilateral involvement occurs, first in the intrinsic foot muscles, followed by the peroneal muscle group, the extensor group (anterior tibial muscle and long toe extensors), and lastly by the calf muscles and the posterior tibial muscle. Usually, early drop foot occurs because of weakness of the anterior tibialis muscle, which may be compensated for or substituted by the long toe flexors in patients with remaining function. During ambulation, this extensor substitution pattern is seen mainly in the swing phase of the gait cycle. Another common problem encountered during ambulation is caused by the varus component of the hindfoot, which affects stance phase stability by increasing the tendency for ankle twisting. Dorsiflexion also may be limited by bony impingement of the talus and the anterior aspect of the tibia, or by a hindfoot equinus component (often caused by short calf muscles).

The pathogenesis of cavovarus deformities in CMT can be attributed to the imbalance between the strong peroneus longus and weak anterior tibialis muscle couple, and strong tibialis posterior and weak peroneus brevis couple.

Although the calf muscles, posterior tibialis muscle, and the long toe flexors are spared in the early stages of the disease, the dorsiflexors (anterior tibialis muscle, long toe extensors, and the peroneus tertius muscle) and the everters (long and short peroneal muscles) of the foot show early involvement. The muscular imbalance between the peroneus brevis and the posterior tibialis muscles leads to a medial shift of the talonavicular and the calcaneocuboid complex and locks the subtalar joint in supination. At the same time, the weakness of the anterior tibialis muscle and the concomitant relative overactivity of the peroneus longus muscle force the forefoot into increased pronation. The increased plantar flexion of the first metatarsal bone (resulting from forefoot pronation) augments hindfoot inversion during standing or during the stance phase of walking. Severe hindfoot varus stresses the ankle joint and causes lateral opening in situations of prostrated compensation. The loss of activity in the short foot muscles leads to claw toes, which are augmented by extensor substitution.

Because of a weak anterior tibial tendon that leads to drop foot, the long toe extensors are activated to compensate for this deficiency (extensor substitution). The toes are hyperextended in the metatarsophalangeal joints. At the same time, the long toe flexors pull the end phalangeal bone into plantar flexion, leading to claw toes. The higher the muscular imbalance, the broader is the resulting foot deformity. All components of the cavovarus foot in Charcot-Marie-Tooth disease are flexible in the early stage of the disease and become rigid after a period of years.

In the Orthopaedic University Hospital Heidelberg we treated more than 600 patients with CMT-associated foot-deformities and over the past years the concept of surgical treatment was continuously improved.

We recommend a 4-step surgical-procedure:-

1. Prepare Tendon-Transfers
2. Correct Hindfoot
3. Correct 1st MT
4. Fix all Tendon-transfers

Consisting of more or less the following operative techniques:

- Complete/split posterior tendon transfer (personal modifications)
- Plantar fascia release (Dieffenbach/Steindler)
- Great toe procedure (Jones)
- Double or Beak triple arthrodesis (Chopart´or Lambrinudi)
- Base of the first metatarsal osteotomy

The Heidelberg concept of decision-making, surgical treatment and results are demonstrated by the use of clinical examples.

## **Guest Lecture: Tumours of the foot and ankle**

### **Tim Briggs**

Consultant Orthopaedic Surgeon

Sarcoma Unit

Royal National Orthopaedic Hospital, Stanmore

According to the latest literature, the author reports epidemiological data, clinical observations, radiographic features and diagnostic findings of common benign and malignant bone (enchondroma, osteoid osteoma, fibrous dysplasia, adamantinoma, osteochondroma, osteosarcoma, Ewing's sarcoma) and soft tissue (lesions of neural origin e.g. Morton's Neuroma, lesions of fibrous origin e.g. plantar fibromatosis, lesions of degenerative origin e.g. ganglion cyst, lesions of fat origin e.g. lipoma, lesions of synovial origin e.g. synovial chondromatosis, PVNS, synovial sarcoma) tumours of the foot.

Based on the experience at the Sarcoma Unit of the Royal National Orthopaedic Hospital, observations are made on biopsy, principles of staging and treatment indications and options.

Emphasis is placed on the value of various diagnostic modalities used preoperatively for staging and the adequacy of treatment rendered using current tumour surgery principles.

# The biology of bone regeneration

**David Marsh**

Professor of Clinical Orthopaedics  
Institute of Orthopaedics and Musculoskeletal Science, UCL  
Royal National Orthopaedic Hospital, Stanmore  
International Ambassador for the Bone and Joint Decade

Most of our understanding of how fractures heal has come from experimental models of diaphyseal fracture, for the simple reason that the measurement of stiffness (the gold standard index of healing) is impractical in metaphyseal models. However we often wish to apply our understanding to situations of cancellous healing, such as metaphyseal fractures and arthrodesis. Caution is therefore needed in applying the classical healing sequence.

In any case, fractures can heal in a variety of ways depending on the mechanical environment. In both cortical and cancellous bone, an environment of rigid immobilisation of well-apposed bone ends leads to healing by the process normally dedicated to homeostasis in intact bone – coupled osteoclastic resorption and osteoblastic bone formation. The initiating role of osteoclasts in this healing mode should make us think twice about the administration of bisphosphonates for secondary fragility fracture prevention. Micromotion between bone ends, or a gap, lead to healing by callus formation, usually involving endochondral ossification. A special case of bone regeneration is distraction osteogenesis, which bears more resemblance to intramembranous ossification.

Osteoporosis and ageing go hand-in-hand and the contribution of each factor to the difficulties we encounter in treating fragility fractures is unclear. Probably the biological deficiency owes more to ageing (which seems to deplete both stem cells and growth factors), but is complicated by the challenges of holding the fracture over a prolonged healing time when the material properties of the bone are inferior, due to osteoporosis.

Failure of healing can be due to many possible combinations of mechanical and biological factors. It seems logical to apply first principles to try to analyse each case and provide tailored treatment strategies, incorporating a combination of cells, molecules and fixation methods. This line of thought will be taken further in the next talk.

## How to achieve union

### Dishan Singh

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Arthrodesis is a surgical procedure to eliminate motion in a joint by providing a bony fusion. Two types of arthrodeses are routinely done: intra-articular and extra-articular. Dowel arthrodeses are rarely used. In order to accomplish successful arthrodesis, it is necessary to optimise the patient's condition prior to this elective procedure.

Planning of an arthrodesis is as important as planning an osteotomy. Correct alignment should be obtained from proximal to distal in the limb. When surgically approaching a joint on which arthrodesis is to be performed, the surgeon must handle all surrounding soft tissues and especially tendons with great care. It is important that tendons spanning the joint continue to function normally, since joints below the arthrodesis will have to function as well as possible to compensate for the loss of motion at the arthrodesed site.

To best accomplish arthrodesis of a joint, all articular cartilage must be removed to a level of bleeding cancellous subchondral bone. Joints with deep joint contours may be debrided of cartilage and allowed to remain with naturally stable geometry.

The angle of arthrodesis must approximate the normal anatomical position. It must be remembered that if significant portions of bone ends are removed, the expected angle of arthrodesis must be extended to compensate for bony loss, or the limb may be too short to function well.

Following proper joint positioning, internal fixation devices should be inserted to ensure joint stability during the period of bony union. If normal joint contours have not been used, autogenous cancellous bone should be interposed between the bony surfaces and also placed along the hidden surface of the joint prior to placement of the internal fixation. All types of conventional internal and external fixation can be and have been used for arthrodesis fixation. The desired end result is rigid fixation, regardless of type of fixation used.

Following completion of surgery, the limb must be placed in additional rigid external fixation until radiographic evidence of bony union. Failure to do so is likely to result in metal loosening or arthrodesis failure. Since the joint is being arthrodesed at a normal angle, the biomechanical forces of unprotected weight bearing will tend to bend the joint, cycle the metal, and result in failure.

# Assessment of healing in hindfoot arthrodeses

**Michael J Coughlin**

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Assessment of healing in hindfoot arthrodeses is a specifically important topic because of the occasional hindfoot nonunions that develop after surgical intervention. There is poor correlation with symptoms and radiographic views. The clinical presentation of a hindfoot nonunion often includes swelling, pain with stress examination, and continued pain with ambulation. Radiographs are notoriously difficult to interpret. Loose hardware is uncommon and broken hardware is seldom seen. Radiographs may indeed appear to show a successful arthrodesis. In our study, interestingly, the radiographs demonstrate a much higher rate of radiographic unions than the CT scan. One of the questions that develops is whether spot welds of the joint may be sufficient to call it "healed or fused".

The technique we developed that has been adopted by the FDA in the U.S. utilizes AP, lateral and Broden's views, but in each case a CT scan is performed as well. A caliper is used to measure the magnitude of joint arthrodesis. CT scans using 2mm slices were routinely used. The amount of arthrodesis is measured after eliminating areas of artifact and non-contact areas.

Subtalar arthrodesis occurred more quickly in a patient with a triple arthrodesis than with an isolated subtalar fusion. There is no correlation between radiographs and CT scans. We still have difficulty in defining what is the magnitude of joint arthrodesis necessary to call an arthrodesis successful. We have defined this as > 50% of the joint surface fused based on our experience with subtalar coalitions. In these cases, if one has greater than a 50% coalition with a plantar-grade foot, it is typically not painful.

Questions that remain are how long should a patient be kept non-weight bearing and at which point can immobilization be discontinued. In this study, we initiated weight bearing at 6 wks after surgery with an arthrodesis level of 22% and discontinued casting at 12 wks when the fusion was 35 -55% completed. These subtalar arthrodeses continued to heal even after weight bearing was initiated and cast immobilization was discontinued.

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# **Hindfoot and ankle arthrodesis: arthroscopic versus open techniques**

**Ian G Winson**

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Arthroscopic Ankle Arthrodesis has a substantial literature behind it as a technique for fusing the ankle. It has a low complication rate and high efficacy. In comparison, open ankle arthrodesis does appear from the literature to have a higher complication rate. As such the question is possibly not open versus arthroscopic techniques but where the limits of arthroscopic techniques lie. Open surgery has also improved from a technical point of view over the last twenty years but is likely to have a complication rate greater than Arthroscopic techniques (providing it is actually possible to undertake the surgery).

As with all foot and ankle surgery it is necessary to have the attitude that an algorithm of management is going to maximise the benefit to patients

There are now papers describing arthroscopic subtalar, tibial-talo-calcaneal and triple arthrodesis. Though the indications are described, which cases were not done arthroscopically and why during the same period in the same unit are not described.

Cases likely never to be suitable for arthroscopic techniques are those where there is effectively no cavity to enter, where deformity is fixed and when there is a need for a simultaneous corrective osteotomy and fusion. Arthroscopic fusion is also contra-indicated when there is a major bone defect of sufficient size and shape that it requires attention on its own merits.

Arthroscopic Techniques are going to grow in their application but we need to remain objective about the true results not just low complication rates.

# Hindfoot fusion and tendon transfer

## Michael M Stephens

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### Introduction

The use of a tendon transfer at the same time as a hindfoot fusion is not commonly required. However there are specific indications where it has a major influence for the long term successful outcome. Conversely if the situation is not recognised and it is not carried out a sound triple arthrodesis may functionally fail.

### Indications

There are certain specific indications where the combined use of a tendon transfer with a fusion is very beneficial. These are as follows:-

1. Neurological deficit
2. Partially correctable deformity
3. Unbalanced fixed deformity
4. A deformity that has some flexibility but has associated degenerative joint disease

### Specific Indications

When a triple arthrodesis is carried out in the presence of a neurological deficit even though a sound arthrodesis is obtained the motor imbalance will act on the arthrodesed segment and can influence early degeneration in the adjacent joints. For example, in hereditary sensory motor neuropathy the relative over activity of tibialis posterior acts on the triple arthrodesis. This stops the normal external rotation and eversion of the talus into the ankle mortice on dorsiflexion leading to erosion of the medial tibial plafond by a varus talus. Depending on the severity of the tibialis posterior over pull a tibialis posterior recession or tenotomy should be carried out and a peroneus longus tenodesed to the peroneus brevis at the base of the fifth metatarsal. If there is an associated foot drop the tibialis posterior tendon should be transferred through the intermuscular septum. In spinal dysraphism when a triple arthrodesis is carried out for a cavovarus deformity the tibialis anterior continues to dorsiflex the ankle but again may prevent external rotation of the talus in maximum dorsiflexion. So a split tibialis anterior transfer is indicated to compensate for this. At the same time the tibialis posterior may need to be recessed or transferred with a foot drop.

In the partially correctable deformity particularly with residual varus from congenital talipes equinovarus lateral column shortening through a calcaneocuboid joint fusion is an excellent adjunct to a split tibialis anterior transfer. This procedure is also useful in spinal dysraphism.

In the partially correctable pes valgus lateral column lengthening through a distractional arthrodesis of the calcaneocuboid joint is an excellent adjunct to tendon transfers. The tendon transfers obviously depend on the primary pathology but this can be used with a flexor digitorum longus transfer in the acquired flat foot particularly if it is not fully correctable. Likewise the Cobb procedure can be used in the same situation. In spinal dysraphism tibialis anterior can be transferred to the neck of the talus combined with a plication of the medial capsule of the talonavicular joint and spring ligament. This gives a dynamic lift to the talus and correcting the talar calcaneal angle yet still maintaining flexibility in the subtalar joint negating the use of a triple arthrodesis in such situations.

There are occasions when there is an unstable deformity due to skeletal abnormality. In tibialis posterior tendon dysfunction there is often associated instability of the navicular cuneiform or first TMT joint confirmed on weight bearing x-rays by a sag of these joints. On these occasions navicular cuneiform or first TMT fusion is combined with FDL transfer and medial translational calcaneal osteotomy to maintain the function of the medial arch and column.

When there is a partially flexible deformity due to muscle imbalance there can be associated degenerative disease. This is most commonly seen in the acquired flat foot deformity with tibialis posterior insufficiency. Arthrodesis of the talo-navicular or first TMT joint reconstitutes the skeletal stability of the medial column and this then allows the tendon transfer to work efficiently.

### **Conclusion**

The indications for a tendon transfer with an arthrodesis are uncommon, but when closely examined, may be more common than expected. When one carries out balancing of the foot through tendon transfer long term results of the arthrodesis can only be improved.

## Hindfoot arthrodesis with external fixation

**Sunil Dhar**

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Hindfoot fusion can be performed by a variety of techniques, arthroscopic or open, using internal (screws, intramedullary nails, blade plates) or external fixation. Charnley popularised ankle fusion using compression with an external fixator and others have used monolateral or bilateral fixators. Circular (ring) frames, invented by Ilizarov, are however, the external fixators of choice as they are mechanically much more stable and allow manipulation of bony fragments post application. Thus deformity and limb length inequality can be satisfactorily addressed. Ring fixators provide multiplanar stability that assists in soft tissue healing and allows early weight bearing and effective dynamisation at the fusion site.

A biomechanical comparison of ring fixator with tibio-talo-calcaneal nail showed the former to have a two-fold greater torsional stiffness and equivalent bending stiffness. Comparison with screws has shown the ring fixator to have equivalent stiffness.

The standard construct includes two tibial rings, a calcaneal ring secured by two calcaneal wires and a talar wire and a metatarsal half ring. The joint is debrided and compressed per-operatively through compression rods between distal tibial ring and calcaneal ring. Further compression is carried out as required and the frame is maintained till radiological fusion. Before removal, the fixator may be dynamised. A weight bearing short leg cast is worn for 4 weeks after removal of the frame.

High rates of fusion have been achieved in difficult clinical situations using circular frames. Hawkins et.al (2008) reported on 20 complex ankle fusions including 17 osteomyelitis, 10 segmental defects, 5 non-unions and three equinus deformities. All except three had debridement of necrotic bone and nine had concurrent limb lengthening. The infection was resolved in all except one and fusion was achieved in 80% (16/20). Rochman et.al (2007) achieved fusion in all 11 patients for infected talar nonunions or extrusions with concomitant tibial lengthening in 8 and equinus correction in 4 patients. Similar 100% union rate was reported by Eylon et.al (2008) following fusion in post-traumatic arthritis and Charcot arthropathy. Whilst secondary arthritis due to open fractures and high energy trauma can increase the rate of non-union, Bek et. Al (2008) demonstrated a 100% union rate with Ilizarov fixation for secondary arthritis due to landmine or gunshot injury.

This talk sums up the current place of circular external fixation in achieving stable hindfoot arthrodesis.

## **Correction of severe hindfoot deformities**

**Wolfram Wenz**

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Various severe multiplanar deformities of the foot in children and in adults need mid and hindfoot reconstruction as an important step for the surgical correction. Many different neurologic and non-neurologic causes can be responsible for the deformity. The reconstruction strategies differ with regard to the possible underlying pathologies. It is therefore of greatest importance to identify all components and the pathogenesis, to understand the etiology of the deformity, and to distinguish between neurologic and non-neurologic pathologies.

It is common to combine different soft-tissue procedures (“balancing”) and bony procedures (“correction”) for the correction of multiplanar deformities. Exceptions are individual non-neurologic deformities such as idiopathic juvenile talipes planovalgus, tarsal coalition, Charcot’s foot, and osteoarthritic deformities that do not require soft-tissue balancing.

The Heidelberg concept of decision-making, surgical treatment and results are demonstrated by the use of clinical examples.

## **HRG coding**

### **Patricia Allen**

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Leicester General Hospital

Coding in foot and ankle surgery is frequently haphazard and inaccurate. The aim of this session is to examine how the coding system works (OPCS and HRG) and how PBR tariffs are generated from them. This will be an interactive session to gain feedback on the difficulties members have in trying to accurately code foot and ankle procedures and to talk about how the structure of HRG grouping in foot and ankle surgery can be improved. I will also discuss the process of requesting additional OPCS codes to enable more accurate coding of new procedures.

## **Joint registry**

### **Paul Cooke & Andy Goldberg**

Nuffield Orthopaedic Centre

The National Ankle Joint Registry: A launch meeting hosted by Andy Goldberg and Paul Cooke.

With increasing numbers of surgeons performing ankle replacement, and an increasing total number being performed, there is a need for a uniform and comprehensive reporting system which will allow sensible audit.

In 2008, Paul Cooke raised money from BOFAS, and industry (J&J DEPUY, Orthosolutions), which funded Andy Goldberg to work on a project to develop the National Ankle Joint (NAJ) registry.

Now Andy has secured agreement for central and industry funding, and with the agreement of the NJR we will join in the near future.

This breakfast meeting is both a chance to celebrate, and an opportunity to hear how to enter cases and use data for audit.

The meeting is a "must" for all consultants, fellows and trainees who perform ankle arthroplasty, or are likely to do so, and also for industry representatives.

# Anatomy and pathology of adult flat foot

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## Introduction

The adult flat foot may be categorized as either residual flat foot deformity from a developmental cause or as an acquired flat foot.

Many factors may contribute to the acquired flatfoot deformity, although it is often difficult to define the exact cause:

- Posterior tibial tendon dysfunction
  - Due to inflammatory synovitis
  - Due to degenerative rupture
  - Due to acute trauma
  - Due to accessory navicular
- Spring ligament rupture
- Charcot's foot
- Posttraumatic deformities
- Neuromuscular imbalance (polio, cerebral palsy, closed head injury, stroke)



The acquired flatfoot is associated with a tight triceps surae, abduction of the forefoot, subluxation of the talus, hindfoot Valgus. The dysfunction of the posterior tibial tendon may be either the primary cause or a sequence of another pathology.

In order to understand the pathologic biomechanics, it is important to understand the anatomy and the biomechanics of the hindfoot.

## Anatomy and Pathophysiology

The **posterior tibial muscle** arises from the interosseous membrane and the adjacent surfaces of the tibia and fibula in the proximal third of the leg. The muscle forms part of the deep posterior compartment of the calf. The tendon forms in the distal third of the leg and passes posterior to the medial malleolus where it changes direction. To prevent dislocation, the tendon is encased in a tendon sheath beneath the flexor retinaculum. Distally the retinaculum blends with the sheath of the posterior tibial tendon and the superficial deltoid ligament.

The posterior tibial tendon does not have a mesotenon, and there is an area of relative hypovascularity immediately distal to the medial malleolus. This area may also contribute to degenerative changes of the tendon and consecutive rupture of the tendon. The tendon inserts with its anterior slip primarily into the tuberosity of the navicular, the inferior capsule of the medial naviculocuneiform joint, and the inferior surface of the medial cuneiform. A second slip extends to the plantar surfaces of the cuneiforms and the bases of the second, third and fourth metatarsal.

Based on the location of the tendon, which is posterior to the axis of the ankle joint and medial to the axis of the subtalar joint, its function is to plantarflex the ankle and invert the foot. Therefore its predominant function is to invert the midfoot and elevate the medial longitudinal arch.

During normal gait, contraction of the posterior tibial muscle causes subtalar inversion, locking of the calcaneocuboid and talonavicular or transverse tarsal joints. Without tibialis posterior function there is no formation of a rigid lever of the Chopart joint line, and the forward propulsion force of the gastrosoleus muscle complex acts at the midfoot rather than the metatarsal heads. This creates excessive midfoot stress, which leads to collapse of the medial longitudinal arch, eversion of the subtalar joint, heel valgus, and abduction of the foot at the talonavicular joint.

The relative strength of the Tibialis posterior muscle is due to its large cross-sectional area, and is greater than two times the strength of the peroneus brevis muscle which is its primary antagonist. Because of the short excursion, elongation of even one centimetre makes the tendon ineffective at maintaining the longitudinal arch.

The vascular supply of the posterior tibial tendon may be split into proximal and a distal aspects. The proximal aspect of the tendon is supplied by branches of the posterior tibial artery. The distal aspect, which is at the bone-tendon interface, is supplied by branches from the posterior tibial and dorsalis pedis arteries. This pattern of blood supply produces a 14 mm zone of hypovascularity, beginning 4 cm proximal to the tendon insertion <sup>4</sup>.

The **ligamentous stabiliser** of the medial arch is the **spring ligament complex** which is the ligaments of the talonavicular calcaneal articulation: It is the superomedial calcaneonavicular ligament which originates from the sustentaculum tali and inserts on the edge of the medial navicular articular facet. Further the inferior calcaneonavicular ligament that originates from the anterior aspect of the sustentaculum tali and inserts on the plantar aspect of the midnavicular cortex. And finally the tibioligamentous portion of the deltoid ligament, originating from the medial malleolus and inserting in the dorsal edge of the superomedial calcaneonavicular ligament.

The **plantar fascia** can be separated into three components: medial lateral and central. The central portion has the most relevance in relationship to arch pathology. It originates from the medial tubercle of the plantar aspect of the Calcaneus and splits into five branches. Each branch has multiple insertion points. As the plantar fascia extends distal to the metatarsal heads, tension causes the heads to depress and the arch to rise. Under tension the plantar fascia releases the tensile forces from the plantar surface of the foot skeleton.

### **Pathology**

The major question that is not yet answered is whether the static (spring ligament, plantar fascia) or the dynamic structures (posterior tibial tendon) supporting the arch fail first.

The normal gait cycle is divided into a stance phase and a swing phase. The weight bearing portion of the cycle and arch flattening phase is the stance phase. Weight bearing begins with the initial contact of heel strike. The tibia rotates inwardly and the Hindfoot moves into a more Valgus position. The posterior tibialis muscle acts eccentrically as a shock absorber by controlling the arch collapse and eversion of the foot. When the Calcaneus moves into this everted position the cuboid follows, the forefoot abducts and the medial longitudinal arch flattens out. As the body's center of gravity moves forward on the foot, the tibia rotates outwardly. The Hindfoot complex actively inverts and comes to a slight varus position by the pull from the posterior tibial tendon (PTT). This leads to the reconstitution of the medial arch by locking the talonavicular joint and forms a rigid lever. This rigid lever is then used for push off.

The tibiotalar joint is posterior to the center of the longitudinal arch but lies between the main weight-bearing portions of the foot and the weight-bearing forces of the calcaneus. The longitudinal arch spans this distance. Increase of pull from the triceps surae and corresponding increased force on the tibiotalar joint shifts the weight-bearing toward the forefoot by the way of the longitudinal arch. A stiff or inflexible medial longitudinal arch is necessary for normal forward propulsion to occur.

Any weakening of the arch supporting structures will cause the arch to collapse and will make the transfer of load less effective. Once the uncoupling has begun, a dynamic imbalance can occur. The posterior tibialis muscle becomes insufficient as the talocalcaneonavicular complex loses its stiffness, the tendon's effect on arch maintenance is lost- The posterior tibial muscle's direct antagonist, the peroneus brevis becomes a deforming force. Together with the deforming force of the Achilles tendon on the everted calcaneus, it pulls the hindfoot and forefoot in further valgus. <sup>1-18</sup>

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# Functional assessment & classification for plano valgus foot

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It behoves us as clinicians not to make the treatments that we undertake worse than the problem with which the patient presents.

To that end, when we assess our patients, we are not just establishing a diagnosis, but also ascertaining the level of disability that the problem imposes on these patients.

Information from history and examination, combined with targeted investigations, can build a picture, not only of the condition and its aetiology, but the resulting functional impairment, the severity and the sites of deformity and pathology.

The rationale is to use that information, to try and develop useful plans of management and explain those plans to the patient, so that their expectation of treatment is the same as the surgeon's.

The problem with the plano valgus foot lies with its variability. Certainly, "one size does not fit all". No single one-off treatment is suitable for all types. Therefore, it is usual for management plans, both conservative and surgical, to be "tailor-made" to the patient. It is reasonable to use information from diagnosis, function, deformity, mobility and imaging, to try and group patients, so that appropriate treatment plans can be devised or compared and tested.

In obtaining an history, it is important, not only to ascertain the site, severity and change of symptoms, the interaction with the rest of the body, but also the impact on activities of daily living, work and leisure. Usually, these conditions are not single one-off events. The impact and severity of symptoms and functional disability can change with time and treatment, so that more than one assessment can frequently give greater information than the initial presentation.

From the history, it will become evident that the patients will fall into 1 of 3 groups:

1. Those with acute symptoms – (previously normal foot)
2. Those with acute symptoms – (superimposed on a previous flatfoot deformity)
3. Those with chronic deteriorating symptoms (associated with longstanding deformity)

Physical examination produces information on severity of deformity, gait, joint mobility, tendon and ligament integrity, soft tissue quality and nerve and vascular status. The structured examination should allow assessment of plano valgus feet, both in stance phase and during movement.

A modification of the Johnson & Strom classification for posterior tibial tendinopathy can be used to group or classify **deformity** for all plano valgus feet. This modification is based on the degree of severity of the resting forefoot supination and its flexibility.

- 1a - Non-deformed, mobile, but symptomatic foot
- 2a - Early plano valgus deformity with mobile hindfoot and less than 15 degrees of forefoot supination but passively correctable
- 2b - Moderate plano valgus foot, mobile hindfoot, 15 - 30 degrees' forefoot supination, but passively correctable
- 2c - Greater than 30 degrees of forefoot supination, not passively correctable
- 3 - fixed hindfoot deformity
- 4a - Arthritis of ankle with no tilt
- 4b - Ankle involvement with tilt

**(the sub grouping of group 4, does require radiology, as well as clinical examination)**

Targeted investigations, starting with plain radiology, allow the further assessment of deformity, for example, the ankle or the midfoot and the presence or absence of joint degenerative changes. More complex imaging, such as ultrasound, MRI or CT, can be targeted to answer specific questions arising from this initial assessment.

In summary, the four questions to be addressed are:

1. What is it?
2. Why has it happened?
3. How bad is it?
4. What do we do?

Combining information from diagnosis, function, structure, joint mobility, soft tissues and imaging, can help us to clarify between these heterogeneous groups and, therefore, “tailor make” our plan of management for each of our patients, hopefully to produce an optimum outcome.

# Orthotic management of adult acquired flatfoot

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Patients with adult acquired flatfoot show several kinematic abnormalities which contribute an increased energy cost of walking. They have reduced hindfoot dorsiflexion and forefoot plantar flexion, and increased heel valgus and forefoot abduction. Orthotic treatment aims to reduce these abnormalities so as to improve symptoms and allow recovery of the soft tissue restraints and posterior tibial tendon.

In-shoe devices are probably most commonly used. The UCBL device cups the hindfoot closely and has been shown in cadaver models to correct many of the above kinematic abnormalities better than most other devices. Less data is available on alternative in-shoe devices. In-shoe devices only work well in low-heeled lace-up footwear and it is important to explain this to the patient; a few patients will reject orthotic treatment not because the insoles do not work but because they do not accept the footwear requirements.

Braces which extend above the ankle theoretically give additional support, although the evidence that they do so in real practice is limited. The Marzano brace combines a UCBL insole with a rear-entry supramalleolar component and achieves many of the same objectives. More recent braces include air bladders which can be adjusted to customise corrective pressures; again, the evidence for their effectiveness is limited.

In stiff deformities, more supportive and shock-absorbing devices will be more comfortable. Patients who have additional ankle deformities may benefit from a supramalleolar brace or solid ankle-foot orthosis.

Over-the-counter standard orthoses will be satisfactory for some patients. However, some require devices which are made from a mould or customised to their feet. The presentation will give examples of the prescription and provision process.

Recent studies have emphasised the use of orthotics as part of a multi-modal treatment programme supporting physiotherapy to improve muscle strength and protect against future injury.

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# **Physiotherapeutic management of posterior tibial tendon dysfunction (PTTD)**

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Acquired adult flatfoot deformity is characterised by partial or complete loss (collapse) of the medial longitudinal arch, with insufficiency of the supporting posteromedial soft tissue structures of the ankle and hindfoot. It is most commonly associated with posterior tibial tendon dysfunction (PTTD).

A three to six month trial of conservative treatment is often recommended. This includes different types of orthoses, bracing, footwear, immobilisation in plaster or removable boot, in conjunction with non steroidal anti-inflammatory medication and RICE (rest, ice, compression, and elevation) depending on the stage of the condition, and presence of fixed or flexible foot deformity.

Physiotherapy has an important role in the conservative treatment of PTTD, especially when used in combination with other conservative treatments. The benefits of physiotherapeutic intervention in the earlier stages of PTTD have been documented. In patients with advanced pathology, physiotherapy techniques are often helpful and can provide an acceptable alternative to surgery especially for those who are not amenable to surgical intervention.

Patients who undergo surgical reconstruction benefit significantly from functional physiotherapeutic rehabilitation as part of their post operative programme.

This presentation will discuss and illustrate physiotherapy techniques used for rehabilitating PTTD conservatively and following surgical correction.

# **Surgical management of posterior tibial tendon Insufficiency**

**Michael J Coughlin**

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Since the recognition of posterior tibial tendon insufficiency by Kettlecamp in the 1960's, an evolution of surgical care has occurred. One of the major advances was to grade the dysfunction into Stages 1-4. This allows the surgeon to determine whether joint sparing surgery can be performed. The main differentiation is whether a fixed or flexible deformity is present. This certainly allows bracing, and non-surgical options; however with the progression of the disease, synovitis can progress to tendon dysfunction or rupture and with this, progressive flexible or fixed pes planus deformity. Early on synovectomy may stabilize the problem. A lateral column lengthening, medial calcaneal slide osteotomy, TAL or gastroc slide may all be combined in an attempt to maintain maximal function. With progression to Stage 2, a calcaneal slide osteotomy coupled with an FDL transfer may be warranted. As more severe Stages develop, subtalar or triple arthrodesis is indicated; for Stage 4, a TTC arthrodesis may be necessary although this is a salvage procedure.

In this presentation, videos will be used to explain the techniques of gastroc slide, TAL, subtalar and triple arthrodesis, calcaneal slide, and lateral column lengthening.

The postoperative course for these procedures typically requires lengthy immobilization for 10-12 weeks, followed by intensive physical therapy to rehabilitate the extremity after the reconstructive or salvage surgical procedures.

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## Guest Lecture: MRI of forefoot disorders

**Paul O'Donnell**

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Magnetic Resonance Imaging (MRI) is the technique of choice in the evaluation of many disorders of the forefoot, but is frequently augmented by ultrasound (US). The utility of both techniques will be illustrated with reference to forefoot pathologies, including: Morton's neuroma; MTP joint capsulitis; plantar plate injuries; Freiberg's disease and subchondral insufficiency fracture of the metatarsal head; metatarsal stress injuries/fractures and the spectrum of hallux sesamoid disorders. Other causes of metatarsalgia/forefoot pain include inflammatory and crystal arthropathies, tendon lesions (acute/chronic trauma, neoplasms) and tumours.

Morton's neuroma: although the diagnosis is usually based on clinical findings, imaging can confirm the size of the neuroma, which may be of value in determining the success of injection therapy or surgery, and exclude conditions that can present in a similar way: the clinical diagnosis was changed in 28% of cases and the location or number of lesions altered in one third of the remaining feet in one study <sup>1</sup>. Neuromas are shown reliably by US, which also identifies a significant number of mimicking conditions and allows accurate injection.

Capsulitis is another predominantly clinical diagnosis, where imaging is often normal or near-normal. MTP joint synovitis is often minimal and subtle low-reflectivity on US at the plantar aspect of the joint, within the plantar fat pad and surrounding the flexor tendon may be the only signs. More florid synovitis may be due to inflammatory arthropathy and is reliably identified using both MRI and US.

Plantar plate rupture: identification of this entity with MRI requires high resolution imaging and good patient compliance, as even a small amount of motion artefact can obscure this small structure. Arthrography of the MTP joint is a useful adjunct to MRI but, as this condition is not reliably seen using US, joint injection under fluoroscopic guidance should be specified if the patient is referred for a therapeutic/diagnostic procedure.

Metatarsal insufficiency fractures involving the shaft are common and easily identified with MRI. Callus can be identified, even early in the evolution of the fracture, with US, but further imaging is needed to confirm the diagnosis. Subchondral insufficiency fracture (SIF) of the metatarsal head is a rarer, lesser known entity with similar risk factors to insufficiency fracture elsewhere and similar imaging to Freiberg's disease. The two conditions are likely to share some aetiological factors (mechanical stress, subchondral fracture, vascular injury and subsequent osteonecrosis) but tend to affect different age groups, Freiberg's in adolescents and SIF older females (mean 53 years in one series of 14 patients <sup>2</sup>).

MRI is useful in the evaluation of hallux sesamoid pain. High resolution imaging is again required, to differentiate metatarsosesamoid arthropathy from a range of acute or chronic conditions involving the sesamoid bone(s), but not the joint. Differentiation of fracture from stress oedema in a bipartite sesamoid can be problematic; MRI can distinguish a viable from a necrotic bone and identify adjacent soft tissue abnormalities which may be contributing to symptoms.

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## Metatarsalgia with callosities

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Metatarsalgia with callosities implies that it is highly probable that the cause of pain at the plantar aspect of the metatarsal bone is due to increased plantar pressure, biomechanical overload. The amount of callus is, however, not a specific measure for pain. A range of pathologies can cause such an overload along one or more of the lesser rays. The speaker will present his clinical approach, differentiating between this variety of pathophysiological patterns causing metatarsalgia and thus presenting a possible treatment algorithm.

The most common cause of metatarsalgia presenting with central overload of the forefoot is decrease of the weightbearing capacity/ function of the medial longitudinal arch. As generally accepted such is the case in the hallux valgus complex. If conservative treatment fails a correct surgical correction will most often result in relief of the metatarsalgia.

Far less we will encounter patients with equinus, cavus and/or a plantarflexed first ray causing a different distribution of forefoot overload.

Very little emphasis is given in literature to the role of lesser toe deformity in causing metatarsalgia. In contrast far too much attention is paid to the possible role of the relative (over-)length of metatarsal bones resulting in an epidemic increase of unnecessary metatarsal osteotomies. It is argued that adequate correction of the 1<sup>st</sup> ray, be it HV complex or plantarflexed 1<sup>st</sup> ray, in combination with correction of clawtoe deformity, realigning the MP joints and thus the plantar soft tissues, suffices in the majority of cases.

Finally, congenital or acquired (post-traumatic or iatrogenic) prominences of one or more metatarsal bones are to be considered as a cause of metatarsalgia. Deviations can occur in 3 dimensions and are diagnosed on basis of history, careful physical examination and radiographic examination (in AP and frontal plane). Different osteotomies (shortening, elevating, lengthening, plantarflexing) might be indicated to re-establish a normal load distribution under the forefoot.

# Metatarsalgia without callosities

Hans-Jorg Trnka

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When dealing with pain in the forefoot, the term metatarsalgia is often used. This however, is not a proper diagnostic term and encompasses a number of clinical situations of varying aetiology. In fact, the term metatarsalgia describes an acute or chronic pain arising from, or in relation to, one or more of the metatarsophalangeal joints. This pain can be caused by pathological change to any of the anatomical structures surrounding the metatarsophalangeal joints. These include: cartilage, metatarsals, capsular ligaments, vessels, nerves, tendons, bursae and subcutaneous tissue. Metatarsalgia is not limited to plantar pain, although in most cases the pain is plantar to the metatarsal heads.

Callosities are the manifestation of increased pressure during walking. The causes of these are not discussed in this paper.

The causes of 'metatarsalgia without callosities' may be categorized into systemic causes, regional causes, and biomechanical disorders.

1. Systemic causes
  - a. Vascular
  - b. Metabolic
  - c. Rheumatic
  - d. Neurological
  - e. Psychogenic
  
2. Regional causes
  - a. Skin or subcutaneous tissue
  - b. Bursae and tendons
  - c. Peripheral nerves
    - i. Morton's neuroma
  - d. Bone and joints
    - i. Freiberg's disease
    - ii. Osteomyelitis
    - iii. Infectious arthritis
    - iv. Trauma
  - e. Tumours

3. Biomechanical disorders
  - a. Functional pathologies
    - i. Toe deformities
      1. Hammer toes
      2. Mallet toes
      3. Claw toes
      4. overlapping toes
      5. underlapping toes
    - ii. Hyperpronation of the Hindfoot
    - iii. Ligamentous laxity
    - iv. Muscle disorders
    - v. Overloading – obesity
  - b. Structural disorders
    - i. Overloading of the forefoot
      1. Pes cavus
      2. Pes equinus
    - ii. Irregular forefoot weight distribution
      1. First ray insufficiency
      2. First ray overloading
      3. Lesser ray insufficiency
      4. Lesser ray overloading
      5. Fifth ray overloading

Biomechanical disorders are generally associated with callosities; the only pathology not leading to a plantar callosity is the 2<sup>nd</sup> ray cross-over toe deformity.

The major problem is to identify the cause of pain in the forefoot region. Besides adequate radiographs, clinical examination is the most important diagnostic modality. Clinical examination includes the patient's shoes, gait examination and, it is most important to palpate the patient's foot. Laboratory tests are also necessary, if one suspects systemic aetiology.

Since the causes of metatarsalgia are so variable, treatment options can be too.

Any systemic cause needs to be addressed at its origin.

For regional causes such as tendon and peripheral nerve pathologies, non-surgical treatment options should be considered prior to surgical ones as, for example, in the treatment of Morton's neuroma, with local injections first and excision if this fails.

If however, a tumour was diagnosed, this would almost certainly need to be surgically addressed.

Medial deviation caused by true angulation of the phalanx is referred to as clinodactyly.

Disorders of the 2<sup>nd</sup> MTP joint may also lead to varus deviation of the toe. The primary cause of varus deviation of the second toe is instability of the 2<sup>nd</sup> MTP joint. Synovitis is the principal cause of this instability. A repetitive inflammatory synovitis process weakens the retinacula of the plantar plate. This weakening and degeneration of the plate and capsule, in conjunction with ground reaction forces directed dorsally, results in subluxation in the sagittal plane alone or, in the transverse plane as well.

The goal of non-operative treatment is to limit the degree of inflammatory synovitis and to stop degeneration of the capsule and plantar plate. Strapping of the toe, single corticoid injections with strapping, stiff soled shoes and physiotherapy aimed at reducing plantar forefoot pressures (gastrosoleus / hamstring stretches and intrinsic toe exercises) are the principal non-operative treatment options.

Surgical management addresses the mild, moderate, and severe degrees of deformity.

Early stages of varus deformity require Z-lengthening of the EDL and tenotomy of the EDB tendon, capsulotomy, medial collateral ligament release and lateral collateral ligament reefing. In addition, temporary K-wire fixation of the MTP joint is necessary.

For subluxation of the MTP joint without excessive over-length of the metatarsal, the flexor to extensor transfer in combination with Z-lengthening of EDL and tenotomy of the EDB tendon, capsulotomy, medial collateral ligament release and lateral collateral ligament reefing can be used. In addition, if necessary, temporary K-wire fixation of the MTP joint is recommended<sup>13</sup>.

If the situation is one of dislocation of the MTP joint or overlength of the metatarsal, the Weil osteotomy is our surgical treatment modality of choice.<sup>15,16</sup>

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## Eponyms in foot and ankle surgery

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There are many eponyms in use in foot and ankle surgery, some of which are more familiar than others. For this talk I have selected three men who were all more or less contemporaries and practiced as surgeons in the nineteenth century. As it happens, one was a Frenchman, one a Scot and the third a Russian.

**Jacques Lisfranc de St. Martin** was a Frenchman who described a midfoot injury and amputation, **James Syme** was a Scot who described a hindfoot amputation and **Nikolai Ivanovich Pirogov** was a Russian who also described a hindfoot amputation but who also treated an Italian revolutionary for a war wound to his foot.

However, each deserves to be remembered for so much more than just their eponymous contribution to foot and ankle surgery. An examination of their lives shows just how much each of them achieved and how much they contributed to orthopaedic surgery in general as well as to our speciality in particular.

## **Guest Lecture: Hallux rigidus - long term results of operative treatment**

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This report deals with my 19 year study of 114 patients: eighty of whom underwent a cheilectomy and 30 who underwent an arthrodesis at a follow-up seven to 10 years following surgery. Our study concluded that there is no association of hallux rigidus with the age of the patient. There was family history associated with two-thirds of the patients. 95% had bilateral disease. Gender correlation demonstrated 65% were female. There was no difference between childhood onset and adult onset and our results seemed to demonstrate that hallux rigidus is pure and simple degenerative arthritis of the hallux MTP joint. We found no evidence that hallux rigidus was associated with pes planus, a long first metatarsal, first ray hypermobility, hallux valgus, occupation, footwear or adolescent onset. It is associated with hallux valgus interphalangeus.

Indications for cheilectomy vs. arthrodesis are based on radiographic and clinical findings that define hallux rigidus as a Stage 0, 1, 2, 3 or 4 deformity. These findings on grading correlated well with our operative findings. Key clinical findings are the presence of joint pain with MTP ROM in the mid-range; likewise, the presence of 50% remaining of the articular cartilage (or less) at the first MTP joint means that an arthrodesis is indicated.

Hallux rigidus grades 1-3 are an indication in general for cheilectomy, while a grade 4 hallux rigidus deformity is an indication for an MTP arthrodesis. Both procedures show gratifying results if the correct grade leads to the appropriate surgery. The technique of MTP arthrodesis using power reamers for joint preparation and contoured MTP joint plates has proven to be very successful in achieving the desired alignment following MTP arthrodesis. A thin titanium plate reduced the need for hardware removal as well. Both arthrodesis and cheilectomy demonstrate gratifying results at long term follow-up if performed on the appropriate grade hallux rigidus deformity.

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# Claw toes and hammer toes

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This presentation is entitled Claw toes and Hammer toes. However, what are we talking about? A questionnaire was completed by 76 of all 101 Dutch departments of orthopaedic surgery, which showed the existence of a wide variation in definition of lesser toe deformities. Furthermore, only half of these departments had a protocol or consensus in the treatment. In a literature search performed in the PubMed database (May 2006) we found 42 articles stating a clear definition of hammer toe or claw toe and found quite a variation in the definitions, also.

Extension of the metatarsophalangeal (MP) joint is the discriminating factor and essential characteristic for claw toe. Claw toe and hammer toe should be characterized by flexion in the PIP joint, which is the single criterion for a hammer toe.

The flexibility of the joints is a basic factor in determining the treatment, starting with conservative treatment of the flexible deformities. The more rigid the deformity the more complaints can be expected and the less effective and/or more extensive the conservative treatment probably is. In a study concerning patients with RA we established a positive relation between increasing extension contracture of the MP joints, symptoms and plantar pressure.

In the operative treatment a flexible deformity can be corrected through surgery on the tendons. As soon as the deformity is fixed a condylectomy of the proximal phalanx is performed to realign the toe, but at the same time much care should be given to evaluate the situation at the MP joint and the tension of flexor digitorum longus. In case of extension contracture at the MP joint a lengthening of the extensor tendon is added. In addition dorsal capsulotomy, and further release, also of the plantar capsular adhesions, herewith repositioning the plantar soft tissues under the MT head, may prove necessary.

## **MTP joint instability**

### **Michael J Coughlin**

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The aetiology of a rupture of the lateral and plantar MTP capsule was first delineated by Coughlin in 1987. There is no doubt that early diagnosis is important in the treatment of this process before a severe deformity develops. With dislocation, many of the surgical soft tissue choices are eliminated.

The key element of physical examination is the presence of a positive Drawer which denotes instability of the 2nd MTP joint. Without an anatomical deformity, the drawer is an important physical finding. Radiographic findings may include MTP joint malalignment, a long 2nd metatarsal or hypertrophy of the 2nd metatarsal. Nuclear scans may demonstrate synovitis or increased uptake in the MTP joint. Conservative treatment includes taping, occasional intra-articular steroid injections and metatarsal pads.

Surgical treatment includes soft tissue release to achieve adequate realignment; this includes reefing of the MTP joint capsule, flexor tendon transfer and/or joint decompression or metatarsal shortening. The different techniques of soft tissue release, capsular realignment and flexor tendon transfer are delineated. These results were reported by Coughlin in 1987 and later on in 1993.

Boney decompression with a Weil osteotomy with shortening of 3-5mm may allow realignment but may translate a metatarsal head plantarward leading to increased plantar pressure. The amount of bone resected (the "kerf" at the osteotomy site) and shortened is critical to achieve the desired result.

Post-operatively, the K-wires fixation and soft dressings are important in maintaining fixation as well as exercising in the peri-operative. Attention also must be given at the time of surgery to the possible location of a neuroma adjacent to an unstable joint. Late salvage may include second MTP arthrodesis or soft-tissue interposition arthroplasty, although these procedures are rare.

A comprehensive treatment of dorsal and lateral MTP joint instability is important in the treatment of the instability of the 2nd metatarsal phalangeal joint.

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## Management of the iatrogenic floppy lesser toe

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Lamm (2009) differentiated between flail toe, in which the digit lacks stability and structural integrity, and floppy toe, in which the digit fails to purchase the weightbearing surface. This presentation will touch on both these conditions as they overlap. Both conditions are essentially the result of skeletal shortening or soft tissue lengthening, or a combination.

Correction of toe deformity often requires skeletal shortening to fit within the soft tissue envelope. This may be obtained by osteotomy (eg Weil, Giannestras or Helal osteotomies) or bony excision (Hoffman procedure and its variants for rheumatoid toe deformities, Stainsby procedure, excision arthroplasty of the PIPJ).

In the excisional procedures, lack of toe control is seen as the price of relief of sub-metatarsal pain and rubbing over stiff toe deformities, and is accepted by most patients. Newman and Fitton (1979) described flail toes after 23% of proximal phalangectomies for hammertoe, although none of these patients was symptomatic. Briggs described malalignment in 19% of feet after Stainsby procedures and the toes did not touch the ground in 31%; most were asymptomatic, particularly when all the toes had been operated on. Hossain et al (2003) reported malalignment after 14% of Stainsby procedures and 10% were concerned about the appearance of the toe. Mangaleshkar (2001) found that half their non-rheumatoid patients were concerned about the appearance of the toe after Stainsby procedures.

Floppy toes occur after 20-60% of Weil osteotomies. Trnka carried out an elegant cadaver study, which showed that the osteotomy alters the moment arm of the intrinsic muscles, which change from weak flexors to weak extensors. Trnka noted incidentally that the plantar plate became lax after the osteotomy made the metatarsal shorter than the plantar fascia (the principal plantar flexor); the hypothesis that this is a significant cause of floppy toe remains untested. Flexor-extensor transfer prevents the development of floppy toes at the cost of stiffness (Boyer 2004). Gregg (2007) reported a combination of Weil osteotomy and plantar plate repair; it is not entirely clear how many patients had floating toes, probably 3/35 (8.6%). Even after combined plantar plate repair and flexor-extensor transfer, Bouché reported residual extension in 4/15 patients and lack of active toe purchase in one, although only 2 of these were symptomatic.

Kennedy and Deland (2006) reported dorsiflexed toes in 3/32 patients after the Giannestras osteotomy and found that this complication was avoided by careful positioning of the metatarsal head.

Figures for toe instability after other procedures are difficult to identify. However, clinical results and patient satisfaction are not closely related to toe stability.

It is important to explain to patients having correction of toe and/or lesser MTP joint deformity that they may not have toe control afterwards, and that the toes may occasionally be unstable. Surgery should avoid excessive bone resection or soft tissue lengthening.

Symptomatic toes with bony defects may be improved by interposition bone grafting, usually from the calcaneum. No reports of revision surgery for floppy toes after the Weil or Stainsby procedures, or more traditional proximal hemiphalangectomy have been published. In appropriate patients, amputation provides relief of pressure or pain symptoms with generally acceptable cosmesis.

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## **Guest Lecture: Nerve injuries of the foot and ankle: the neglected orphan**

**Rolfe Birch**

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Royal National Orthopaedic Hospital, Stanmore

Please refer to the following article for a text version of the talk:

Birch R. Iatrogenous lesions of nerves and arteries in the leg and foot. *Foot and Ankle Surgery* 2008;14:130-137



# **BRITISH ORTHOPAEDIC FOOT & ANKLE SOCIETY**

**Annual Scientific Meeting**

**Podium Abstracts**

# The epidemiology of foot injuries in professional rugby union

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## Background

Foot injuries represent a small but important proportion of injuries to professional rugby union players. There are no detailed epidemiological studies regarding these injuries.

## Purpose

The aim of this study was to describe the epidemiology of foot injuries sustained by a cohort of professional rugby union players and identify areas that may be targeted for injury prevention in the future.

## Study design

Descriptive epidemiological study.

## Methods

Medical personnel prospectively recorded injuries in professional, premiership rugby union players in England over 4 seasons. Injuries to the foot were identified and the time away from training and playing was reported.

## Results

A total of 147-foot injuries were sustained resulting in 3,542 days of absence in total. Acute events accounted for 73% of all foot injuries, with chronic, mostly overuse conditions, accounting for 25% (undiagnosed 2%). Chronic conditions led to proportionately more time away from training and playing ( $p < 0.001$ ). Specifically, stress fractures in the foot accounted for 8% of the total foot injuries but 22% of the absence. Navicular stress fractures had the longest recovery time with the mean return to training and match play of 188 days.

## Conclusions

In collision sports, such as rugby, injury is inevitable, but clinicians should always be seeking ways to minimise their occurrence and impact. This study revealed significant morbidity associated with chronic and overuse foot injuries in these professional athletes. With greater attention paid to risk factors, some of these injuries, and importantly, recurrent injuries may be avoided.

# Static and dynamic analysis of foot structure in athletes sustaining Jones stress fracture

Nyska M, Ifthach H, Gideon M, Moshe A  
Meir Medical Centre, Israel

## Background

The literature shows an anecdotal relationship between high-arched feet and proximal fifth metatarsal stress fractures. This relationship has never been supported by sound scientific evidence. Our aim in this study was to examine whether athletes sustaining this injury are characterized by a static foot structure or a dynamic loading pattern during stance.

## Materials and Methods

Ten professional soccer players who regained full professional activity following a unilateral proximal fifth metatarsal stress fracture and ten control uninjured soccer players were examined. Independent variables included static evaluation of foot and arch structure, followed by dynamic plantar foot pressure evaluation during stance. Each variable was compared between injured and uninjured feet.

## Results

Static measurements of foot and arch structure did not reveal differences among the groups. However, plantar pressure evaluation during stance revealed relative unloading of the fourth metatarsal in both the injured and sound limbs of injured athletes compared with control, while the fifth metatarsal revealed pressure reduction only in the injured limbs of injured athletes.

## Conclusion

Athletes who sustain proximal fifth metatarsal stress fracture are not characterized by an exceptional static foot structure. Dynamically lateral metatarsal unloading during the stance phase may either play a role in the pathogenesis of the injury, or alternatively represent an adaptive process.

## Clinical Relevance

Footwear fabrication for previously injured athletes should not categorically address cushioning properties designed for high-arch feet, but rather focus on individual dynamic evaluation of forefoot loading, with less attention applied to static foot and arch characteristics.

# **Operative treatment of stress fractures of the fifth metatarsal in elite professional footballers**

**Tansey C, Parsons S, Hodkinson J**  
Wrightington Hospital, Wigan, UK

## **Design**

Retrospective chart and radiographic review.

## **Background**

Stress fractures of the fifth metatarsal are increasingly common among elite professional footballers (soccer players). This reflects the use of lighter, less protective and more flexible sports footwear combined with the increasingly physical demands of the professional game at the highest level. Stress fractures of the fifth metatarsal can be satisfactorily treated non-operatively by cast immobilisation and a graduated return to activity. The demands placed on the modern elite professional footballer are such that a different treatment approach is required for the same injury in this subgroup of patients.

## **Methods**

Stress fractures of the fifth metatarsal in elite professional footballers are treated by the senior author (JPH) by operative surgical fixation. We reviewed the charts and radiographs of all fifth metatarsal stress fractures that were treated operatively in elite professional footballers over a five year period. Details recorded included fracture location, method of fixation, complications, time to radiological union and time to return to independent weightbearing and competitive sporting activity.

## **Results**

There were 32 fifth metatarsal stress fractures in 30 elite professional footballers. All fractures were clinically united at a mean 5.5 weeks and radiologically united at a mean of 10.3 weeks. The patients could weightbear immediately and could independently weightbear from 4 weeks. The mean time to return to full competitive activity was 10.3 weeks. There were no complications.

## **Conclusions**

Operative treatment of fifth metatarsal stress fractures is an effective treatment in elite professional footballers that produces consistently good results and allows an early return to full activity.

# Ankle arthroscopy: is pre-operative marking of superficial peroneal nerve important?

Suzangar M, Rosenfeld P  
St Mary's Hospital, London

## Background

The incidence of nerve injury following ankle arthroscopy has a documented rate of 1% to 24%<sup>1-15</sup>. The intermediate branch of the superficial peroneal nerve is at most risk with an antero-lateral portal incision<sup>6, 9-12</sup>. The superficial peroneal nerve (SPN) is often marked as part of pre-operative planning,<sup>1</sup> despite there being little evidence of the effectiveness of this simple measure in reducing nerve injury in ankle arthroscopies.

## Methods

We reviewed 100 consecutive patients who underwent an anterior ankle arthroscopy between February 2005 and April 2009. All arthroscopies were performed by a single surgeon (PFR) with pre-operative marking of the SPN. All patients were interviewed by telephone to find out if there had been any temporary or long-term neurological problems following the surgery. Any patients with neurological complications were reviewed in clinic. Patients' notes were reviewed for any documented complications. Their level of satisfaction and improvement of symptoms were also assessed.

## Results

We were able to trace 98% of patients. The average follow up was 15.3 months (1 to 39 months). The only neurological deficit in this series was in one case (1%) who developed sensory loss in the distribution of the medial branch of the SPN. 61% of the cases were highly-satisfied/satisfied, 23% were moderately satisfied and 16% were not satisfied with the outcome of their surgery. The reason quoted by the 16% unsatisfied patients was failure to improve their symptoms to their expected level or their need for another operation (41% of the unsatisfied group)

## Conclusion

The incidence of nerve injury in our series was 1%. This is a dramatic improvement on the majority of published studies<sup>1-15</sup>. We believe that marking the SPN prior to surgery is a simple and essential measure in reducing the neurological complications of ankle arthroscopy.

# Early results of posterior ankle arthroscopy for hindfoot impingement-experience from a district general hospital

Sandiford N, Weitzel S

St Mary's Hospital, Sidcup

## Introduction

Arthroscopic management of posterior ankle impingement syndrome (PAIS) is now commonly practiced. Scanty information about the results of this procedure in a district hospital is available.

## Aim

We present the results of our series of patients treated with hindfoot arthroscopy for PAIS, and describe the complications encountered.

## Patients and Method

Twenty procedures were performed on 19 patients (12 males, 7 females) between January 2006 and September 2008. Patients were followed up for an average of 7.9 months. Return to sport, patient satisfaction, relief of symptoms and the American Orthopaedic Foot and Ankle Society (AOFAS) hindfoot score were all assessed.

## Results

Procedures performed included excision of an os trigonum, flexor hallucis longus decompression, and microfracture of the posterior talus. The average age of the patients was 35 years. Return to activity occurred at an average of 4 weeks. Four patients were dissatisfied, 1 was unsure and all the other patients were satisfied with their outcome. The average pre-operative AOFAS score was 73.8 and the post operative score was 84.5. There were no neurovascular injuries.

## Conclusion

There was a significant incidence of dissatisfied patients in the absence of major complications. This might reflect technical difficulties early in the early learning curve for this procedure.

# Is there a learning curve in foot and ankle surgery?

Walton R, Theodorides A, Molloy A, Melling D  
University Hospital Aintree

## Introduction

A learning curve is a recognised phenomenon in surgery. It implies that the frequency of perioperative adverse events will decrease with the increase in experience of the surgeon. Evidence shows increased instruction and experience in a specific surgical task leads to improved performance. There is conflicting evidence as to whether there is a learning curve for total ankle replacement, and a paucity of evidence for foot and ankle surgery as a whole. Current evidence is centered on perioperative complications, rather than functional outcome.

## Aim

To determine whether a learning curve effect is present during the first year of independent practice by measuring patient outcome.

## Materials and methods

150 patients underwent elective foot or ankle surgery during the first 12 months of a newly appointed consultant's practice. Preoperative and six month postoperative functional scores were recorded, together with perioperative complications. Two patients died of unrelated causes in the first 12 months. 121 patients (81.8%) were followed up for a minimum of six months by telephone. Functional outcome was assessed with a modified American Orthopaedic Foot and Ankle Society midfoot Score (85 points). Outcome was compared between the first and second six-month periods using the student's t-test.

## Results

Eighty procedures were undertaken during the first six months compared to 70 in the second. Total ankle replacements were only undertaken in the latter period. Otherwise there was no statistical difference in the caseload. One wound infection occurred during each period and other perioperative complications were equivalent. Functional improvement was greater in the group from the second 6 months (+23.86 v's +18.69). This difference did not reach statistical significance ( $p = 0.061$ ).

## Discussion and Conclusion

There is a trend, approaching significance, towards a learning curve during a foot and ankle consultant surgeon's first year of practice. Collating data from other new consultants may demonstrate a learning curve with statistical significance.

# Patient satisfaction in foot and ankle surgery – the most useful patient reported outcome measure?

Oddy MJ, Jones S, Flowers MJ, Davies MB, Blundell CM  
Sheffield Teaching Hospitals NHS Trust

## Introduction

The assessment of quality in the provision of healthcare is one of the core features of the National Health Service in the 21<sup>st</sup> Century. From April 2009 Patient Reported Outcome Measure (PROM) data are being collected for the Department of Health for elective hip and knee arthroplasty using generic and disease specific measures of health status. The perceived uses of these data may be for research, assessment of procedural outcome, measures of health inequalities and to aid commissioning groups in selecting their secondary care providers. Foot and ankle surgery covers a wide spectrum of operative procedures with patient responses less predictable than with major joint arthroplasty. We report the use of a sixteen point satisfaction-based questionnaire in order to investigate the nature of patient outcome after the processes of foot and ankle surgery.

## Methods

A prospective series of 100 two-part Visual Analogue Scale (VAS) questionnaires was distributed to patients undergoing elective foot and ankle surgery at the Northern General Hospital under the care of four foot and ankle surgeons over a three-month period. The questionnaires were numbered to allow patient anonymity. The first part of nine questions enquired about pre-operative preparation and information and was distributed before surgery. The second part of seven questions, distributed at the first post-operative clinic sought to investigate their hospital and operative experience. Free text comments were requested in addition to the VAS responses, which were expressed as percentages.

## Results

97% of part one and 85% of part two questionnaires were returned completed. 82% had both parts completed and matched. The day case to inpatient ratio was 55:45. For part one, all clinically related questions scored more than 90% satisfaction, with only two scores for administration-based questions falling below this level. For part two, satisfaction for clinical questions again scored more than 90% and overall, all scored more than 80% satisfaction. Only 23% of pre-operative and 28% of post-operative questionnaires were returned with free-text comments.

## Conclusions

A simple patient satisfaction-based questionnaire may be as useful as existing non-validated generic scoring systems used in foot and ankle surgery when assessing quality in the health service, particularly where regional demographics or referral patterns may be important factors influencing patient outcomes. Active dialogue with the surgical colleges and Department of Health should be pursued to avoid inappropriate outcome measures being imposed in foot and ankle surgery.

# Proximal medial release of the gastrocnemius muscle in the treatment of recalcitrant plantar fasciitis

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## Background

Isolated Gastrocnemius contracture has been implicated as the cause of a number of foot and ankle conditions. Plantar fasciitis is one such condition that can be secondary to altered foot biomechanics as a result of gastrocnemius contracture. We performed an isolated proximal medial head of gastrocnemius release (PMGR) as a day-case procedure and report our results of this procedure in the treatment of recalcitrant plantar fasciitis.

## Material and Methods

We prospectively followed a consecutive series of 22 heels in 18 patients following a PMGR. To be included, at least one year of conservative treatment must have been tried and isolated Gastrocnemius contracture confirmed clinically using Silfverskiold's test pre-operatively. Outcome measures included the visual analogue pain score (VAS) and a 5-point Likert scale of postoperative success. Subjective and objective calf weakness was also evaluated. Final follow up was at an average of 25 months (range: 12 to 36 months) after the surgery.

## Results

Two patients were lost to follow up. In the remaining 20 heels the average VAS for pain had improved from 9.4 to 1.8 ( $P < 0.001$ ). Fourteen heels (70%) were pain free or significantly better at final follow up. There was no objective evidence of calf weakness and only one patient (5%) felt subjectively weaker on the released side. There were no 'major' complications and only 2 cases (10%) suffered a 'minor' complication. One was a case of superficial wound sepsis and the other was of prolonged calf pain following the surgery. Both resolved without further intervention.

## Conclusions

A PMGR is a simple way of treating patients with plantar fasciitis who fail to respond to conservative management. The results, in our series, have been favorable and the morbidity low. We recommend the use of gastrocnemius release once non-operative management has failed.

# Major complications following foot and ankle surgery – analysis using national hospital episode statistics

Jameson S, James P, Oliver K, Townshend D, Reed M  
Northumbria Healthcare NHS Trust

## Background

Diagnostic and operative codes are routinely collected on every patient admitted to National Health Service (NHS) hospitals in England and Wales (hospital episode statistics, HES). The data allows for linkage of post-operative complications and primary operative procedures, even when patients are re-admitted following a successful discharge. Morbidity and mortality data on foot and ankle surgery (F&A) has not previously been available in large numbers for NHS patients.

## Methods

All HES data for a 44-month period prior to August 2008 was analysed and divided into four groups – hindfoot fusion, ankle fracture surgery, ankle replacement and a control group. The control group was of first metatarsal osteotomy, which is predominantly day case surgery where no above ankle cast is used. The incidence of pulmonary embolism (PE) and all cause mortality (MR) within 90 days, and a return to theatre (RTT, as a complication of the index procedure) within 30 days was calculated for each group.

## Results

7448 patients underwent a hindfoot fusion. PE, RTT and MR were 0.11%, 0.11% and 0.12% respectively. 58732 patients had operative fixation of an ankle fracture. PE, RTT and MR were 0.16%, 0.08% and 0.35%. 1695 patients had an ankle replacement. PE, RTT and MR were 0.06%, 0.35% and zero. 35206 patients underwent a first metatarsal osteotomy. PE, RTT and mortality rates were 0.02%, 0.01% and 0.03%.

## Discussion

There is controversy regarding the use of venous thrombo-embolic (VTE) prophylaxis in foot and ankle surgery. Non-fatal PE in F&A surgery has previously been reported as 0.15%. NICE guidelines recommend low molecular weight heparin (LMWH) for all inpatient orthopaedic surgery. 94% of F&A surgeons prescribe LMWH to post operative elective inpatients in plaster according to a previous British Orthopaedic foot and ankle society survey. VTE events, RTT and mortality rates for all groups were extremely low, including inpatient procedures requiring prolonged immobilisation. We question the widespread use of LMWH.

# Coding issues in foot and ankle surgery

Barrie JL, Taylor P

East Lancashire Foot and Ankle Service

## Introduction

Coding systems are important for epidemiology, research, audit, activity analysis and now remuneration. There have been concerns that the existing coding systems do not represent foot and ankle activity accurately.

## Materials and methods

The senior author's logbook was analysed for 2 years. Each operation descriptor was recorded. A "simple descriptor" described an operation of one component ("scarf osteotomy"). A "multiple descriptor" described multiple instances of one component ("bilateral scarf osteotomy"). A "compound descriptor" described a procedure made up of more than one component ("scarf osteotomy and 2<sup>nd</sup> toe straightening"). We encoded the logbook using OPCS4.5 and the RCSED Electronic Logbook. We assessed whether simple descriptors could be coded unambiguously (ie there was a one-to-one relationship between descriptor and code so that distinct procedures could be identified) and whether compound descriptors contained ambiguous codes. We also considered whether the overall procedure was adequately summarised by the tabulated codes. Codes were converted to the HRG4 and BUPA payment codes and referenced to chevron osteotomy.

## Results

There were 513 procedures with 157 different descriptors (3.27 cases/descriptor, compared with 4.44 in upper limb and 7.69 in lower limb). Fifty-four descriptors (321 patients) were simple, 18 (52 patients) were multiple and 85 (140 patients) were compound. Using OPCS, 57.4% of simple descriptors (46.1% of patients) were ambiguous, as were 82.4% of compound descriptors (85.7% of patients). In 27.1% of descriptors (33.6% of patients) the tabulated codes did not give the overall procedure clearly. Using the eLogbook, 48.1% of simple descriptors (25.2% of patients) and 74.1% of complex descriptors (70.7% of patients) were ambiguous and in 30.6% of descriptors (37.1% of patients) the codes did not summarise the operation well. Most remuneration compared reasonably with chevron osteotomy, with some idiosyncrasies. Overall remuneration was lower than procedures of comparable complexity in other specialties.

# **HRG 4 Codes: does surgeon input improve coding accuracy and optimise NHS Hospital Trust income in foot and ankle surgery**

**Dunning M, Taylor H**

Royal Bournemouth Hospital

## **Introduction**

The HRG 4 coding system was introduced in April 2009 to allow the calculation of tariffs for all surgical procedures. At our institution we felt surgeon input could improve the accuracy of this coding and optimise trust income.

## **Method**

A retrospective audit of one month's procedures under the care of a single consultant was performed. The hospital's coding and tariff, as performed by coding clerks, was reviewed and the procedures were re-coded by a foot and ankle fellow using the notes and the HRG 4 grouper. A comparison was made between the coding and income generated in the standard fashion and that achieved after optimisation by surgeon input.

## **Results**

The codes of 51 patients were examined. 86% of major foot procedures were correctly coded. However, 56% of 'minor' procedures were recoded as 'intermediate', many of these involving hallux valgus surgery. 58% of procedures had a different code after surgeon input and 41% generated a different tariff. The total tariff for the coding clerk group was £79,192. The total tariff in the surgeon assessed group was £97,268 - a difference of £18,076. Extrapolated over the year this could represent a potential gain of over £200,000, for a single consultant in a single Trust.

## **Conclusion**

We believe surgeon involvement in coding is crucial to improve accuracy and to optimise trust income. We will discuss various issues surrounding the new HRG 4 codes and how best to use them in current practice.

# **The importance of getting coding right in foot and ankle surgery: an audit of current practice in our unit**

**Hamilton P, Piper-Smith J, Singh S, Jones I**  
Guy's Hospital, London

## **Introduction**

Since the introduction of payment by results in the NHS in 2004, the accurate recording of services performed has played a crucial role in reimbursement to hospital trusts by primary care trusts (PCT). Failure to accurately charge for these services causes a shortfall in funding received. Under the new reimbursement system, similar treatments are grouped together under the same tariff and referred to as a Healthcare Resource Group (HRG). Coding is the assignment of procedures to HRG's. We aim to assess the accuracy of coding performed at our institution and link this directly to the funds received from the PCT. Foot and ankle surgery has a particular interest in coding due to the multiple codes that are utilised to code for one procedure.

## **Method**

We looked at 40 consecutive operations performed at our institution. We compared the codes assigned by the surgeon placing the patient on the waiting list, which were the codes seen directly on the operating list with the final codes given to the PCT. We compared the two codes and looked at the difference in final costing.

## **Results**

There were a total of 75 codes from the 40 operations assigned by the surgeon compared with 103 codes assigned by the coding staff. Although most of the codes were different when the final costing data was generated there was little difference in the overall costs.

## **Discussion**

The importance of accurate coding has become paramount in the current national health service funding. We have shown large discrepancies between the codes the surgeon produces and the final code given to the PCT. Although, in our unit, this has not led to differing final reimbursement figures, it does have the potential to create inaccuracies with a failure to pay for work performed. We will present our data and describe the correct coding for common procedures in foot and ankle surgery, to allow accurate reimbursement.

# **Arthroscopic and open ankle fusion in haemophiliacs: a tale of two cities**

**Butler M, Cooke PH, Dheerendra S, Goddard NJ, Goldberg A, Sharp RJ, Ward NJ**  
Nuffield Orthopaedic Centre, Oxford and Royal Free Hospital, London

## **Introduction**

Severe haemophilia affects 1 in 10,000 men. The ankle along with the hip and knee are commonly affected. Ankle fusion is the preferred surgery for end stage arthritis in the younger patient although debate exists as to the preferred technique. We conducted a retrospective review of the arthroscopic ankle fusions on haemophiliacs from Oxford and compared data with that of a specialist unit in London using an open technique.

## **Materials and Methods**

We reviewed 22 ankles (22 patients) from Oxford and 10 ankles (8 patients) from London. 90% had Type A haemophilia with similar regular monthly Factor VIII usage: 17941 U/month (Oxford) compared with 17992 (London). 73% of patients in the Oxford Group and 100% of the London group had Hepatitis C and/or HIV.

## **Results**

Union was achieved in all patients. The mean time to union in the open group was 9.1 weeks (Mode- 8 weeks, Range 7-14) compared to 12.2 weeks (Mode- 12 weeks, Range 8-24) in the arthroscopic group. Screw removal was required in 4 patients (3 arthroscopic versus 1 open). 1 patient in the arthroscopic group suffered a pseudoaneurysm of the dorsalis pedis artery. The arthroscopic group spent less time in hospital- 5.7 days compared to 9.5 days for the open group in London.. Factor VIII usage was less in the arthroscopic group- 32,882 Units compared to 40013.

## **Discussion**

Patients of this nature should be managed in centres used to dealing with their complex needs. Arthroscopic ankle fusion in haemophiliacs is safe for these patients. Although arthroscopic fusion may take slightly longer to unite, there are benefits in terms of reduced patient stay and factor VIII requirement and therefore costs.

# **Pinching from the shoulder: use of PHILOS plate or blade plate as a fixed angle device for complex tibiotalar and tibiotalocalcaneal fusion**

**Pradhan R, Rosenfeld PF**  
St Mary's Hospital, London

## **Background**

Complex tibiotalar (TT) and tibiotalocalcaneal (TTC) fusions are performed for significant ankle and hindfoot arthritis and/or deformity. Literature suggests several methods of fixation including crossed screws, plates, nail and external fixation. These are technically difficult operations with reported complication rates as high as 30-80%. We present a retrospective cohort study of angle blade plate and PHILOS plate fixation for these patients in our hospital.

## **Methods**

This study describes 21 consecutive patients with 22 TT or TTC fusions between December 2005 and May 2009. The surgery was performed for severe deformity or arthritis as a result of: osteoarthritis (2), post-traumatic arthritis(4), rheumatoid arthritis (7), Charcot arthropathy (5), avascular necrosis(1), and post traumatic avascular necrosis (3). The senior author performed all of the operations. In the first ten cases (two TT and eight TTC) an angle blade plate was used, A PHILOS plate was used in the subsequent ten cases (three TT and seven TTC). One patient had bilateral TTC fusions with a blade plate on one side and a PHILOS plate on the other. There were 8 male and 13 female patients. All the procedures were performed through a lateral transfibular approach. The patients were followed up regularly with clinical and radiological evaluation until union or otherwise.

## **Results**

Fusion was achieved in 19 out of 21 patients (90.5%) and 20 out of 22 arthrodeses (90.9%). All five TT fusions went on to union (100%). Fifteen out of 17 TTC fusions united (88.2%). One TTC fusion using an angle blade plate needed revision surgery for non-union of subtalar joint. In the PHILOS group, one patient developed MRSA infection of the surgical site leading to non-union which necessitated removal of metal and prolonged treatment with intravenous antibiotics. The patient now has a relatively painless fibrous ankylosis.

## **Conclusion**

TT and TTC fusions are complex operations performed for severe arthritis and deformity, often on patients with significant co-morbidities. It is a salvage procedure to relieve pain and/or correct deformity of the foot and ankle. This study suggests that both the angle blade plate and PHILOS plate provide a stable fixed angle construct, which achieves a high rate of bony union with alignment correction.

# **Hindfoot arthrodesis: effect of early weight bearing on union rate - one to six year follow-up**

Hajipour L, Allen PE  
Leicester General Hospital

## **Introduction**

Non-union occurs at a rate of 5-10 % following ankle and hindfoot arthrodesis, but the effect of early weight bearing on union rate in these patients has not been studied.

## **Materials and Method**

We have looked at the union rate following ankle and hindfoot arthrodesis with an early weight bearing protocol in a single surgeon series between 2003 and 2008. Data was collected retrospectively on 108 patients with a total of 198 ankle and hindfoot joint arthrodesis.

## **Results**

The non-union rate was 3.4% (9 in 154 joints) in the early weight bearing group and 18% (8 in 44 joints) in the late weight-bearing group. Union rate following revision surgery with bone graft was 100% in both groups.

## **Discussion**

Early weight bearing following ankle and hindfoot arthrodesis has no adverse effect on the union rate.

# **A comparison of two night ankle-foot orthoses used in the treatment of plantar fasciitis**

**Attard J, Singh D, Cullen N, Gemmell E, Cooper D, Smith K**

Royal National Orthopaedic Hospital, Stanmore

## **Background**

Non-operative treatment for plantar fasciitis varies widely and includes the use of night ankle-foot orthoses (AFOs). Some studies have shown that this is more effective in the initial management of plantar fasciitis than anti-inflammatory therapy. During sleep the foot and ankle tend to assume a plantarflexed position, which results in tightness of the calf muscle group, accounting for the stiffness and pain experienced by patients as they take their first weight bearing steps in the morning. However, when the foot and ankle are kept in a dorsiflexed stretched position at night, stress relaxation occurs and the plantar fascia relaxes.

## **Aim**

Compliance with night AFO's that dorsiflex the foot/ankle has always been a problem. This study compares the effectiveness of a posterior AFO, which dorsiflexes the ankle, with an anterior AFO, which maintains the ankle in a plantigrade position, in order to assess whether it is absolutely necessary to dorsiflex the foot and ankle during the night to avoid early morning pain and stiffness, or whether it is sufficient just to maintain the foot plantigrade.

## **Methods**

18 participants were recruited on a voluntary basis and at random from among those patients referred to the Orthotics department with plantar fasciitis to be provided with a night orthosis. The inclusion criterion was that the diagnosis was purely plantar fasciitis with no secondary diagnosis, symptoms or complications. Each participant was given a questionnaire to fill in; this evaluated how satisfied the participants were with the orthosis with regards to comfort, ease of use and appearance, and whether the pain in the foot was reduced and at what stage was it reduced. The two types of AFOs used in this study were: i) a posterior AFO that holds the ankle in variable and adjustable dorsiflexion and ii) an anterior AFO that keeps the ankle and foot in plantigrade, with no adjustment to the amount of dorsiflexion.

## **Results**

67% of the participants confirmed that morning pain and stiffness was less after wearing the AFO; this included 78% of those that wore the anterior AFO and 56% of those that used the posterior orthosis. 56% of all participants reported that the orthoses were uncomfortable and disrupted sleep. The most uncomfortable was the posterior AFO (89%), as opposed to the anterior one (22%). Both types of orthoses were reported to be relatively easy to don and doff (89% anterior AFO and 78% posterior AFO). On a scale of 1 to 10, the participants were asked to grade the pain before starting the orthosis treatment regime, after 6 weeks of wearing the AFO and again 6 weeks later. On average, the anterior AFO reduced the pain from 7 to 2.1, while the posterior orthosis only reduced the pain from 8.1 to 6.7.

## **Conclusion**

In general, plantar fasciitis night AFOs are poorly tolerated orthoses; however, their use can be justified in that the pain levels are reduced. The anterior AFO seems to be more effective in achieving this, without dorsiflexing the foot and ankle beyond plantigrade. Thus, one could argue that there is no need to dorsiflex the ankle to achieve the goal. However, further investigation is necessary with a larger patient cohort.

# **Radiological diagnosis of degenerate change of the subtalar joint: a study comparing the reported degree of osteoarthritis in a plain radiograph when compared with a CT scan**

**Day M, Topliss CJ**

Swansea Hospital, Morriston

## **Introduction**

With increasing availability of CT scans their use in the investigation of the subtalar joint increases, whilst we continue to use plain x-ray. Using a standardised reporting protocol, we graded x-rays and CT scans to compare the diagnosis made using each modality.

## **Materials and Methods**

An atlas and reporting system of the subtalar joint was designed using a modification of Kellgren and Lawrence's system. 50 consecutive CT scans of the subtalar joint were identified and saved along with paired plain x-rays of the foot and ankle. All investigations were anonymised. Scans were excluded if there were no plain films or there was evidence of previous trauma. Orthopaedic surgeons were asked to report on the 50 CT scans and 50 plain radiographs using the reporting protocol, commenting on two components for each investigation; the anterior and middle facets and the posterior facet of the subtalar joint.

## **Results**

In 33% of cases the facets of the subtalar joint could not be appreciated from the plain x-rays. The difference between the modalities in reported grade of degeneration of the anterior and middle facets of the subtalar joint was statistically significant ( $p= 0.014$ ) but not for the posterior facet (0.726). When looking at the Spearman correlation coefficient, the anterior and middle facets had no correlation ( $r = - 0.067$ ) although the posterior facet did ( $r = 0.029$ ).

## **Discussion**

When looking at the posterior facet of the subtalar joint plain x-rays and CT scans give comparable results. When looking at the anterior and middle facets the information gained from the plain x-rays bears no resemblance to that gained from the CT scans.

## **Conclusion**

The plain x-ray is an inaccurate, unreliable method of investigating degenerate pathology of the subtalar joint and should be superseded, and perhaps replaced, by the CT scan.

# The use of thromboprophylaxis in total ankle arthroplasty

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The Freeman Hospital, Newcastle upon Tyne

## Introduction

Thromboprophylaxis in orthopaedic practice has long been a debated issue. The recent NICE guidelines have recommended low molecular weight heparins (LMWH) for all orthopaedic patients, although a number of authors have highlighted the low risk of thromboembolism in foot and ankle practice. We looked at our series of total ankle replacements (TAR) to identify the incidence of thromboembolism and any complications associated with chemical thromboprophylaxis.

## Methods

All patients who had undergone TAR were reviewed retrospectively. Risk factors according to the NICE guidelines were identified as was the type of chemical thromboprophylaxis, if given. Complications including thromboembolism, wound ooze, swelling and delay in discharge were recorded.

## Results

There were 45 TAR's in 45 patients. 20 patients (44%) had been given some form of chemical thromboprophylaxis. There were no cases of thromboembolism in either group. In the group receiving chemical thromboprophylaxis, nine patients (45%) had a wound complication. In the group receiving no chemical thromboprophylaxis only one patient (4%) had a wound complication.

## Discussion

Thromboprophylaxis in total ankle arthroplasty significantly increases the risk of wound complications. We would recommend caution when prescribing chemical prophylaxis for patients undergoing total ankle replacement.

# The distal branches of the sural nerve and their relationship to the bony landmarks of the lateral part of the foot

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## Introduction

The sural nerve is commonly encountered in many operations on the lateral part of the foot and ankle, such as fixation of distal fibula, 5<sup>th</sup> metatarsal and calcaneal fractures, and fusion of the subtalar or calcaneo-cuboid joints. However there is no consensus and quantitative description of the branches of sural nerve distal to the ankle in the reviewed literature. This study aims to describe these branches and quantify their relations.

## Methods

The distal course of the sural nerve was dissected in 30 embalmed cadaveric limbs.

## Results

A fibular branch was found in close proximity to the tip of the distal fibula in 63% of specimens. A dorsal branch at the level of the cuboid was found in 80% of specimens, however, its point of departure from the main nerve varied considerably. More distally a series of plantar branches of varying number, and at varying distances to each other was found. These branches were then described in relation to the following bony landmarks: the tip of the distal fibula, the calcaneo-cuboid joint, the tuberosity of the base the 5<sup>th</sup> metatarsal, the shaft of the metatarsal and the 5th metatarso-phalangeal joint. The distances between these landmarks were quantified using digital analysis.

## Conclusion

The sural nerve has a number of previously undescribed but potentially important branches distal to lateral malleolus in the foot. Identifying these branches during surgery with relation to the various bony structures should minimise the risk of nerve injury.

# **Popliteal nerve block for hindfoot surgery in a district general hospital setting**

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## **Background**

Postoperative pain following hindfoot surgery can be difficult to control with opioid analgesics. Popliteal nerve blocks have been shown in the literature to be effective in both delaying the onset of postoperative pain and reducing the intensity of the pain, with a variable duration of effect. In 2007 we established a 'block team' of anaesthetists available to administer popliteal blocks preoperatively.

## **Methods**

Forty-nine consecutive patients undergoing hindfoot surgery were selected. Data was collected: The proportion of patients having a block; opiate requirement during surgery, in the recovery room and on the ward; pain score; time to mobilize after surgery; and length of stay. We compared two techniques used for popliteal block and also compared post-operative pain control with and without a popliteal block.

## **Results**

There was a considerable increase in the percentage of patients who had a popliteal block after the block team was established (40% to 91%). Six of 23 (23%) patients needed opiates in the recovery room in the nerve block group; compared to 12 of 20 (60%) patients who did not have a block. Comparing the two techniques used for the nerve block, ultrasound guidance reduced postoperative intravenous opiate usage compared to blocks given with the aid of a nerve stimulator ( $p < 0.05$ ). Fifteen of 16 (94%) patients mobilized on the first post operative day in the ultrasound group compared to 16 of 23 (64%) in the patients who had no block. There were no complications recorded as a result of popliteal nerve blocks.

## **Conclusion**

Establishing a block team has improved the proportion of patients receiving a popliteal block in hindfoot surgery in our hospital. The ultrasound guided technique gives superior results in terms of pain relief and earlier mobilization, when compared to blocks administered using a nerve stimulator.

# Ultrasonography in the diagnosis of foot and ankle fractures presenting to the emergency department

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## Introduction

Foot and ankle injuries are common in the Emergency Department (ED)<sup>1</sup>. Of those which require radiographs, in accordance with the Ottawa Foot and Ankle Rules, approximately 22% have a fracture.<sup>2</sup> In the last decade ultrasound has been developing as a tool for emergency musculoskeletal assessment – it is inexpensive, rapid and visualises soft tissue and bony structures.

## Methods

This diagnostic cohort study was designed to determine whether ultrasound could detect acute bony and non-bony foot and ankle injuries. Ottawa Rules positive patients over 16 year of age without obvious dislocation/compound fracture were eligible. An ultrasound scan (USS) for bony injury was performed by a member of the ED, blinded to radiographic findings. Patient management was determined according to the radiographs. Significant fractures were defined as a breadth greater than 3 mm (as per the Ottawa Foot & Ankle Rules study group)<sup>3</sup>. All radiographic reporting was conducted blind to the results of the USS. All USS operators received a specific 2-day training in musculoskeletal ultrasound prior to the trial.

## Results

One hundred and ten subjects were recruited. Eleven had significant radiological fractures, ten of which were seen on ultrasound. The single missed fracture arose due to the operator not scanning proximally enough on the fibula. On re-scanning following radiographic review the fracture was clearly seen on ultrasound. To date the sensitivity of USS is 90.9%, with 95% CI (65.7, 98.3). The specificity is 90.9% with 95% CI (88.1, 91.7). The positive predictive value is 0.526, with a 95% CI (0.380, 0.569). The negative predictive value is 0.989, with a 95% CI (0.959, 0.998). The positive likelihood ratio is 10.00, with a 95% CI (5.526, 11.901) and the negative likelihood ratio is 0.100, with a 95% CI (0.018, 0.389).

## Conclusion

Our pilot study demonstrates that ultrasound shows great promise for the sensitive detection of foot and ankle fractures.

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# Radiographic evaluation of the distal tibiofibular syndesmosis

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## Introduction

Diagnosis of syndesmotic injuries is primarily based upon the assessment of ankle radiographs. Earlier studies examining normal radiographs are limited by small sample size and methodological issues.

## Materials and Methods

One thousand four hundred and fifteen consecutive patients with ankle radiographs were reviewed. 1023 patients were excluded as a result of a history of ankle/hindfoot pain, trauma, or surgery; or radiographic evidence of ankle/hindfoot pathology. 392 patients (218 females, 174 males) with normal ankle radiographs were included. 83 of 392 patients had bilateral normal radiographs. All radiographs were reviewed independently by a fellowship-trained foot and ankle surgeon and a fellowship-trained musculoskeletal radiologist. Tibiofibular overlap and tibiofibular clear space were measured on anteroposterior (AP) and mortise radiographs. These four measurements were analyzed.

## Results

Mean AP overlap was 8.3 mm ( $\pm 2.5$ ). Mean mortise overlap was 3.5 mm ( $\pm 2.1$ ), 7.7% patients had  $< 1$  mm overlap and 4.9% of patients had  $< 0$  mm overlap. Mean AP clear space was 4.6 mm ( $\pm 1.1$ ), 7.1% patients had  $> 6$  mm clear space. Mean mortise clear space was 4.3 mm ( $\pm 1.0$ ), 4.3% patients had  $> 6$  mm clear space. All measurements were significantly different between females and males ( $p < 0.001$ ). Mortise clear space is the most accurate measure when obtaining contralateral radiographs. Intraobserver and interobserver reliabilities of all measurements were high (intraclass correlation coefficient range 0.820-0.983).

## Discussion and Conclusion

Our data unequivocally demonstrates that basing treatment of syndesmotic injuries on previously reported radiographic criteria can lead to unnecessary operative intervention or failure to treat. Lack of overlap on the mortise view can represent a normal variant, which has not been definitively reported in prior investigations. Our data forms the basis for new radiographic criteria to evaluate syndesmotic disruption.

# **Ankle tightrope syndesmosis fixation: a review of 38 cases**

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## **Introduction**

Several methods for the management of syndesmosis disruption during ankle fracture fixation have been documented. The Tightrope anchor is a relatively new technique consisting of two buttons and a strand of Fiberwire which is looped twice through the buttons to create a pulley effect between the fibula and tibia, thereby stabilising the ankle syndesmosis. We have reviewed the outcomes in 38 patients treated with this technique.

## **Materials and Methods**

Data including nature of operation, complications and the need for subsequent surgery were recorded for all patients receiving a Tightrope from May 2006 to September 2008.

## **Results**

The mean patient age was 35 years, and 23 were male. 30/38 patients required no further surgery and had a good functional outcome. Two patients had prominent fibula plates removed but achieved good functional outcomes. For one patient a Tightrope was performed following diastasis screw failure: an improved but suboptimal outcome was achieved. A patient with fibromyalgia had a good range of movement but complained of discomfort. One patient with Poland sequence, who fell post operatively, needed tightrope removal and syndesmosis debridement resulting in a good but painful range of movement. Another patient developed a pulmonary embolus following surgery and prolonged swelling and discomfort limited her functional capacity. Two patients required tightrope removal and significant wound debridement following osteomyelitis of the fibula and tibia.

## **Discussion and Conclusion**

The Tightrope is an effective method of ankle syndesmosis repair, with a reduced need for subsequent diastasis related surgery (35/38) when compared to our diastasis screw method (100%). However, our significant rate of osteomyelitis is disturbing, warranting further investigation.

## **Pragmatic treatment of fractures of uncertain stability: clinical features and risk of displacement**

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The most important determinant of treatment of malleolar fractures is stability. Stable fractures have an intact deep deltoid ligament and do not displace with functional treatment. If the deep deltoid/medial malleolar complex is disrupted, the talus is at risk of displacement.

We developed clinical criteria for potential instability and applied them to a prospective series of patients. Criteria included: a medial clear space of <4mm; medial tenderness, bruising or swelling; a fibular fracture above the syndesmosis; a bimalleolar or trimalleolar fracture; an open fracture; a high-energy fracture mechanism. Patients with a medial clear space of < 4mm and none of these criteria were considered to have stable fractures, while those with a medial clear space of >4mm were considered to have a displaced fracture.

We studied 152 consecutive skeletally mature patients with undisplaced, potentially unstable malleolar fractures treated by the senior author between 1<sup>st</sup> January 1998 and 31<sup>st</sup> December 2007. Patients were treated in a below-knee walking cast (136 patients) or a functional ankle brace (16 patients) for six weeks. Weight bearing was encouraged throughout. Weight bearing radiographs were obtained at one week and six weeks. Displacement was defined as talar displacement with a medial clear space >4mm. Demographic, clinical and radiological data were collected prospectively.

There were 88 male and 64 female patients, with a median age of 43 years. Criteria for possible instability were: medial tenderness, 115 patients; proximal fibular fracture, 29 patients; bimalleolar fracture, 17 patients; other criteria, 15 patients. Three fractures displaced (risk of displacement 2.0%, 95% CI 0.4-5.7%). All displaced within the first week and were treated by open reduction and internal fixation. One bimalleolar fracture developed a symptomatic medial malleolar non-union which was treated by percutaneous screw fixation (risk of non-union 5.9%, 95% CI 0.1%-28.7%). All the other fractures achieved clinical union by 8 weeks.

# **A prospective comparison study assessing a patient-centered home therapy program for unstable ankle fractures**

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Ankle fractures are common injuries affecting all age groups and constitute a large proportion of the orthopaedic trauma caseload. Frequently a large number of bed days are utilized waiting for swelling to subside and a theatre slot to become available. We audited current practice and then implemented a home therapy program (HTP). If HTP criteria were met then patients with reduced, unstable ankle fractures were taught how to use crutches and allowed home from the emergency department in order to ice and elevate at home. They were then admitted from clinic for surgery the same day and then discharged when safe and comfortable.

The purpose of this study was to prospectively compare the local management of surgically stabilised ankle fractures before and after instigating a home therapy program.

43 consecutive patients met our inclusion criteria and underwent surgical fixation of unstable ankle fractures over a three month period (February to April 2008.) The average length of hospital stay was 8 days (1-18), 4.5 days pre-operatively and 3.5 days post operatively.

Forty-eight patients underwent surgical fixation of unstable ankle fractures over a four month period (November 2008 to February 2009.) Twenty-one met the home therapy criteria. The average length of hospital stay was reduced to three days, 1.6 days pre-operatively and 1.3 days post operatively. Additionally a patient survey revealed high levels of satisfaction with the HTP.

The home therapy program has effectively reduced hospital stay both pre and post-operatively. Patients mobilising at home pre-operatively mobilise earlier post-operatively and are discharged home earlier. Over the three-month period of HTP, 131 bed days were saved which equates to a saving of £30,000.

# **Preliminary results of closed reduction of intra-articular calcaneal fracture with Ilizarov frame**

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## **Background**

Closed reduction of intra-articular calcaneal fractures sometimes lack the accuracy desired for restoring the normal anatomy of the articular surface of the calcaneus. In this study, we evaluate the preliminary results of closed reduction of the intra-articular calcaneal fractures with an Ilizarov frame.

## **Patients and Method**

Forty patients (25 males and 15 females) with 50 intra-articular fracture calcaneal fractures were treated with closed reduction and an Ilizarov frame. The mean age was 25.4 years (range from 19 to 65). Union was achieved after two months. The results were evaluated on the basis of combined clinical and radiological examination at the latest follow-up. Results were classified according to the protocol and scoring system used by Paley and Hall 1993.

## **Results**

The mean follow up period was 1.9 years (range 6 months to 4 years). At final follow up there were 15 excellent feet, 26 were good, 6 fair and 3 poor. The mean Bohler angle postoperatively was 26° (range 17 to 35). Superficial infection occurred in seven feet and was controlled. Skin pressure necrosis of the posterior aspect of the heel occurred in three feet. One needed a skin graft.

## **Conclusion**

This method is a minimally invasive technique. The technique has the ability to restore the normal anatomy, shape and length of the calcaneal body, especially in Sander's type III and type IV fractures. It is particularly useful for osteoporotic bone as it provides rigid fixation.

# Association between glycosylated hemoglobin and the risk of lower extremity amputations in diabetes mellitus - review and meta-analysis

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## Context

Diabetes is associated with a several fold increase in the risk of lower extremity amputation. Although a number of epidemiologic studies have reported positive associations between glycaemia and lower extremity amputation, the magnitude of the risk has not been adequately quantified.

## Objective

To synthesize the available prospective epidemiologic data on the association between glycaemia as measured by glycosylated haemoglobin and lower extremity amputation in individuals with diabetes.

## Data Sources

We searched electronic databases (MEDLINE and EMBASE) and the reference lists of relevant articles.

## Study Selection

We considered prospective epidemiologic studies of cohort or nested case-control design that measured glycosylated haemoglobin level and assessed lower extremity amputation as an outcome. Of 2,398 citations identified, we included 14 studies comprising 94,640 subjects and 1,227 cases.

## Data Extraction

Data were abstracted using standardized forms or obtained from investigators when published information was insufficient. Data included characteristics of case and control populations, measurement of glycaemia, assay methods, outcome, and covariates.

## Results

The overall risk ratio for lower extremity amputation was 1.26 (95% CI, 1.16-1.36) for each percentage point increase in glycosylated hemoglobin level. There was significant heterogeneity across studies ( $I^2$ : 76%, 67-86%;  $p < 0.001$ ) not accounted for by recorded study characteristics. Among studies that reported the type of diabetic population, the combined estimate was 1.44 (1.25-1.65) for individuals with type 2 diabetes and 1.18 (95% CI, 1.02-1.38) for type 1 diabetes, but the difference was not statistically significant ( $p = 0.09$ ). We found no significant publication bias.

## Conclusions

There a substantial increase in risk of lower extremity amputation associated with every 1% higher HbA1c in individuals with diabetes, highlighting a potential benefit of blood glucose control. In the absence of evidence from clinical trials, this paper supports glucose-lowering as a component of overall care in the patient at high risk of amputation.

# **Long term dynamic function of the tibialis posterior tendon following Cobb procedure and Rose calcaneal osteotomy for pes planus**

**Malek IA, Sumroo T, Fleck R, Siddique M**  
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## **Introduction**

A Rose calcaneal osteotomy and Cobb procedure for treatment of acquired pes planus is gaining in popularity as a result of the advantages of anatomical reconstruction and reduced graft site morbidity. Although, its ability to provide long term dynamic function and effect on patient's symptoms remains to be seen.

## **Materials and Methods**

Twenty-two patients with stage two and three posterior tibialis tendon dysfunction underwent surgical reconstruction with a Cobb procedure and Rose calcaneal osteotomy between 2003 and 2008. The average age was 59 years (range: 20-80 years). There were 18 females and four males.

## **Results**

We evaluated the dynamic function of the tibialis posterior muscle tendon function by ultrasonograms postoperatively at mean follow-up time of 36 months. Eighty three per cent of patients achieved a single heel raise. Seventy-three percent of the patients showed an intact and mobile tibialis posterior tendon on supination and pronation movements. There was no difference in the satisfaction of patients with a tenodesis or non tenodesis.

## **Conclusion**

Our results suggest that Cobb procedure does provide dynamic tibialis posterior function in majority of patients.

# Management of early tibialis posterior dysfunction by structured physiotherapy

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## Introduction

Tibialis posterior tendon dysfunction is a common cause of foot pain and dysfunction in the middle aged patients. Initially, it presents as medial ankle pain and swelling, with or without a flexible flat foot, later progressing on to a fixed deformity. Operative management for the early stages of tendon dysfunction poses a significant workload on hospitals and physical burden on patients. We have evaluated non-operative management of early tibialis posterior tendon dysfunction (1).

## Methods

This is a prospective study on patients with stage I and II tibialis posterior tendon dysfunction treated with a structured physiotherapy protocol. Twelve consecutive patients referred to a foot and ankle consultant with early tibialis posterior dysfunction from July 2008 were included in the study. The physiotherapy regime includes repetitive resisted active dorsiflexion, inversion, eversion, heel rise, and tip toe walking. The intensity of physiotherapy is progressively increased over the period of four months in four phases. Criteria for successful rehabilitation are ability to perform greater than ten single stance heel rises and tip toe walking for more than 100 yards. Patients who cannot achieve the expected progression were re-referred for surgical intervention. All the patients were referred for support with orthoses, however, only a few received the orthoses during the treatment period. The outcome was assessed using the validated outcome score Foot Function Index (FFI) before and after physiotherapy regimen.

## Results

The study group consisted of 10 females and two males with 10 unilateral and two bilateral cases. The mean age was 59 years (48 to 79). The average number of physiotherapy visits was five. Prior to treatment the mean number of single stance tip toes performed by the patients was four. Out of 12 patients, ten successfully completed the rehabilitation. The mean FFI before rehabilitation was 55, which improved to 19 at the end of four months rehabilitation. On analysis using a paired t test 95% CI for mean difference: (25.07, 46.93)  $P < 0.0001$ . The improvement was consistent with all the three components of FFI (pain, activity and function) ( $p < 0.0001$ ).

## Conclusion

This study suggests early tibialis posterior tendon dysfunction can be treated effectively with structured physiotherapy.

## Reference

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# Adult acquired flatfoot: a 13-year prospective series

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## Introduction

Adult acquired flatfoot is a common cause of foot pain. The majority of series describe surgery although important non-surgical series exist. This series of 166 patients gives an overview of the clinical spectrum of the condition and outcomes.

## Materials and methods

Data was collected prospectively on 166 consecutive patients with adult acquired flatfoot between 1995 and 2005. 104 patients were reviewed at a median of eight years (range 3-13). A standardised clinical examination, AOFAS hindfoot and visual analogue satisfaction scores were performed.

## Results

There were 40 men (median age 56 years) and 126 women (median age 60 years). 68% had other musculoskeletal problems. Patients were Truro staged at presentation; Stage 1: 26 patients. Stage 2A: 84 patients. Stage 2B: 25 patients. Stage 2C: 23 patients. Stage 3: 6 patients. Stage 4: 2 patients.

Stage 1 patients were younger ( $p < 0.001$ ). 133 patients had soft-tissue symptoms, but 33 had degenerative problems. Degenerative patients had a higher median age ( $p = 0.0138$ ) and stiffer deformities ( $p < 0.0001$ ). Most patients (131, 78.9%) were managed conservatively. Surgery was commoner in the arthritic group ( $p = 0.001$ ).

Fifty-two conservatively treated feet were clinically reassessed. In 31 (59%) patients the Truro stage had not changed, 11 (21%) had improved and 10 (20%) had deteriorated. Twenty percent of patients treated with orthoses stopped using them after 18 to 24 months. In non-surgically treated patients, the median AOFAS score was 73/100 and satisfaction score 71/100. In surgically treated patients the median AOFAS score was 74/100 and satisfaction score 83/100.

## Discussion

There is a young group of patients with adult acquired flatfoot, with soft tissue symptoms but no progressive deformity. There is a large group with a flexible deformity who can mostly be treated with orthoses, and an older group with stiffer, arthritic deformities who are more likely to need surgery.

## Conclusion

Final outcomes and satisfaction were similar in surgically and non-surgically treated patients.

# **Flexor digitorum longus tendon exposure for flatfoot reconstruction: a comparison of two methods in a cadaveric model**

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## **Background**

A novel method for harvesting the flexor digitorum longus (FDL) tendon has previously been described via a plantar approach based on a surface coordinate. The aim of this investigation is to provide a comparison with the traditional medial midfoot dissection for tendon harvest.

## **Methods**

The FDL tendon was exposed in 10 cadaveric feet via a limited plantar approach and also medially as far as could be accessed via the knot of Henry. The FDL was marked with a metal clip in each approach. The lengths of the skin incisions were recorded and the distance between the two markers was measured. The morphology of the FDL tendon was observed including interconnections with the flexor hallucis longus (FHL) tendon.

## **Results**

The mean additional length of tendon accessed via the plantar approach was 22.9 mm with a mean reduction in skin incision length of 15.6 mm. The FDL tendon showed some division at the site of the plantar exposure and there were FDL - FHL interconnections in nine of the feet with three distinct patterns observed.

## **Conclusion**

Using the plantar exposure, a longer length of tendon can be obtained through a smaller skin incision, which has been quantified here. Observations on FDL tendon morphology and interconnections may have clinical significance.

# The basal opening wedge osteotomy for hallux valgus, does it work?

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## Introduction

An osteotomy in the proximal first metatarsal corrects the metatarsal head position with much less movement of the fragment than an equivalent distal osteotomy. Most described techniques are technically demanding and reported complications including non-union, mal-union and transfer pain. We present our results of an opening wedge osteotomy with a medial wedge plate. We also present the pitfalls and tips to avoid complications.

## Materials and Methods

Thirty-four procedures in 30 patients were performed using the Arthrex wedge plate. Demographic and clinical data, AOFAS scores and radiological measurements of standardised radiographs were collected for all the patients.

## Results

All patients were females. The average age was 52 years. Twenty-seven were primary procedures and 7 patients had had previous, failed 1<sup>st</sup> ray surgery. No bone graft was used. Thirty-two feet showed clinical and radiological signs of union. Four complications occurred and one was treated with metatarsophalangeal joint fusion. One had an infection. Two patients had broken screws. The average hallux valgus angle and inter-metatarsal angle corrections were 20° and 9° respectively. Average increase in AOFAS scores: preoperative 47 to postoperative 81.

## Discussion

The spacer in the plate acts as a pillar and obviates the need for a bony strut. Keeping an intact lateral cortex and preventing any shaft displacement was important in avoiding transfer pain. 4.5mm or smaller plates appear to have fewer problems and better scores, although this was statistically unproven. Screw breakage in the absence of infection had no bearing on overall outcome. Some patients with poor fixation may benefit from non-weight bearing for the first 6 weeks.

## Conclusion

The wedge plate osteotomy is a powerful tool to correct moderate to severe hallux valgus. It does not need additional bone graft and has a favorable clinical and radiological outcome. The prelude to optimum result was meticulous technique avoiding the discussed pit falls.

# **The treatment of the hallux valgus with a percutaneous chevron osteotomy**

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## **Introduction**

Hallux valgus is a common foot deformity. A widely used method for correction of mild and moderate hallux valgus is a distal metatarsal (Chevron) osteotomy. The purpose of this study was to assess the results of a percutaneous chevron osteotomy two years after my first communication in Arcachon.

## **Patients and method**

The operation is performed by one senior surgeon. The patient is placed in the supine position. The foot is allowed to overhang the end of the table. No tourniquet is used. The procedure is controlled by fluoroscopy. The chevron osteotomy is undertaken with a Shannon burr of 12 mm and a 20 mm for the last case. The axis of translation is determined preoperatively and adapted to the foot: more or less plantar displacement of the metatarsal head, or, more or less shortening of the metatarsal itself. The translation of the head is controlled by a temporary intramedullary K-wire inserted medially. The fixation is with an absorbable k-wire for one part and by screw for the other part. The medial exostosis is not systematically removed. The procedure is completed by an Akin osteotomy in 90%. A lateral release procedure is performed percutaneously.

## **Results**

The mean age of the patients was 55 years at time of operation. At the follow-up of 3 months all patients are examined and X-Ray's taken. The Kitaoka score increased from 45 to 89. The hallux valgus angle decreases from 37° to 10°. The metatarsus varus is 10°. Three patients need a new surgery for a secondary displacement. Our results are comparable to those published for open chevron osteotomy in terms of correction of the HV and intermetatarsal angles.

# Early experience with a minimally invasive modified chevron and akin osteotomies for correction of hallux valgus

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## Introduction

In most areas of surgery there has been a move in recent years towards less invasive operative techniques. However, minimally invasive surgery (MIS) is not automatically 'better' surgery. Several MIS techniques for correcting hallux valgus have been described. We present our experience with an MIS chevron type osteotomy, Akin osteotomy and distal soft tissue release. This technique utilises rigid internal screw fixation (without the need for k wire fixation). This is the first such series to be reported in the United Kingdom.

## Patients & Methods

A consecutive series of twenty three patients (30 feet) with mild to moderate HV deformity were included in the study and were independently assessed clinically and radiographically and scored using the AOFAS scoring system, visual analogue score for pain and a subjective outcome score. All surgery was performed by a single surgeon (DR) using a high-speed burr to create the osteotomies. The osteotomy was fixed with a rigid screw. The mean age was 59 (24-75), and 90% were female. All patients had minimum follow-up of three months (mean 7.5, range 5 -12).

## Results

The mean AOFAS score improved from 39.3 (median 44, range 25-57) preoperatively to 89.9 (median 92, range 77-100) postoperatively. The mean visual analogue score improved from 7 to 1. 82% of patients were very satisfied / satisfied with the procedure. There were no cases of infection, two cases of type 1 complex regional pain syndrome and two screws required removal.

## Conclusion

This small series represents the senior author's learning curve with this new technique and as such, these early MIS results compare well with outcomes reported with modern open techniques for mild to moderate hallux valgus deformities. A randomised study to compare open and closed techniques is now being undertaken.

## **Hammer toe correction: a comparative study of K wire versus bioabsorbable fixation**

**Malek I, Torres P, Soomro T, Siddique M**  
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The surgical correction of hammertoe deformity of the lesser toes is one of the most commonly performed forefoot procedures. In general, percutaneous Kirschner wires are used to provide fixation to the resected proximal interphalangeal joint. Although these wires are effective, issues such as pin tract infection as well as difficult postoperative management by patients make alternative fixation methods desirable.

The biomechanical studies suggested that the bioabsorbable implant would be a suitable fixation device for the hammer toe procedure. These wire are made of a copolymer of 82% poly-L-lactic acid and 18% polyglycolic acid.

The aim of our study was to assess the clinical outcome of these two implants. We compared 100 consecutive proximal interphalangeal joint fusions performed with each implant. There was no statistically significant difference in the fusion rate at six months using either implant. However, there was significant statistical difference in cost, rate of infection, implant migration, recurrence of deformity, patient's return to driving, walking with routine foot wear and satisfaction. There was 11% rate of reactive inflammation in the absorbable wire group but no infection.

The study shows the absorbable wires are safe for fusion of proximal inter phalangeal joints.

# Relationship between functional foot orthotic device use and ankle proprioception

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## Introduction

Functional Foot Orthoses (FFO's) have been shown to improve one element of balance, postural sway, when prescribed for patients with ankle injuries. Little is known, however, about the effect of these devices on ankle stability/proprioception, or the changes which might occur as the patient becomes habituated to using the device. We studied these effects from the time of initial application of the FFO through to regular usage at six weeks.

## Methods

Patients with musculoskeletal conditions affecting the lower limb that required custom made FFO's were evaluated. A standardised protocol, using the Biodex stability system (a balance platform), to assess several stability indices was performed. Patients were assessed before fitting the orthosis, at the time of fitting and six weeks later. The American Orthopaedic Foot and ankle Society (AOFAS) score was also used to evaluate the progress of these patients.

## Results

There were 13 male and seven female patients, aged 10 to 64 years. Patients had a range of orthopaedic conditions and all been assessed by orthopaedic specialist and podiatrist as having correctable foot biomechanics. In 6 patients, proprioception deteriorated on initial application of FFO's. However, all patients exhibited improved over-all stability by a mean of 2.5 points (Normal range 0.82-3.35) at 6 weeks evaluation. The mean AOFAS on presentation was 72 and the final mean score was 97, both of which were clinically and statistically significant (t test,  $p < 0.05$ ). Eighteen patients had complete resolution of symptoms of pain and instability.

## Conclusions

FFO's alter foot biomechanics, and in doing so appear also to improve balance and proprioception. Proprioception deteriorated in 30% of cases on initial application of orthotics, but pain and instability improved in more than 90% of patients on extended use of foot orthotics, with this improvement becoming manifest by 6 weeks after starting use of the device.

# **Comparison of first metatarsophalangeal joint fixation between Hallu-fix plate and ACE screws**

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We present a case control comparison between two methods of fixation for 1<sup>st</sup> metatarsophalangeal (MTPJ) fusion. From 2007-2008 sixty patients were treated with either 4.0mm ACE (De Puy) screws or a Hallu-fix (Integra LifeSciences) plate fixation. We found no difference between the two groups in regard to age, ASA grade, smoking status and non-steroidal anti-inflammatory use but there was a statistically significant difference in union rates. In the Hallu-fix group, nine patients went on to develop a non-union whereas one patient developed a non-union in the ACE screw fixation group,  $p = 0.01$ . Whilst there may be perceived advantages with the Hallu-fix system in regard to the accuracy of reduction, from our results we caution against its use, and have found a better outcome with cheaper 4.0mm ACE screws.

# Imaging plantar plate tears in lesser metatarsophalangeal joints: MRI versus ultrasound arthrography

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## Introduction

Lesser metatarsophalangeal joint (MTPJ) instability is a common cause of forefoot pain. Instability is probably caused by tears of the plantar plate and collateral ligaments. We prospectively compared MRI and ultrasound with and without arthrography in the assessment of patients with MTPJ instability.

## Materials and methods

MTPJ instability was diagnosed by the draw test. Nineteen patients underwent imaging with consent. One musculoskeletal radiologist performed MRI arthrography and a different musculoskeletal radiologist performed ultrasonography supplemented with arthrography. Each radiologist reported his own study, blinded to the results of the other modality. Where possible, the radiological diagnosis was evaluated at surgery.

## Results

MRI identified four full thickness plantar plate tears. In five studies no contrast was seen in the MTP joint and in 10 contrast was contained within the joint.

Ultrasound identified six full thickness plantar plate tears as hypoechoic zones that extended through the whole thickness of the plate. Eleven studies showed partial thickness tears. Two studies showed thinning of the plate. Ultrasound arthrography identified seven full thickness tears by extravasation of injected fluid into the flexor tendon sheath. Eleven studies showed partial thickness tears and one was normal. Ultrasound and ultrasound arthrography agreed in 14/19 patients. MRI agreed with ultrasound on 3 of 6 full thickness tears and with ultrasound arthrography in 4 of 6 full thickness tears. MRI gave additional information about the articular surfaces in four patients. Surgical comparison was available in 11/19 patients. Ultrasound with and without arthrography correctly predicted four partial thickness tears. Ultrasound arthrography correctly predicted 6/7 full thickness tears, MRI 3/7 and ultrasound 3/7.

## Discussion

Ultrasound with arthrography appears the best modality to distinguish between partial and full-thickness tears. It is cheaper, simpler and can be performed in the outpatient setting. Larger studies with surgical confirmation are required to assess its value more precisely.

# Lesser metatarsophalangeal instability: a cohort study of clinical features and outcome

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## Introduction

Lesser metatarsophalangeal instability is a common cause of forefoot pain. Previous studies were small and there is little data comparing surgical with non-surgical treatment.

## Patients and methods

Metatarsophalangeal instability was diagnosed and staged with the draw test. We recorded the clinical presentation, involved toes, severity of instability, presence of toe deformity and management. Patients were followed-up in clinic or by telephone interview with visual analogue pain and satisfaction scores and AOFAS lesser metatarsophalangeal scores. Outcomes were assessed by an independent observer.

## Results

We studied 154 patients: 127 (82%) female and 27 (18%) male. The median age was 56 years (range 33-85). One foot was affected in 107 patients (69%) and both feet in 47 (31%). The second toe only was affected in 99 patients (64%) and multiple toes in 52 (34%). Seventy-three patients (47%) had a complaint of generalised forefoot pain. Sixty-eight (44%) had pain and deformity localised to the second toe. Thirteen patients (8%) had toe deformity with significant MTPJ instability. 150 toes (52%) had grade 1 instability, 108 (37%) grade 2 instability and 21 (7%) grade 3 instability. Twelve toes (4%) presented dislocated with a history of instability. Ninety-nine patients (64%) were treated conservatively, using functional taping, shoe modifications, insoles and injections. Fifty-five patients (36%) had surgery, including lesser toe straightening, flexor-extensor transfer, plantar plate repair, Weil and Stainsby procedures. 79% of patients were reviewed at a mean of 65 months (range 14 to 138). Mean pain score was 31mm  $\pm$  23.7mm for the conservative group and 23mm  $\pm$  24.1mm in the surgical group. Mean AOFAS score was 69  $\pm$  16.3 for the conservative group and 67  $\pm$  17.8 in the surgical group. 39 (52%) conservatively treated patients were either satisfied or very satisfied compared to 31 (66%) surgically treated patients. No differences were statistically significant. (299 words)

# Proximal interphalangeal joint fusion with Stay Fuse

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## Purpose

We conducted a study of 72 hammer toes treated with proximal interphalangeal joint (PIPJ) fusions with a Stayfuse implant. The aim of the study was to assess the clinical results of PIPJ fusion carried out with Stayfuse implants.

## Method

There were 10 males and 62 females. Average age was 52 years. Twelve cases had bilateral and 60 cases had unilateral foot involvement. Fifty-two second and 20 third toes were operated on. Mean follow up was twelve months. The results were assessed clinically, radiologically and with the American Orthopaedic Foot and Ankle Society (AOFAS) score.

## Results

All the joints fused clinically except two. There were ten PIPJs which did not fuse radiologically. The AOFAS score improved from 42 preoperatively to 84 post operatively. There were two cortical breaches of the proximal phalanx, one implant breakage and one case of dissociation of the components of the implant at six weeks after the surgery, with a recurrence of deformity. There were two patients who complained of over-straight toes. Fifty-two patients were very satisfied with the procedure, seventeen satisfied and three patients were unsatisfied.

## Conclusion

We conclude that the Stayfuse is a safe, reliable method to correct PIPJ deformity, although there is a learning curve. The main advantages of the implant are that there is no postoperative implant exposure, no violation of healthy joints, no risk of pin tract infection, rotational and angular stability, early rehabilitation and a high patient satisfaction. The disadvantages of the implant are dissociation of the components and the difficulty of removal, if this is needed.

# **The plantar approach to the foot: a new surgical approach for tarsometatarsal joint surgery**

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Department of Human Anatomy, Glasgow University

## **Introduction**

Tarsometatarsal joint (TMTJ) arthrodesis is traditionally performed through a dorsal approach and is associated with higher incidence of cutaneous nerve damage, prominent metalware and high non-union rates. It is postulated that applying fixation to the plantar (tension) side, rather than the dorsal (compression) side would create a more stable construct with higher union rates. A suitable surgical approach has not previously been described. The aim of this study is to define a plantar surgical approach to the TMTJ's.

## **Methods**

We dissected 10 cadaveric feet, identifying nerves, vessels, muscles and their innervation on the plantar aspect of the 1<sup>st</sup> and 2<sup>nd</sup> TMTJ's.

## **Results**

We found that in all specimens a plane of dissection could be created between the two terminal divisions of the medial plantar nerve between flexor digitorum brevis and abductor hallucis. Although exposure of the 1<sup>st</sup> TMTJ was relatively easy, access to the 2<sup>nd</sup> TMTJ was difficult due to its location at the apex of the transverse metatarsal arch and the overlying peroneus longus insertion. We found that the peroneus longus tendon had a variable insertion not only at the base of the 1<sup>st</sup> metatarsal but also at the medial cuneiform and the base of the 2<sup>nd</sup> metatarsal.

## **Discussion**

This is a new surgical approach, following an internervous dissection plane. The feasibility of making an incision over the convex side of the rocker bottom deformity and the biomechanical advantage of a plantarly applied fixation device may make this an attractive surgical approach.

# Results of tarso-metatarsal joint fusion using a low profile locking plate

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## **Introduction**

Tarsometatarsal joint (TMTJ) fusion is performed for arthritis or painful deformity. First TMTJ fusion may be performed as a part of corrective surgery for hallux valgus deformity. K-wires and trans-articular screws are often used to stabilize the joints. We present our experience with the use of locking plates (LP) for TMTJ fusion.

## **Patients and methods**

Thirty-three TMTJ's in 19 patients were fused and stabilised with LP's between January and September 2008. The procedure was performed for Lisfranc arthritis in 13 patients and Lapidus procedures in six. Two out of 6 were revisions after failed fusion using transarticular screws. Iliac crest bone autograft was used in 26 joints in 12 patients. All patients post-operatively had below knee plaster immobilization and protected weight bearing walking for first 6 weeks. Clinical and radiological surveillance continued until bone union. AOFAS midfoot scale was used as outcome measure.

## **Results**

There were 7 male and 12 female patients with average age of 51 (14 -68). The American Orthopedic Foot and Ankle Society (AOFAS) midfoot score showed a 42% improvement in pain, 30% improvement in function and 53% improvement in alignment. The average AOFAS overall score improved from 30 preoperatively to 67 postoperatively. All except one joint in one patient had clinically and radiologically fused joints. One patient underwent removal of the metalwork and four had delayed wound healing. The average satisfaction score was 7 out of 10. 86% said of patients said that they would recommend the surgery to a friend, and 91% would undergo the surgery again.

## **Discussion**

Locking plates have been recently introduced for ankle and foot surgery. Biomechanical studies have shown that the plates are not as strong or stiff as trans-articular screw fixation, however, they are easy to use, have more flexibility for realignment and can act as a buttress for bone graft. In our series all, except one, patients achieved bony union without loss of alignment.

## **Conclusion**

Locking plates provide satisfactory stability for TMTJ fusion, without complications.



# **BRITISH ORTHOPAEDIC FOOT & ANKLE SOCIETY**

**Annual Scientific Meeting**

**Poster Abstracts**

# **A new intraoperative technique for evaluating the distal tibio-fibular syndesmosis**

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## **Background**

The intraoperative tests presently in practice (hook test, external rotation stress test) have high interobserver variance<sup>1,2</sup> and are difficult to interpret. We describe a new intraoperative technique to evaluate the syndesmosis.

## **Discussion**

Syndesmotic stability in ankle fractures is usually evaluated by pulling on the fibula with a bone hook. Widening of the syndesmosis by more than 2mm on mortise radiographs is the described indication for syndesmosis screw fixation<sup>1</sup> The “hook test” is difficult to interpret and has high interobserver variance.<sup>2</sup> Candal-Couto et al<sup>2</sup> showed in their cadaveric study that AP mortise views correlated poorly with observed diastasis in a hook test. Fluoroscopic examination following application of external rotation stress has been shown to demonstrate syndesmotic instability<sup>3</sup>. We describe a new technique to test the inferior tibiofibular syndesmosis in ankle fractures. The AO screw tap, when used to tap for the screw hole at the level of syndesmosis, is used to test the syndesmosis.

## **Technique**

The fibular fracture is exposed reduced and fixed with a 1/3<sup>rd</sup> tubular plate. The screw hole close to the syndesmosis is left empty so it can be used to address the syndesmotic injury. Using the screw hole at the level of syndesmosis and using a standard 2.5mm drill, a drill hole is made through near and far cortices of the fibula. The screw hole is tapped using the standard 3.5mm tap, and the tap is used to push the fibula away from the tibia at the level of syndesmosis through the screw hole. If there is evidence of widening of the tibiofibular clear space on mortise view, the syndesmosis is fixed with a fully threaded 3.5 mm screw after drilling. If there is no evidence of syndesmosis the screw hole is filled with a 3.5 mm screw just fixing the fibula.

## **Conclusion**

This new intraoperative technique proved to be very useful in our hands for intraoperative syndesmosis evaluation. Further studies are required to validate this test.

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# **Manual and computer assisted measurements of hallux valgus angles: a comparative study**

**Srivatsava S, Chaockalingam N, El-Fakhri T**  
Mid Staffordshire NHS Foundation Trust

## **Introduction**

Radiographic angles are used routinely to assess the severity of deformity in foot and ankle conditions such as hallux valgus. Measurement of the hallux valgus angle (HVA), intermetatarsal angle (IMA), distal metatarsal articular angle (DMAA) and interphalangeal angle (IPA) help the clinician to determine the appropriate surgical procedure, assess outcome and compare results with other studies. The manual method using marker pens and a goniometer is prone to errors, and can be time consuming and arduous. Digital radiography is now being used more commonly in

hospitals. Computer programs are now available to assist in angular measurements and might reduce the errors and improve reliability. The primary objective of this study was to compare the inter- and intra-observer reliability between manual measurements using a goniometer and computer-assisted measurements for radiographic angles in hallux valgus (HVA, IMA, DMAA and IPA).

### **Materials and Methods**

This study was conducted at Stafford General Hospital after obtaining appropriate approval from the local research ethics committee. A total of 30 weight-bearing antero-posterior radiographs of patients with hallux valgus deformity were used. These radiographs were digitised for computer-assisted measurements using a custom made computer software. The radiographs and digitised images were reviewed by 3 observers and each set of images was reviewed 3 times at 1 week intervals. The technical error of measurement (TEM) was calculated for intra- and inter-observer data to assess the error in angular measurement.

### **Results**

The TEM was lower with the computer-assisted method for both intra- and inter-observer data, suggesting that this method was more reliable. This improvement with the computer-assisted method was present for all four angles, and all three observers irrespective of the experience and skill level.

### **Conclusion**

The computer-assisted method was more reliable than manual method for angular measurements in hallux valgus. Furthermore the time taken to obtain the measurements was significantly less with the computer-assisted method.

## **Compliance with self-administered deep vein thrombosis prophylaxis in foot and ankle patients**

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According to NICE Guidelines, some foot and ankle patients are, by definition, at high risk of DVT/PE. Despite NICE guidance, DVT recommendations are still controversial, and are being reviewed by the BOA to be more operation and context specific. One consultant at our institution therefore initiated a 6 week medical DVT prophylaxis regimen for all his post operative hindfoot surgery patients who were placed in plaster. From January 2007 to February 2008 we audited 97 hind-foot patients to measure their compliance rate, complications and DVT/PE rate.

Compliance was excellent (96%) particularly with regard to LMWH, but only 70% had medication prescribed for the 6 weeks, and 3% developed a DVT. We compare our study with the literature and discuss the difficulties of formulating a DVT prophylaxis protocol.

Self administered LMWH is acceptable and compliance is excellent in post operative foot and ankle patients, but not necessarily effective.

# The use of SPECT-CT in the evaluation of the continuing pain following foot and ankle arthrodesis

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## Introduction

The potential advantage of using SPECT-CT over conventional bone scanning is that it has the promise of linking the multiplanar reconstructional image of CT with the functional analysis of bone scintigraphy. We present our experience of use the SPECT-CT in the analysis of continued or recurrent pain post foot and ankle arthrodesis.

## Methods and Materials

A retrospective analysis of all the patients who underwent SPECT-CT for continued pain having previously undergone an arthrodesis procedure. The scans and notes were evaluated. The request for the scan was at the clinician's discretion and was reserved for cases where the diagnosis was unclear on clinical and radiological grounds.

## Results

A total of 30 patients underwent SPECT-CT of the foot and ankle for the investigation of continued pain post-arthrodesis. The scan proved helpful in 27/30 (90%) cases in determining the cause of the pain. Non-union with increased uptake at the site of the fusion was identified in 8 cases. All the other cases showed successful arthrodesis. Other abnormalities identified were metalwork impingement (13%), degeneration of surroundings joints which were mapped (40%) and pathology distinct from the arthrodesis site such as a stress fracture (10%).

## Discussion

Determining the exact cause of pain in patients who have undergone previous foot and ankle surgery can be difficult. Conventional methods include injection studies along with CT, MRI and bone scanning as additional adjuncts. SPECT-CT has the potential advantage of combining multiplanar CT to identify the anatomy with bone scintigraphy to identify areas of active inflammation or degenerate changes. In our group of patients who have undergone previous arthrodesis we have shown the study to be useful in the majority of cases in determining the site of pain. In particular we found it useful in mapping degenerate changes.

## Conclusion

SPECT-CT is a useful adjunct to clinical and plain radiological assessment in the management of patients presenting with continued pain post arthrodesis procedure in the foot and ankle.

# Ultrasound investigation of midfoot joint degenerative disease as a complementary investigation to plain X-ray radiography

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## Introduction

Degenerative disease occasionally affects the joints of the midfoot. First line imaging of the midfoot is typically with plain X-ray radiography. Some patients referred to our centre for ultrasound-guided injections do not have clearly identifiable joint pathology on X-ray but marked degenerative midfoot changes on ultrasound. We hypothesise that ultrasound can be a useful investigation of midfoot joint degenerative disease alongside plain X-ray radiography.

## Methods

Ultrasound findings of midfoot degenerative disease were retrospectively reviewed in 64 patients referred for ultrasound joint injection with midfoot pain, and compared with plain X-ray findings. To

demonstrate the clinical relevance of radiologically identified pathology, pain diaries were also examined for response to the corticosteroid injections.

### **Results**

Overall, degenerative midfoot changes were identified in 62 patients on ultrasound, but only 45 patients on plain X-ray (96.9% vs 70.3%,  $P < 0.001$ ). Among 45 patients with degenerative changes on plain films, ultrasound demonstrated the degenerative pathology in 44 cases and identified a different pathology in 1 case (neuroma). Of the remaining 19 cases with unremarkable X-rays, ultrasound demonstrated degenerative midfoot pathology in 18 cases. There was a good response to corticosteroid injection (75.6%), even where degenerative changes were only seen on ultrasound (81.8%).

### **Discussion**

Ultrasound detects midfoot degenerative disease even in the presence of unremarkable X-ray findings. X-ray of the feet alone is probably insufficient to rule out degenerative changes in the midfoot. Ultrasound may be useful as an additional investigation. Similar response to corticosteroid injections regardless of X-ray findings suggests ultrasound is not overdiagnosing clinically unimportant degenerative disease.

### **Conclusion**

The high sensitivity of ultrasound in detecting clinically relevant midfoot pathology, regardless of X-ray findings, suggests that ultrasound should be explored as a complementary investigation approach to plain X-rays in midfoot joint degenerative disease.

## **Day case foot surgery under local anaesthesia – an audit looking into patient satisfaction**

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### **Introduction**

In our trust the majority of forefoot surgery has traditionally been carried out under general anaesthesia and often involved an overnight stay. The use of general anaesthesia can result in postoperative nausea and vomiting which can delay discharge from hospital. The use of local anaesthesia day surgery facilities is one way to overcome these problems. We set out to assess the patient experience and level of satisfaction after such procedures.

### **Materials and Methods**

Forty consecutive patients undergoing forefoot surgery under the care of two surgeons were prospectively followed up. All had their surgery under ankle block and IV sedation. The patients filled out a pain chart and a telephone interview with standard questionnaire was performed the next day. This was compared with the previous 20 patients with forefoot surgeries who had had their surgery performed under general anaesthesia.

### **Results**

Thirty-seven patients were discharged on the day of surgery and 3 patients were discharged the next day due to pain, (these were early on in the study). In the GA group only 2 (10%) went home the same day. Thirty patients had no pain, 5 had mild pain and 5 had moderate pain. 39 patients had no postoperative nausea or vomiting. Thirty-five patients were mobilizing comfortably within 4 hours of surgery. All patients were satisfied with the anaesthesia despite 2 patients having moderate pain in recovery. Overall all 40 expressed satisfaction at the way the whole procedure had happened.

### **Discussion**

Forefoot surgery can be successfully performed under ankle block with a high degree of patient satisfaction. Review after the first 10 procedures showed patients had some postoperative pain

(mild to moderate) and so our analgesic protocol was changed to include regular medication post operatively and patients were counseled. Postoperative pain was not an issue for the remaining patients

## **The use of diagnostic injection in the context of anatomical joint communications**

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### **Background**

Diagnostic injection plays an increasing role in the diagnosis of foot and ankle pathology. Joint communications have been reported in several studies, and it has been suggested they may impact on clinical management.

### **Method**

We analysed the findings of 389 arthrograms of the foot and ankle, identifying any joint communications noted on imaging. A case note review was then undertaken on a subset of 153 of these patients with the aim of establishing the effect of injection findings on clinical management. All injections were performed and reported by a single consultant radiologist.

### **Results**

Joint communications were seen in 24% of patients with an equal distribution amongst males and females. Rates of individual joint communications were consistent with those previously published. Injection studies had an impact on subsequent management in 88% of cases. Symptoms resolved with injection alone in 28% of patients with no communication versus 8% in those with a communication. Surgical plans were changed in over 20% of cases if a joint communication was found. There were no major complications reported (Joint sepsis or contrast allergy).

### **Conclusion**

This study confirms the presence of multiple joint communications within the foot and ankle, and highlights the importance of arthrography in the diagnosis of pathology.

We would recommend joint injection be considered in all patients, especially if joint fusion is being considered. Contrast should be used in all cases to demonstrate any potential communications, which should be taken into consideration when surgical management plans are formulated. A significant number of patients will experience resolution of symptoms from injection alone, with no further intervention needed

## **Functional and radiographic outcomes following combined medial cuneiform opening wedge osteotomy and lesser metatarsal closing wedge osteotomies for severe metatarsus adductus**

**Perera A, Stanley J, MacNiocall R, Stephens M**  
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Metatarsus adductus (MA) is associated with a medially facing distal facet of the medial cuneiform (with a normal first metatarsal) and varus/adducted deformities of the metaphysis of the lesser metatarsals (MTs). Patients with severe symptomatic metatarsus adductus may not improve with time, especially those with residual deformity after CTEV correction. A number of surgical techniques have been described; however, the published series are small and use radiological rather than functional outcomes. It is clear that failure and complication rates are high with these procedures. A combined medial cuneiform and lesser metatarsal basal closing wedge osteotomy

has potential advantages over more commonly used procedures, including the combined cuneiform-calcaneal osteotomy, by correcting at the level of deformity.

We reviewed a consecutive series of 15 cases (11 severe idiopathic metatarsus adductus, 4 with history of clubfoot, all Bleck's grade severe) treated with combined cuneiform-metatarsal osteotomies. Patients were followed up for a mean of 30 months using child, parent and clinician-based outcome measures as well as radiological assessment. Outcomes are also compared to currently used and historical procedures.

Bleck's grade improved to 65% normal 35% mild post op; Radiographic improvements (all  $p < 0.001$ ); 1st ray angle  $30^\circ \rightarrow 62^\circ$ , 1<sup>st</sup> MT-Talar angle  $43^\circ \rightarrow 9^\circ$ , 2<sup>nd</sup> MT-Talar angle  $41^\circ \rightarrow 8^\circ$ , 2<sup>nd</sup> MT- Calcaneal angle  $48^\circ \rightarrow 14^\circ$ , 5<sup>th</sup> MT- Calcaneal angle improved from  $13^\circ \rightarrow 3^\circ$ . Mean postop scores: Chesney - 14 (12-15); Utukari - 13 (10-18); Laaweg - 93 (81-100); Vitale - 13 (10-14). Although these radiographic scores correlate well with published literature, none of the radiographic scores correlated well with the clinical scores. All children gained improved levels of activity. These results suggest that patient centered outcomes may be a more reliable measurement of success following procedures to correct MA.

Our findings indicate that this technique can be used effectively in children  $>4$  years and is a safe alternative to historical procedures, with excellent radiographic/clinical outcomes, and a low complication rate.

## Body mass index and outcomes after total ankle replacement

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### Objective

Total ankle replacement (TAR) is an established alternative to ankle fusion in selected patients. One of the possible exclusions used is the presence of a high body mass index (BMI). This is based on our experience with hip and knee replacements where poor outcomes have been associated with obesity. However, little work has been done on this subject in the ankle. We report the first series solely focusing on the impact of BMI on TAR and change in BMI after TAR.

### Methods

We identified patients from theatre logs over the last 7 years. All patients with minimum 2 years of follow-up were contacted and invited to complete the Short Form-36 (SF-36) and Visual Analogue Score – Foot and Ankle (VAS-FA). Pre-operative and up-to-date body mass index was calculated for each patient. Medical records were reviewed to ascertain the indication for surgery and the incidence of complications.

### Results

Forty-five patients were identified of whom 8 (17.7%) were deceased. 27 of 34 (79%) completed the questionnaires (14 male; 13 female). The average follow-up was 60 months (range 27 – 98 months). Five patients had a BMI less than  $25 \text{ kg/m}^2$ , 15 patients between 25 and 30 and 7 greater than 30. The average BMI pre-operatively was  $28.3 \text{ kg/m}^2$  and at follow-up  $28.3 \text{ kg/m}^2$  with a mean change of  $0.07 \text{ kg/m}^2$  ( $p=0.45$ ). In those who had a BMI of less than  $30 \text{ kg/m}^2$  preoperatively ( $n=20$ ) the average change was  $-0.38 \text{ kg/m}^2$  ( $p=0.08$ ). Osteoarthritis was the commonest indication ( $n=16$ ) followed by rheumatoid arthritis (8) and post-traumatic arthritis (3). The average change in BMI in those who lost weight ( $n=16$ ) was  $-2.03 \text{ kg/m}^2$  compared to an average increase of  $2.77 \text{ kg/m}^2$  in those who gained ( $n=11$ ). SF-36 and VAS FA were both higher in the group who had a decrease in their BMI at follow-up and were also older. Five patients needed subsequent surgery: 4 of these patients had a BMI  $>25 \text{ kg/m}^2$  but only 1  $>30 \text{ kg/m}^2$ . Two patients with wound complications had a BMI of 27.8 and  $34.9 \text{ kg/m}^2$ .

## **Conclusions**

Being classified as obese did not seem to influence the risk of needing late surgery – only one of seven (14%) compared to four of 20 (20%) in the non-obese. It is acknowledged that arthritis of adjacent joints can develop following TAR requiring later surgery. In our series both cases requiring wound debridement for infection were overweight or obese according to BMI. However numbers were small and a larger series is needed for further assessment.

SF-36 and VAS FA scores were higher in those with a pre-operative BMI less than 30 kg/m<sup>2</sup>. They were also higher in those who showed a reduction in BMI at follow-up. Given the weak correlation of SF-36 with the VAS-FA we feel that these scores are more representative of the general patient condition rather than a true reflection of the impact of an ankle replacement.

Overall, an ankle arthroplasty did not seem to affect the BMI with no significant change from pre-operative states. This may reflect appropriate patient selection of less mobile, less energy demanding individuals. This group of patient unfortunately may not be expected to mobilize sufficiently to achieve a significant weight reduction.

## **Day case foot surgery – an audit of patients' acceptance and analgesic requirements**

**Ranasinghe U, Calthorpe N, Santra D**  
Russells Hall Hospital, Dudley

### **Background**

The majority of foot surgery has previously been performed on an inpatient basis. There are anecdotes suggesting that patients have severe and protracted post-operative pain. At Russells Hall Hospital, a specialist orthopaedic foot and ankle surgeon was appointed and a new day case service was established. An audit was performed to assess whether we were providing an appropriate service.

### **Aim**

To objectively assess the day case foot surgery service, with particular reference to post-operative analgesia.

### **Standards**

- <0.5% re-admission after discharge
- <2% unplanned admission rate
- <5% reporting 'severe' pain score in the first 48 hours after discharge
- >85% reporting no pain or mild pain after discharge (with medication)
- >85% satisfied with the management of their pain while at home.

### **Method**

All patients received a standardised anaesthetic and analgesic regime (consisting of Propofol, Fentanyl, IV Paracetamol and Diclofenac plus an ankle block of 20ml 0.25% Marcain administered by the surgeon after tourniquet inflation). Postoperative pain relief consisted of cocodamol and ibuprofen. Data was collected over 61 consecutive procedures. Post operative pain was assessed in recovery, on the ward and patients received a telephone call the following day to assess pain 24hrs post operatively.

### **Results**

Four broad categories of surgical procedures were performed.  
22 patients (11 bilateral) underwent osteotomy for hallux valgus (Scarf/Akin)  
10 patients (2 bilateral) had a great toe osteotomy plus lesser toe surgery  
17 patients (3 bilateral) had cheilectomy/fusion/arthroplasty for hallux rigidus  
2 patients underwent heel osteotomy and peroneal tendon repair.

All patients were discharged home on the day of surgery from the day surgery unit and there were no re-admissions. Only patients having a great toe fusion or heel osteotomy were treated in plaster post operatively, the remainder had soft dressings and were allowed to mobilize as comfortable. On telephone follow up, 20% reported severe pain in the first 48hrs after discharge whilst 51% reported no or mild pain in the first 48 hours. 100% of patients were satisfied with their day case surgery experience.

### **Conclusions**

The unplanned admission rate exceeded the standards set. However, the published standards for pain control post discharge were not met. Patients do have pain at home, although most patients were able to cope with the pain and would have the procedure performed in a day case facility again.

### **Recommendations**

In our experience day case foot surgery patients require postoperative opioids as take home drugs to decrease the severity of pain at home. We are assessing the use of oxycontin for this purpose. Our practice will then be re-audited.

## **The effect of pre-existing hind- and mid-foot arthritis on the outcome of arthroscopic ankle arthrodesis**

**McKenzie J, Sheridan B, Robinson D, Winson I**  
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### **Introduction**

Hind and midfoot arthritis has been shown to be present in up to 96% of patients prior to ankle arthrodesis. It is not known how this affects outcome following ankle fusion. The aim of this study was to identify any correlation between pre-existing hind and midfoot arthritis and the clinical outcome of arthroscopic ankle arthrodesis.

### **Methods**

A retrospective review of the most recent preoperative radiographs of 50 patients who underwent 51 arthrodeses from 1993 to 2003 was performed. The severity of hind- and midfoot osteoarthritis was recorded using the Kellgren and Lawrence grading score. Postoperative outcome scores for the patients were then retrieved from prospectively collected follow up data. The preoperative radiological scores and the postoperative clinical scores were then compared and analyzed.

### **Results**

There was no statistical correlation between preoperative radiological score and postoperative clinical findings.

### **Discussion**

It is well known that arthritis is present in associated joints in all but a few patients after ankle arthrodesis. It has been suggested that this is caused by the ankle fusion itself though the relationship between ankle arthrodesis and later ipsilateral arthritis is likely to be complex. This study is small but it reaffirms that pre-existing associated arthritis is common. The study has shown that the severity of pre-existing hind- and midfoot arthritis seems to have no effect on the subjective clinical outcome of surgery. Further prospective studies may be able to define the causes of ipsilateral arthritis and their clinical sequelae in more detail. This will lead to a better understanding of the factors influencing a poor outcome in arthroscopic ankle arthrodesis.

# **Basal opening wedge osteotomy of the first metatarsal in hallux valgus correction - experience with the use of Arthrex plate**

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## **Background**

Opening wedge osteotomy of the first metatarsal base is a powerful tool to achieve correction in moderate to severe Hallux Valgus. The purpose of this study was to present our results of a basal opening wedge osteotomy without bone graft, using a new low profile titanium plate (Arthrex) with a central spacer specifically designed for this purpose.

## **Materials and Methods**

We present a retrospective review of 22 feet in 18 patients treated with a basal opening wedge osteotomy. Between January 2006 and December 2007, 22 feet with moderate to severe Hallux Valgus were treated. Two feet had undergone a previous Scarf and Chevron osteotomy, respectively which had failed. Evaluation of correction was undertaken using postoperative x-rays and outcome assessment using a scoring system based on a questionnaire.

## **Results**

14 feet (64%) had good correction and 8 feet (36%) needed further surgical correction due to a poor outcome. This included recurrence of the deformity in four feet and osteoarthritis with or without hallux varus requiring first MTP joint fusion in three feet and one case of transfer metatarsalgia needing Weil's osteotomy.

## **Conclusion**

The high failure rate was a result of inclusion of paediatric and young adult patients with a severely abnormal distal metatarsal articular angle. The incidence of osteoarthritis could be attributed to subtle lengthening and jamming of the joint following the osteotomy. There were no problems related to union or loss of alignment at the osteotomy site, even in elderly patients. Basal opening wedge osteotomy is a technically demanding procedure with a steep learning curve. With proper case selection and performed by a surgeon after adequate training in a specialist unit, opening wedge osteotomy could be an effective tool to correct moderate to severe hallux valgus deformity.

# **Management of Achilles tendon ruptures: a pilot randomised controlled trial**

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## **Introduction**

Rupture of the Achilles tendon is a disabling condition, affecting 18 per 100 000 people/ year in the UK. Randomised controlled trials have shown that immediate weight-bearing mobilisation provides functional benefits without increasing complications. This pilot randomised controlled trial, compared operative with non-operative management of Achilles tendon ruptures using immediate weight-bearing rehabilitation for both groups.

## **Materials and Methods**

Twenty patients with an acute rupture of the Achilles tendon were randomised to 'operative' or 'non-operative' management. The same rehabilitation protocol was followed for both groups using an orthosis with heel wedges for eight weeks. Patients were reviewed at six weeks and three, six and nine months. The primary outcome measure was the Disability Rating Index; a validated patient reported outcome measure. Secondary outcomes included EQ-5D, Achilles Total Rupture Score and complication rates.

## **Results**

Thirteen men and seven women, aged 36 to 75 years, consented to take part. Ten patients were randomised to each group; one patient crossed-over from operative to the non-operative management and one was lost to follow-up at six months. One re-rupture occurred in the non-operative group, and three superficial wound infections in the operative, although all of these resolved with a short course of antibiotics. Statistical analysis showed no significant difference between the two groups at any time point in relation to any of the patient reported outcome measures.

## **Discussion and Conclusion**

The aim of this pilot randomised controlled trial was to compare operative with non-operative management using an immediate weight-bearing rehabilitation protocol. This study showed no significant differences between the groups in relation to validated patient reported outcome measures. Furthermore, both groups had returned to their pre-injury scores at the nine-month time point.

## **Two to thirteen year follow up of 31 consecutive Buechel Pappas total ankle replacements**

**Sharma V, Nayak R**

Lincoln County Hospital, ULHT

We present the clinical and radiological results of 31 consecutive three component, non-cemented Buechel Pappas total ankle replacement in 29 patients at a mean follow up of 6.4 yrs (range 2-13 yrs).

The procedure was performed by a single surgeon in one centre. The mean age of the patients was 68.4 yrs (range 54-81yrs). Clinical assessment was performed using the American Foot and Ankle Society Ankle and hinfot score and SF12 form. Radiological assessment was performed to assess the positioning, subsidence, bone stock loss and loosening of the implants.

At a mean follow up of 6.4 yrs, the mean AOFAS score was 81. Severe sagittal motion restriction was seen in 9.7%. Overall, dorsiflexion of the ankle was difficult to achieve; a mean dorsiflexion of 5 degrees and plantarflexion of 25 degrees was achieved. No loosening of implants or bone stock loss was noticed. Two revision ankle replacements were performed for malpositioned implants. There was one conversion to arthrodesis. Subtalar arthritis was seen in one patient at 10 years follow up.

Over all, excellent to good results were achieved in 84% of patients according to the scorings at a mean follow up duration of 6.4 yrs. Failures/poor results were mainly due to implant malpositioning.

## **Representation/re-hospitalisation following foot and ankle surgery**

**Rath N, Guha A, Khurana A, Hemmadi S, O'Doherty D**

University Hospital of Wales, Cardiff, UK

We audited all patients who underwent Foot and Ankle surgery at the University Hospital of Wales over one financial year (April 2007 – March 2008).

Patients were identified from the hospital OPCS-4 coding system and all scheduled and unscheduled visits to hospital investigated. Both trauma and elective patients were included. Patients were followed up for a mean period of 9 months (range 1-14 months) following surgery. The records for 1052 patients were evaluated. Of these, 77% were elective cases and 23% were

trauma related. Overall about 10 % of our foot and ankle patients (100/1052) either attended the A&E Department or had an unplanned clinic visit at some stage of their follow up. Three quarters of these patients were admitted to hospital (median stay 1 day, range 1-51days).

Twenty-five patients (24 accident and emergency; 1 medical) simply re-attended, but were not admitted. The majority of these (58%) had plaster-related problems (8/24) or superficial wound infections (6/24). The remaining patients presented with pain around the operated area, and were discharged after investigation. One patient presented to the physicians 44 days after excision of a Morton's neuroma with a DVT.

Seventy five patients (7%) were re-admitted to hospital. Two were admitted under the physicians: one with a pulmonary embolus (30 days post ORIF ankle) and one following a cardiac arrest (20 days post ORIF ankle). Out of the remainder 34 patients had planned removal of metalwork, 9 patients had metalwork removed because of infection and 21 patients had soft-tissue infection requiring antibiotics or debridement. Overall, 9 patients underwent revision surgery (0.85%).

The overall infection and thromboembolic rate was 3.42% (6 A&E + 30 T&O/1052) and 0.28% (1 A&E + 2 medical /1052) respectively.

## **Medium-term outcomes of the Moje press-fit prosthesis**

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### **Introduction**

Ceramic first metatarsophalangeal joint (1st MTPJ) arthroplasty has been used in the treatment of hallux rigidus for over a decade. Complications of ceramic arthroplasty include fracture or loosening of the prosthesis, sometimes resulting in revision surgery. We present the largest series of Moje press-fit implants published to date. Our primary aim was to assess the performance of the Moje prosthesis in the medium term. Our secondary aim was to assess the level of patient satisfaction with this implant.

### **Patients and Methods**

We included all 1st MTPJ replacements between July 2001 and December 2007. Radiographic evidence of loosening was assessed on recent AP and oblique films. Patient satisfaction was measured using a validated telephone questionnaire and AOFAS hallux forefoot score.

### **Results**

During the study period 59 first MTPJ arthroplasties were performed on 44 patients. Mean follow-up was 610 days. Mean AOFAS score was 84 (SD =17) at follow-up. A sub-set of 20 patients who survived a mean of 4 years after their operation maintained a comparable mean AOFAS score of 91 (SD = 10). Severe radiographic loosening was present in 47%. The overall complication rate was 30%, resulting in a revision rate of 8%. Three patients (5%) suffered fractured prostheses. The mean post-operative range of motion at the 1st MTPJ was 270.

### **Discussion**

We have demonstrated a high rate of radiographic loosening but patients remain satisfied with their implants. Despite the narrow range of motion following Moje insertion, patients are relatively pain-free. This perhaps explains the good level of functional outcome we report.

### **Conclusion**

The Moje press-fit prosthesis has an unacceptably high rate of post-operative complication and we do not support its continued implantation. However, patients with radiographical evidence of loosening retain good function at between 2 and 4 years post-procedure.

# Results of proximal medial gastrocnemius release in patients with Achilles tendinopathy

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## Introduction

Gastrocnemius contracture has been shown to produce as much tension in the Achilles as combined triceps surae contracture. Furthermore gastrocnemius contracture is a risk factor for heel pain. Most patients with Achilles tendinopathy are successfully treated with a program of physiotherapy to stretch the gastrocnemius and hamstrings followed by eccentric training of the triceps surae. In some patients, contracture of the gastrocnemius persists. There has been an isolated case report of MRI proven resolution of Achilles tendinopathy following gastrocnemius release. This is the first series of patients to have a proximal medial gastrocnemius release (PMGR) for Achilles tendinopathy.

## Materials and Methods

The purpose of this study was to review in clinic all those patients with refractory non-insertional tendinopathy who were treated with a medial proximal gastrocnemius release with a minimum follow-up of one year.

## Results

Eleven patients (5 female, 6 male) had fifteen PMGR's. Four patients (four Achilles tendons) required further surgery (1 release of the lateral head, 2 endoscopic debridement, 1 open debridement and FHL transfer.) Despite some failures, the patient group felt that the surgery was helpful on the whole. Clinical measurements showed the power in the gastrocnemius to be full following release and the improvement in ankle dorsiflexion was maintained.

## Discussion

Most patients with Achilles tendinopathy do well with an eccentric training program. Surgery to the tendo Achillis risks wound healing problems and rupture. Patients with recalcitrant tendinopathy who have a tight gastrocnemius can be helped with a proximal medial gastrocnemius release which carries fewer risks and does not require a period of plaster immobilisation.

## Conclusion

The proximal medial gastrocnemius release is a safe, well tolerated, and effective procedure for those patients with Achilles tendinopathy who fail an appropriate stretching program.

# The treatment of the hallux valgus deformity with a percutaneous basal osteotomy

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Hallux valgus is a common foot deformity. When the deformity is severe, a basal osteotomy may be considered. The purpose of this study was to assess the results of a basal percutaneous closing wedge osteotomy.

One senior surgeon performed the operations. The patient is placed in the supine position. The foot is allowed to overhang the end of the table. No tourniquet is used. The procedure is controlled by fluoroscopy. The osteotomy is performed with a Shannon burr of 20 mm and a Wedge 3.1. The width of the wedge is increased according to the correction required. The osteotomy is fixed by screw. The medial exostosis is removed. The procedure is completed by an Akin osteotomy. A lateral release procedure is performed percutaneously.

50 patients were treated with a basal osteotomy. The patients were assessed clinically and radiographically.

The osteotomy gave a minimal correction of the intermetatarsal angle of 10°. The basal closing wedge osteotomy allows correction of large deformities, but it can increase the DMAA. The hinge must be medial and dorsal to avoid metatarsalgia.

## **The surgical treatment of superficial peroneal nerve neuromas by burial into bone**

**Zaw H, Hamilton P, Jones I, Singh S**  
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### **Introduction**

Chronic superficial peroneal nerve (SPN) injury can manifest itself as chronic lateral ankle pain if related to the development of a neuroma. Diagnosis relies on a high index of suspicion, with a delay in the definitive diagnosis being very common. A diagnostic SPN blockade with complete resolution of pain can be helpful in the diagnosis. Initial treatment is usually via the chronic pain team. Several different surgical treatments have been proposed for the treatment of those that failed non-operative treatment. We present our experience of SPN neurectomy and proximal stump burial in the fibula.

### **Method and Materials**

Ten patients with symptomatic neuromas, who had failed conservative treatment, were treated operatively from 2006-2009. There were six females and four males. Average age was 49 (34-77). All the patients had a positive diagnostic nerve block to confirm the diagnosis. Preoperative and postoperative AOFAS scores were compared and statistical analysis was performed using Wilcoxon test for non-parametric data. Average time from injury to surgical intervention was 73 months (12-288). All patients underwent the same procedure of neurectomy and burial of the stump in a drill hole in the fibula. One patient underwent concomitant revision ankle fusion.

### **Results**

There was a statistically significant increase in the AOFAS scores post-operatively ( $p < 0.05$ ). Average follow up was 15 months. Nine out of the ten patients reported their results as good to excellent. No recurrences have been seen and there have been no surgical complications.

### **Discussion**

Several different techniques have been described for treatment of persistent neuromas. Techniques include end-to-end anastomosis of the nerve, containment of the nerve by suturing and burial of the nerve in muscle. Recently burial of the nerve endings in bone has been advocated. Theoretically this has the advantage of minimising repetitive trauma and physical irritation that may be associated with recurrence. In this case series we describe a technique for treatment of neuroma by burial of the stump into bone with promising results.

**Conclusion:** Superficial peroneal nerve can be a chronic and problematic condition to treat. We describe a surgical technique for treatment of those that have failed conservative treatment by burial of the proximal stump into bone.

# **Intercalary bone graft fusion of hallux metatarsophalangeal joint - the Chertsey experience**

**Mohan A, Reed D, Khaleel A**

Ashford and St Peters Hospital NHS Trust

We undertook a retrospective study to assess the results of first metatarsophalangeal joint arthrodesis using tricortical bone graft with a dorsal locking plate (VariAx, Stryker). We recruited 13 patients with 14 operations and this included 8 women (age range 49-67) and 5 men (age range 49-67).

The senior author (AK) performed all the operations between Jan 2007 and Dec 2008. Indications for surgery were osteoarthritis (8 patients), failed plate fusion (2 patients), primary OA (3 patients) and osteoarthritis with severe hallux valgus (1 patient). Tricortical graft was harvested from the ipsilateral iliac crest. A precontoured plate with locking screws was used to fix the prepared metatarsal and the phalanx with an interposition bone graft. The dorsal approach was used with the joint fixed in 15 degrees of dorsiflexion and 15 degrees of valgus. Simulated weight bearing checked the gap between the first and second toe peroperatively.

Outcome assessment was done using American Orthopaedic Foot and Ankle society score. The average preoperative score was 29 with a postoperative score of 74. Complications included one non-union requiring revision and one infection requiring plate removal and split skin grafting.

In conclusion, metatarsophalangeal joint arthrodesis with interposition tricortical bone graft is an effective procedure to restore the first ray length and potentially prevent lateral transfer metatarsalgia.

## **Early results of the Mobility total ankle replacement**

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### **Introduction**

Outcomes following total ankle replacement (TAR) have been less favorable than hip and knee arthroplasty. The Mobility TAR is a mobile bearing prosthesis and is the most widely used TAR prosthesis in the United Kingdom. We believe that no study has as yet been published to report on follow-up longer than 1 year after surgery with the Mobility prosthesis.

### **Methods**

Over a two-year period, 50 Mobility TAR's were performed in our unit. Data have been collected prospectively on all 50 patients and all have been reviewed annually since surgery. Follow up ranges from one to three years.

### **Results**

There was one malleolar fracture. 34 concurrent additional procedures were performed, including gastrocnemius recession, calcaneal osteotomy, lateral ligament reconstruction and subtalar arthrodesis. In two prostheses the talar component had collapsed and requires revision. There was one deep infection. One further patient had a wound breakdown. The mean American Orthopaedic Foot and Ankle Society scores improved from 30 before surgery to 69 at the most recent follow up. Radiological assessment showed that 90% of the tibial components were found to be within 7 degrees of alignment in the sagittal plane. 3 patients report continued pain in their ankles without any x-ray evidence of loosening.

## **Discussion**

The Mobility TAR gives good early clinical results. Further follow-up studies are required to see if this performance is maintained in the long-term.

## **MRI scanning in inferior heel pain syndrome: night pain and calcaneal marrow oedema**

**Chimutengwende-Gordon M, Singh D**

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### **Introduction**

A diagnosis in patients presenting with inferior heel pain should be made on the basis of the history and clinical examination initially. Magnetic Resonance Imaging (MRI) scanning is generally only indicated in patients who have atypical symptoms or who do not improve with appropriate management.

### **Aim**

The aim of the study was to review the MRI findings in patients with persistent or atypical heel pain and to determine if specific MRI findings were associated with atypical symptoms such as night pain.

### **Methods and Materials**

A retrospective review of patients who presented with persistent or atypical heel pain between 2001 and 2009 was carried out. The clinical letters and MRI scans of 112 patients were reviewed. The significance of associations between symptoms and MRI findings were analysed using the chi-squared test.

### **Results**

Of the 50 patients with persistent heel pain despite appropriate treatment, 38 (76%) of MRIs confirmed the diagnosis of plantar fasciitis: 7 of these patients had coexisting Achilles tendinopathy, 1 patient was found to have plantar fasciitis with calcaneal marrow oedema and 1 patient had a coexisting partial tear of the plantar fascia. No abnormality on MRI scanning was identified in 7 (14%) patients.

Sixty two patients had presented with symptoms or signs that were deemed to be atypical by the senior author: 21 patients had presented with night pain and the remaining 41 had presented with acute onset or aggravation of pain, tenderness of the lateral or medial aspect of the heel, significant swelling, neurological features or pain at a site posterior to the insertion of the plantar fascia.

Patients with night pain were shown to have plantar fasciitis associated with calcaneal marrow oedema in 11 (52.4%) of 21 cases. The association between night pain and calcaneal marrow oedema was statistically significant ( $p < 0.05$ ). One patient presenting with night pain was found to have a plantar arterio-venous malformation. Acute onset of pain was associated with a tear of the plantar fascia in 4 out of 9 cases.

MRI scans of patients with lateral, medial or posterior pain demonstrated a variety of pathologies including plantar fasciitis, inflammation of the abductor hallucis, regional migratory osteoporosis, osteoarthritis, tibialis posterior tendinitis, peroneal tendinopathy or calcaneal stress fracture.

### **Discussion**

MRI scanning in cases of persistent heel pain provided reassurance by exclusion of conditions requiring a change in management in the majority of cases. Additionally, MRI scanning is useful to confirm the diagnosis prior to performing a plantar fascia release for persistent pain. Bone oedema has been identified on MRI scans of patients with plantar fasciitis by other studies but the association with night pain has not been described previously. Further research to determine if this

finding affects the outcome and hence if patients with heel pain at night should be managed differently/more aggressively will be undertaken.

## **A radiographic evaluation of the Mobility total ankle replacement tibial resection jig**

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We assessed the reliability of the tibial jig by measuring the Coronal (angle a) and Sagittal (angle b) position of the tibial implant at the first post operative non weight bearing and first weight bearing radiographs of 92 out of 95 consecutive Mobility Total Ankle Replacements (MTAR) performed at a single centre by the senior author (SA). An earlier paper by the SA (BOFAS 2007) concluded that early radiological alignment for the MTAR is reproducible and compares favorably with published data.

With respect to the weight bearing measurements; an angle a between 85° and 95° was achieved in 79 out of 92 (85.8%); the mean was 87.6° (81 to 95). An angle b between 83° and 90° (Woods's "correct group") was achieved in 58 out of 92 ankles (63%); the mean was 87.6° (72 to 97). An angle b greater than 90° was achieved in 24 ankles (20 of which were less than 93°). An angle b less than 83° was achieved in 10 ankles (7 of which were 82°).

The only ankles in which significant changes in tibial implant position between weight bearing and non weight bearing radiographs were seen were those in which periprosthetic fractures occurred, representing the extremes of the above ranges.

We conclude that the tibial jig of the MTAR produces reliable and reproducible results which compare favorably with published data and, in the absence of a catastrophic event, the first weight bearing radiographs do not show a significant difference in tibial implant position.

## **Reverse scarf osteotomy for bunionette surgery**

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### **Introduction**

There is no consensus on the operative treatment of bunionettes. Other surgical techniques are complicated by post-operative transfer metatarsalgia but rarely non-union. The scarf osteotomy is established as a stable, reliable and versatile osteotomy for treatment of hallux valgus. These attributes can be applied in bunionette surgery. We review our experience.

### **Materials and Methods**

A retrospective analysis of 17 feet (13 patients) undergoing reverse scarf osteotomy in a 4-year period. The mean patient age was 30 years (range 12-64) including nine adolescent feet. Radiographs were analysed for intermetatarsal angle (IMA), metatarsophalangeal angle (MTPA) and intermetatarsal distance.

### **Results**

Significant reductions were identified in all radiographic parameters measured. Mean reduction in IMA was 4.85 degrees ( $p < 0.0001$ ) and the mean reduction in MTPA was 10.4 degrees ( $p < 0.0001$ ). No transfer metatarsalgia was noted. 2 incidences of recurrence were noted in the adolescent group and required revision. 1 patient developed a non-union requiring revision. 2 patients had minor scar problems.

## **Discussion**

Complications noted in our group included non-union, but in a patient who sustained significant trauma in their post-operative phase. No transfer metatarsalgia was documented. We note a high recurrence rate amongst adolescents: 2 feet had recurrent symptoms within 3 years (22%).

## **Conclusion**

The reverse scarf osteotomy produces a reliable, powerful correction for the symptomatic bunionette. Caution should be exercised when considering this technique for adolescent patients. This paper provides a previously undocumented recurrence rate for surgery of the adolescent bunionette.

## **Functional ultrasound elastography of the Achilles tendon: developing mechanical and outcome measurement tool**

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### **Purpose**

Functional ultrasound Elastography (FUSE) of the tendo Achilles is a technique utilising ultrasound waves and controlled, measurable movement of the ankle to non-invasively evaluate TA elastic and load-deformation properties. The study purpose is to assess Achilles tendons, paratenon and bursa mechanical properties in healthy volunteers and establish an outcome tool for TA treatment.

### **Methods**

We studied 40 Achilles tendons in healthy volunteers using real-time US Elastography scan (Z.one, Zonare Medical System Inc., USA, 8.5 MHz) with and without the Oxford Kinematic Ankle Isometric Device (OKAid) and compared it to findings in grey scale sonography. Tendon insertion, midportion and musculotendinous junction were examined during lateral movement and axial compression/ decompression modes. B mode and elasticity images were derived from the raw ultrasound radio frequency data. The anatomical structures mechanical properties were evaluated by a semi-quantitative score of different colours representing stiff tissue (blue) to more soft tissue (green, yellow, red).

### **Results**

All tendons showed normal tendon tissue and normal findings at gray scale B mode images. Real-time Elastography scans in compression/decompression modes without OKIAD failed to produce elasticity measurement without artifacts in all tendons. Minimal lateral movement of the tendon produced by applying the OKAid to dorsal and planter flex the ankle, resulted in well defined elasticity images with tendon in blue colour (stiff) and soft tissues in variable gradient of green, yellow and red. The dynamic forces measurement using the device enabled us to measure the tendon mechanical characteristics including Young Modulus and load transfer along the tendon.

### **Conclusion**

Our findings show that FUSE seems to be a sensitive method for assessment of TA mechanical properties. FUSE Elasticity measurement may offer an invaluable non-invasive cheap tool to guide TA treatment and rehabilitation protocols according to the healing tissue mechanical properties.

# **The scarf osteotomy for treatment of hallux valgus: effect of first metatarsal width on correction - a radiographic analysis of 112 cases**

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Department of Orthopaedic Surgery, St Mary's Hospital, London

## **Background**

The scarf osteotomy is a predominantly translational procedure used to correct moderate and severe hallux valgus deformity. Correction is dependent on both bony and soft tissue components. The aim of this study was to assess whether the first metatarsal width affected or limited the degree of radiographic correction achieved.

## **Methods**

Radiographs of 112 cases in 101 patients who had a scarf osteotomy performed over an 18 month period were reviewed. The dorso-plantar weight bearing pre-operative, and six-week post operative, radiographs were assessed. On all films, the first metatarsal width was measured at the mid-shaft level. The hallux valgus angle (HVA) and first/second Intermetatarsal angles (IMA) were measured on all films.

## **Results**

Change in angles was calculated between the pre and postoperative figures as a measure of correction as well as their relation to normal values. There was no significant correlation between metatarsal width and the degree of change in hallux valgus or intermetatarsal angles.

## **Conclusions**

The first metatarsal width is not related to the degree of correction that can be achieved using the scarf osteotomy, emphasising the importance of adequate soft tissue correction required during surgery. The series supports the view that the scarf osteotomy produces significant radiographic correction in moderate and severe hallux valgus.

# **Surgical correction of ankle, hindfoot and midfoot deformities using a Taylor Spatial Frame and corrective osteotomies**

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## **Introduction**

Foot and ankle deformities are a common cause of disability. Surgical correction can be challenging. We have performed various osteotomies in combination with different soft tissue procedures, with or without use of the Taylor Spatial Frame (TSF) with good results.

## **Material and Methods**

A retrospective study of 20 consecutive patients operated by a single surgeon (SM) after 2004 was carried out; the patients had undergone surgical correction of ankle, hindfoot and midfoot deformities with procedures including calcaneal osteotomy with lateral column lengthening, various midfoot osteotomies and modified Jones procedure. Demographic details, diagnosis, procedures (including previous operations), length of follow-up, outcome and complications were recorded.

Of the 20 patients, 11 were men. The mean age was 39 years (range 18 to 70). 10 patients required a Taylor Spatial Frame for congenital talipes equino-varus (3), malunion or non-union of ankle fractures (3), polio, Charcot Marie Tooth disease, equino-varus due to periventricular leucoencephalopathy and avascular necrosis of the talus. The remaining group included dysfunction of tibialis posterior (6) and spastic paralysis resulting in fixed equinus (3).

## **Results**

The follow-up was 6 to 54 months (mean 19.4). Patient based foot and ankle outcome criteria were used. Of the 20 patients, 16 had no pain and had satisfactory range of movement and function at the last follow up. Post-operative complications included pin site infection requiring change of pin (2), frame hardware malfunction which needed re-adjustment of frame (2), one residual deformity requiring surgical correction at 22 months, one delayed union, neuropathic pain in one, DVT (1), one residual equinus deformity requiring botulinum toxin injections and one osteomyelitis requiring debridement.

## **Discussion**

We present a series of complex congenital and acquired (including traumatic) conditions of the foot and ankle treated with corrective osteotomies and Taylor Spatial Frame with good results and we intend to extend this to a larger study.

## **Arthrodesis of the first metatarsophalangeal joint using a dorsal plate and a compression screw**

**Kumar S, Pradhan R, Rosenfeld P**  
St Mary's Hospital

Fusion of the first metatarsophalangeal joint (MTPJ) is considered the "gold standard" procedure for arthritis and as a salvage procedure for previous failed surgery. Quoted success rates vary from 80%-100%. Therefore it is important to use the most reliable technique. Biomechanical studies have proven that a combination of a plate and screw is the most stable construct. In a review of the current literature there are few studies using this combination, and even then the cohorts were small.

We present a consecutive series of 46 cases; all performed by one surgeon, using a dorsal plate and lag screw technique and analyse the outcome in terms of fusion rate, patient satisfaction and complication rate.

The average follow up period was 18 months (range 12-27 months). The most common indications were hallux rigidus and severe hallux valgus. 98% of the cases fused uneventfully at 4 months. The average fusion time to fusion was 3.1 months. There was one non-union, which remained asymptomatic after metal removal. This was the only case requiring removal of metal. All the patients were allowed to weight bear immediately. There was no hardware failure. The patient satisfaction was 100%. The average AOFAS score at (1 year) was 90.7.

This is the largest series of 1st MTP fusion using this technique. Due to a highly predictable success rate and reliability we recommend use of this method as a standard procedure for the first MTPJ arthrodesis.

## **'Reverse' scarf osteotomy for bunionette correction: initial results of a new surgical technique**

**Guha AR, Mukhopadhyay S, Reddy M, Thomas R**  
University Hospital of Wales

The bunionette is a lateral prominence of the fifth metatarsal head. It is usually caused by a wide intermetatarsal angle (IMA) between the 4th and 5th metatarsals with associated varus of the metatarsophalangeal (MTP) joint. Increased pressure placed on the head of the 5th metatarsal results in pain and plantar callus formation. Failure of conservative treatment warrants bony corrective surgery. Various distal, shaft and basal osteotomies have been described in the literature.

We have used a 'reverse' scarf osteotomy in 12 cases (10F: 2M) with a mean follow-up of 12 months (range 5-22 months). All patients completed a Foot Function Index (FFI) questionnaire pre-operatively and a repeat questionnaire at the latest follow-up. All angles were measured on a weight bearing AP radiograph of the foot. Post-operatively we mobilised the patients immediately using a heel-bearing shoe.

All osteotomies had healed sufficiently at 6 weeks to allow unprotected weight bearing. Full weight-bearing was allowed after clinical and radiological union was achieved.

The mean preoperative IMA was 13.1 degrees (range: 10.4-18 degrees) and the mean 5<sup>th</sup> MTP angle was 19.9 degrees (range 12.7- 25.5 degrees). Preoperative mean FFI was 34.2 (range 14-71.3). Postoperatively the mean IMA was 7.27 degrees (range: 2.0-11.5 degrees); mean 5<sup>th</sup> MTP angle was 6.36 degrees (range: 2.8-9.0 degrees) and post-operative mean FFI was 5 (range 0-16.7). All except one patient were pleased with the cosmetic correction obtained. One patient did not like the scar but her foot was asymptomatic and her FFI improved from 27 to 0. All patients would undergo the same procedure on the other foot if required and would recommend it to a friend.

'Reverse' Scarf osteotomy in the correction of bunionette deformity offers promising results in the short term. Further long-term follow-up would help to establish the benefits of this procedure.

## **Salvage tibio – allograft – calcaneal fusion of the hindfoot: a description of technique and early results**

Siddiqui M, Pillai A, Maclean A  
Glasgow Royal Infirmary

### **Background**

Massive bone loss, with or without an associated deformity of the hindfoot, as a result of failed ankle arthroplasty, arthrodesis or sepsis is difficult to reconstruct. The aim of treatment is to relieve pain, restore stability and length and correct alignment. We report a technique of salvage hindfoot arthrodesis using interposition bulk allograft and a locked retrograde intramedullary nail.

### **Materials and Methods**

We performed 9 salvage tibio-allograft-calcaneal (TAC) fusions in 8 patients from 2003 – 2008. In all cases a shaped cannulated femoral head allograft was used as an inter-positional spacer and fusion attempted using a retrograde locked Stryker hindfoot nail. All patients were assessed using the AOFAS and Euroqol scoring systems. Clinical and radiological review was carried out.

### **Results**

There were 6 female and 2 male patients. The indication for surgery included failed arthrodesis (2), infected metal work (2) and inflammatory arthritis with severe hind foot deformity (4), and post-traumatic AVN of talus (1). Mean age at surgery was 67years (range 24-76). The mean follow up was 15.7 months (6 – 36 months). Mean preoperative AOFAS score was 29 (range 13 - 46), and the mean postoperative AOFAS score was 59 (range 47 to 61). The mean preoperative Euroqol score was -0.429 (range -0.594 to 0.079), and the mean postoperative score 0.803 (range 0.079 to 0.883). Radiological fusion was seen in all except one patient who needed a below knee amputation for persistent sepsis at - months. All patients were pain free. All reported that given the choice, they would have the surgery again and would also recommend the procedure to a friend or relative.

## **Conclusion**

Salvage TAC arthrodesis using a locked retrograde intramedullary nail, provides a stable weight bearing construct with restoration of hind foot height and alignment with predictable outcomes. Union rates and patient satisfaction with this procedure is high with improvements in both functional outcomes and quality of life.

## **Osteoid osteoma in children's feet: a 17-year experience**

**Micelarakis J**

Children's Hospital Aglaia Kyriakou

### **Aim**

This study investigates the prevalence of osteoid osteoma in the bones of the foot and describes the diagnostic and therapeutic approach.

### **Material and methods**

During the last 17 years (1991-2008) 80 children with osteoid osteoma of the whole skeleton were hospitalized in our department. We reviewed 8 patients suffering from this benign bone tumour in the foot. They were treated with open surgical en bloc resection of the nidus. Diagnosis was based on clinical and laboratory findings and was confirmed histologically at surgery.

Six of the 8 patients described nocturnal pain and relief after aspirin administration. Three children presented with oedema and ankle stiffness, one presented with peroneal spasm and a rigid flatfoot. One patient presented with inflammation of the extensor tendon sheaths of the dorsal foot. The radiographs showed the characteristic "nidus" in 4 patients. Final diagnosis was made in 4 patients with a bone scan and in 3 other patients with an MRI.

This retrospective clinical study describes the age of the child, variety and duration of symptoms, clinical findings, imaging workup, therapeutic solutions and short and long-term follow up.

### **Results**

In our series of patients with osteoid osteoma 10% of cases occurred in the foot, with the majority found in the talus. This correlates with the literature. The mean age of the children was 13 years with a male to female ratio of 1:3. In all cases after complete surgical excision of the tumour, no recurrence was reported after a mean follow up of 5 years (range: 6 months to 10 years).

### **Conclusion**

Osteoid osteoma of the child's foot, despite being rare, should be included in the differential diagnosis when a child complains of foot pain and no other diagnosis is apparent. The target of therapy should be the complete surgical removal of the nidus, as this minimises the risk of recurrence.

## **Functional regeneration without reconstruction of the Achilles tendon after complete loss**

**Parkar A, Taylor M, Nakul P, Venkat R**

Broomfield Hospital Mid Essex NHS Trust Chelmsford

The treatment of complete rupture of the Achilles tendon remains controversial despite the extensive literature. Infection is a potential and serious complication after open Achilles tendon repair and can lead to complete loss of the tendon. Open injuries of the heel and distal calf can also result in complete loss of the tendon. How do we reconstruct after complete loss of the Achilles tendon?

We describe a case of traumatic laceration of the Achilles tendon in a 10 year old boy who developed a secondary infection. This resulted in loss of a 5cm segment of the distal part of the tendon and overlying soft tissue. He was treated using a free groin skin flap. This skin flap, based on the superficial circumflex iliac vessels, was anastomosed to the posterior tibial vessels. The intention was simply to close the soft tissue defect and settle infection while leaving formal reconstruction of the Achilles tendon to a later date.

Unexpectedly, this proved unnecessary as the patient regained Achilles tendon function spontaneously such that he could demonstrate equal Achilles function in both heels.

Two years later we assessed him both clinically and radiologically. His assessment by a physiotherapist showed normal ankle function and his MRI scan showed that the Achilles tendon was intact but thickened over the distal 8cm.

We present a single case report, but as a result of this experience, in similar circumstances, in a child with loss of tendon, we would advocate skin flap and mobilization, in the expectation of significant recovery of Achilles function.

## **The mechanical characteristics of a new second-generation hindfoot nail construct**

**Goldberg A, Cooke P, Sharp R**  
Nuffield Orthopaedic Centre, Oxford

### **Introduction**

Tibio-talar-calcaneal Fusion (TCC) is frequently indicated for hindfoot fusion and correction of deformities in conditions such as failed TAR, synchronous arthritis of ankle and subtalar joints, Charcot neurological deformity, AVN talus and rheumatoid. Fusion over a hindfoot nail is often the preferred method of stabilisation. However, the first generation nails do not offer the ideal characteristics required by a nail and newer second-generation devices have been launched recently, offering the improvements of titanium constructs, additional screw positions, enhanced locking, dynamic and static locking options, radiolucent jigs, opening jigs to optimise initial reduction and a wider selection of locking screw lengths.

An increase in the number of locking holes theoretically increases the risk of nail failure and titanium rather than stainless construction raises the possibility of other mechanical alterations in performance. With all new devices offering such additional features, it would seem desirable to know the likely mechanical characteristics of such devices.

This study compares the mechanical performance of two commonly used first-generation devices to the Oxford Ankle Fusion Nail, a new second generation device.

### **Method**

Devices were tested on an industry-standard jig reproducing walking cycles comparable to the normal stresses and strains expected across a lower leg (identical to those used by previous studies on first generation devices) and the results are compared.

### **Results**

A new second generation titanium nail with additional locking holes and dynamic and static locking options (The Oxford Ankle Fusion Nail) has mechanical characteristics similar to earlier devices and the addition of increased locking options has not compromised the mechanical integrity of the device. These devices should therefore offer enhanced features for clinicians and patients to increase the chances of successful surgical outcome without any increased risk of mechanical failure.

# **The role of primary subtalar fusion in the management of calcaneal fractures with associated subtalar dislocation**

**Dunning M, Taylor H**  
Poole Hospital NHS Trust

## **Objective**

To describe the use of primary subtalar fusion in the management of fracture dislocation of the calcaneum.

## **Discussion & Methods**

Subtalar dislocation, in association with calcaneal fracture, is an unusual injury and in our experience is often missed at initial presentation. We discuss three cases that presented to our foot & ankle unit over a twelve-month period. Two of the three cases were late presentations, with the subtalar dislocation having been initially missed prior to referral.

## **Results**

Case 1 - 64-year-old lady referred 5 months after a fall downstairs. Radiographs and CT demonstrated a fracture dislocation of the calcaneum with subtalar dislocation. She was treated with open reduction and primary subtalar fusion with excellent results at one year follow up.

Case 2 - A 60-year-old man presented 4 weeks after an RTA. Radiological imaging confirmed a comminuted calcaneal fracture, subtalar dislocation and disruption of the calcaneo-cuboid joint. He was treated with a primary subtalar and calcaneo-cuboid arthrodesis with satisfactory results at nine months.

Case 3 - A 66-year-old lady was referred after a fall down 2 stairs. She had a fracture dislocation of the calcaneum with severe medial fragment comminution and significant chondral damage to the subtalar joint. An open reduction and primary subtalar arthrodesis was performed with satisfactory results at six months.

## **Conclusions**

This rare injury, in our experience, is frequently missed. We describe the characteristic radiographic appearances that were present in each of our group. We believe primary subtalar fusion is a good option in patients with this injury, particularly in the older age group.

# **Functional management of Achilles tendon ruptures: a viable option for non-operative management**

**Karkhanis S, Mumtaz H, Kurdy N**  
University Hospital of South Manchester, Wythenshawe, Manchester

## **Background**

Functional management of ruptured Achilles tendons can be effective in all age groups, for both sedentary and sporting individuals. Dynamic mobilization with protection of the healing tendon using the Aircast boot is an essential step in management. We conducted this study to look at the outcomes of our early experience in the use of this orthosis with our unit protocol.

## **Materials and Methods**

We retrospectively reviewed 107-ruptured Achilles tendons over the last 5 years, which were managed conservatively. Case notes were analyzed for demographics and immediate outcomes. Long-term outcomes were assessed by the use of the Acute Tendon Rupture Score (ATRS) - which were distributed as postal questionnaires. The data was analyzed using SPSS software.

## **Results**

Of the 107 tendons (46 right, 61 left, Male: Female= 71: 36, Mean age= 50 years), 105 tendons (98 %) reported clinically healed tendons at an average discharge time of 22 weeks (8 to 72 weeks). Four patients underwent secondary operations (2- open repairs for failure to heal, 1- tendon shortening procedure, 1- tendon lengthening procedure). Two patients reported partial re-ruptures, but healed well, on persistence with the boot. Other complications reported were- 2 patients had persistent pain/ discomfort in the tendo Achillis area, 2 had weak plantar flexion, 1 patient developed a deep vein thrombosis in the affected calf while 1 patient developed a pressure sore on the affected calf which settled with conservative management. We received 52 questionnaires back with a mean ATRS score of 21. Seventy five percent of patients had returned to pre-injury level of activity (average time= 7 months), with the same number being completely satisfied.

## **Conclusion**

Orthotic management of Achilles tendon ruptures provides a viable and successful option for managing this pathology. Under close senior supervision, this management protocol can be tapered to suit tendon ruptures in all age groups and various lifestyles.

## **Arthrodesis of the first metatarsophalangeal joint using a straight dorsal plate produces adequate dorsiflexion of the hallux**

**Hammett R, Saxby T**

Brisbane Foot & Ankle Centre

Arthrodesis of the first metatarsophalangeal joint (1st MTPJ) is a commonly performed and effective treatment for degenerative joint disease of the 1st MTPJ but controversy exists as to the optimum position of the hallux.

We present a consecutive series of patients fused with a straight plate and demonstrate satisfactory clinical and radiographic results. A straight plate placed dorsally over the MTPJ produced a mean 15°(9-20°) dorsiflexion of the proximal phalanx on the 1st metatarsal. There were no cases of plantar ulceration, tip pain in the hallux or interphalangeal joint (IPJ) arthrosis.

Many descriptions of the procedure warn the reader to avoid plantar flexion but few highlight the problem of excessive dorsiflexion, which is poorly tolerated by patients. With the increasing availability of pre-contoured 'anatomic' plates with inbuilt dorsiflexion of up to 10°, a tendency to dorsiflex the hallux will create 'outliers' with excessive dorsiflexion.

We suggest that the use of a straight dorsal plate results in enough dorsiflexion to avoid pain and ulceration under the toe and arthrosis of the IPJ, without generating excessive (>30°) dorsiflexion of the hallux.

## **Prospective review of the results of ankle arthroscopy in the presence of arthritis**

**Atecaí M, Foote J, Dodd L, Palmer S**

Worthing and Southlands Hospitals

We prospectively reviewed the results of a consecutive group of patients with ankle osteoarthritis who underwent arthroscopic debridement for symptoms refractory to conservative measures. The radiological changes preoperatively were graded using the system proposed by Van Dijk.

All cases had moderate to severe arthritic changes. The 3 with mild changes radiologically were found to have grade 3 cartilage damage during arthroscopy. We used the validated Manchester Oxford Foot and Ankle questionnaire to score symptoms preoperatively and postoperatively

following a minimum of 6 months follow up (mean of 13 months). The arthroscopic treatment consisted of a joint washout and a debridement of anterior osteophytes.

There was no significant improvement in the postoperative scores achieved for the walking and social interaction domains ( $p>0.05$ ), however there was an improvement in the pain scores. Using a validated questionnaire we demonstrate a modest improvement in ankle arthritis symptoms following arthroscopic debridement. This fact should be stressed to patients due to have arthroscopic debridement in the presence of arthritis.

## **Variability in the treatment of stable Weber B ankle fractures in the clinic: results of a survey and review of the literature**

**Shaikh N, Guryel E, Unithan A**  
St Peters Hospital, Chertsey

Stable Weber B ankle fractures are frequently seen in fracture clinics. Evidence exists stating that patients with these fractures can be allowed to fully weight-bear without needing any external support. Even with clear evidence in the literature patients at times are placed in below knee casts and on occasions ordered not to weight bear. Alternatively, expensive supportive boots are used.

The aim of our study was to assess the variation in the treatment of stable ankle fractures amongst orthopaedic surgeons. A questionnaire was prepared showing a stable Weber B fracture and seven possible responses for the treatment of that fracture. We showed the questionnaire to a hundred orthopaedic surgeons.

Our survey showed that there is a great deal of variability in the treatment of ankle fractures. By providing a greater degree of awareness with regards to the nature of this fracture a better clinical outcome and cost effectiveness can be achieved.

## **Vacuum assisted closure (VAC) dressing after ankle replacement surgery for primary wound healing in patients with compromised vascularity of limb**

**Kulkarni A, Siddique M**  
Freeman Hospital

### **Introduction**

Ankle replacement is major surgery with significant soft tissue dissection and bleeding. The skin quality is usually poor in these patients as a result of age, oedema, venous congestion, arteriopathy or previous open reduction of ankle fractures and soft tissue injury. The chances of wound infection increase with delayed wound healing. We studied VAC dressings applied in theatre after ankle replacement to assess their impact on wound healing.

### **Patients and methods**

Ten patients were enrolled in a prospective trial of VAC dressings if they had the potential for wound breakdown. The results were compared with 10 other patients who had normal soft tissue and routine Opsite dressing. All patients had daily pain scores, wound status, hospital stay, satisfaction and range of movement recorded.

### **Results**

Patients with VAC dressings had mean pain score of 2/10 post operatively compared with 6/10 with a conventional dressing. The average stay of patients with standard dressing was 8 days. All patients with VAC dressing were discharged 4 to 6 days postoperatively, except one who had an unrelated abdominal emergency whilst an in-patient. None of the patients with VAC dressings had

wound discharge after the VAC was removed on the 5<sup>th</sup> day. Range of movement was similar in both groups of patients. Patient's satisfaction with the VAC dressing was 8/10.

### **Conclusion**

VAC dressings allow primary ankle replacement wound healing even with a vascularly compromised limb.

## **Painless hindfoot movement following retrograde nailing of the ankle: our experience of the fixation nail**

**Modi N, Cutts S, Bowers A, Kanabar K**

James Paget NHS trust

Fourteen patients with 15 fractures of the ankle and distal tibia were treated with retrograde nailing using the inflatable Fixion Nail (Disc Orthopaedics).

The mean age of the patients was 80 years (range 65 to 91). 13 were female and 1 male.

Follow up showed good fracture healing in 10 ankles. One patient developed a deep infection, which required removal of the nail at 4 weeks. There was one non-union. Two patients died from unrelated causes and one was lost to follow up. At follow up, we observed that 10 ankles appeared to have limited but useful movement of the hindfoot with the Fixion nail still in situ. A review of their x-rays showed an area of osteolysis in the calcaneum due to a windscreen wiper effect around the nail. The movement was completely pain free.

We believe that this is the first time this effect has been reported in the literature and that it raises the possibility that a future retrograde nail for the ankle might be specifically designed to both secure the overlying fracture and preserve movement. It also leads us to question the need for a second procedure to remove the nail after healing as movements seems to return with the nail in situ.

## **Removal of foot K wires in outpatient clinic: the patient experience**

**Khurana A, Prasad V, Thomas R**

University Hospital of Wales, Cardiff

### **Aim**

We performed a study to compare the pain and anxiety perceived and experienced by the patients while removing foot K wires in the outpatient clinic without local anaesthesia.

### **Methodology**

Seventy-four consecutive patients operated for forefoot corrective procedures with insertion of K wires, were given a questionnaire before and after removal of the wires in the outpatient clinic. The nature of the operative procedure, number of wires used, wires crossing MTPJ and time from surgery was recorded. The pain and anxiety expected by the patients before the removal of the wires was recorded using a visual analogue scale. Pain and anxiety experienced was also recorded following the procedure.

### **Results**

The mean age of patients was 59.7 years (range 21 to 78). Mean number of wires used was 2.1 (range 1 to 5) and the mean duration since the surgery was 5.1 weeks (range 4 to 8). Wires crossed the MTPJ in 34 patients. Pain expected while removing the wires was mean 5.6 (SD 3.18, median 6) on a scale of 1 to 10. Anxiety expected was mean 4.8 (SD 3.45, median 5). Sleep disturbance with anxiety on the night before removal of the wires was mean 2.4 (SD 3.42, median

0) on a similar visual analogue scale. Pain experienced during the procedure was mean 1.95 (SD 2.6, median 1). This was statistically less than pain expected ( $p < 0.01$ , student T test). Mean anxiety for a similar procedure if one was to be performed again was 1.4 (SD 2.31, median 0). This was statistically significantly lower than the anxiety before the current procedure ( $p < 0.01$ , student T test). The 2 groups with the wire crossing the joint or not, did not show any statistically significant difference in pain experienced ( $p=0.09$ ). There was no significant difference in the anxiety expected or pain experienced in patients with multiple wires in comparison to those with one wire only ( $p= 0.31$  and  $0.96$  respectively). Fifty-nine patients experienced less pain, 10 equal and 5 experienced more pain than they had expected. Similarly, 58 patients reported less anxiety for a repeat procedure, 14 equivalent and 2 reported more anxiety than the present experience. 68 patients confirmed willingness to undergo a similar procedure again if need be and 6 were unwilling. 62 patients would recommend the procedure to their friends while the other 12 would not. There were no complications of the procedure, such as wire breakage or local infection following the wire removal.

### **Conclusion**

Patients experience less pain and anxiety than expected in removal of K wires in outpatient clinic. After providing adequate information, the procedure can be safely carried out on an out patients basis.

## **Mid-term results of the modified SPLATT procedure for residual congenital talipes equinovarus**

**Stanley J, Mac Niocaill R, Perera A, Stephens M**  
Temple Street Children's Hospital, Dublin

### **Introduction**

Residual club foot (CTEV) is a challenging deformity. Transfer of the tibialis anterior tendon to a point more lateral on the forefoot is often utilised. The senior author has developed a modified SPLATT (split anterior tibialis transfer) for residual forefoot supination in CTEV in older children.

### **Aim**

The aim of this study is to evaluate the medium term (mean 6.6 years; range 5.5 – 8.9) outcome in 11 patients (14 feet) treated with the SPLATT procedure (mean age for procedure 6.9 years; range 2.9-10.0). Two patients had cerebral palsy, 1 had spina bifida and 1 had juvenile rheumatoid arthritis, the remaining 7 patients had no clear underlying diagnosis. Outcome measures based on patient centered assessment of function and foot appearance, by using the patient applied assessments of Chesney, Utukuri and Laaveg & Ponsetti (there is increasing recognition that doctor-centered or radiograph based scoring systems do not tally well with patient satisfaction). Objective assessment of outcome was provided by measurement of certain radiological parameters on the immediate pre-operative and the follow up weight-bearing radiographs (1st ray angle, talar-1<sup>st</sup> metatarsal angle, talar-2<sup>nd</sup> metatarsal angle, talo-calcaneal angle). The calcaneal line passing through the medial 1/3 of the cuboid or medial to the fourth metatarsal was also noted. The Blecks grade was recorded (pre-op 100% moderate-severe; post-op 88% mild-moderate). Parents assessed outcome based upon 'best level of activity', functional limitation and willingness to recommend treatment to others.

### **Results**

Mean Chesney score at the time of follow up was 12.25 (8 to 15); mean Utukuri score was 15.75 (10 to 24); Laaveg and Ponsetti score was 81.5 (67 to 95). The 'best activity level' achievable was 'unlimited' in 4 patients, 'football' in 4 patients, 'running' in 1 and limited by an underlying or associated condition in 2 patients (1 with juvenile rheumatoid arthritis and 1 with cerebral palsy related spastic paraparesis). All patients/ parents indicated that they would undergo the same procedure again should it be necessary. Only one patient experienced a complication (delayed wound healing) treated successfully with dressings.

The 1<sup>st</sup> ray angle pre-operatively was 61.2° (range 50 – 70°), post-operatively it was 62.1° (range 50 - 81°). The talar-1st metatarsal angle was 28.8° (range 15-44°) pre-operatively and 19.1° (range 4 - 34°) post-operatively. The pre and post –operative talar-2nd metatarsal angles were 22.5° (range 0 - 35°) and 12.3 (range 0 - 29°) respectively, the talo-calcaneal angle was 17.5° (range 10 - 35°) and 13.7 (range 5 - 20°) respectively. The pre and post-operative lateral talo-calcaneal angles were 34.5° (range 25 - 40°) and 30.6 (range 13 - 45°). The calcaneal line passed through neither the base of the fourth metatarsal nor the medial 1/3 of the cuboid in all patients on their pre-operative films. In the follow-up series forefoot supination and adduction was improved as indicated by the calcaneal line being medialised to the above points in 55.5% of patients.

### **Discussion**

The recognition that patient orientated subjective assessment is gaining in acceptance, and confirm patient satisfaction with function, cosmesis and pain levels with the SPLATT procedure. More traditional radiological outcome measures also confirm that the modified SPLATT is a safe, effective and acceptable procedure.

## **Definitive corrective surgery on diabetic non healing ulcers improves outcome**

Ahmed MO, Sharif K, Bates M, Edmonds M., Kavarthapu V  
Kings College Hospital, London

### **Aim**

To analyse the impact of definitive corrective surgery on the course of chronic non-healing diabetic foot ulcers.

### **Method**

The specialist diabetic foot clinic at the Kings College Hospital has six thousand attendees a year. We retrospectively reviewed a group of sixteen patients with chronic non-healing diabetic foot ulcers who had deformity correction surgery between Jan 2007 and Nov 2008. They underwent a minimum of twelve months of conservative treatment including pressure-relieving methods such as orthotics and total contact casts. A third of them were suggested to have an amputation and referred for a second opinion. Ulcers were classified as B3 according to the Texas diabetic wound classification at the time of referral. Eight ulcers were located over the forefoot, six over the mid foot and two over the hind foot. Collectively they had eighteen surgeries including six Taylor spatial frames, six corrective osteotomies and fusions, three tibio-calcaneal nails and three exostectomies. The period of ulcer prior to surgery together with the time to healing of the ulcer postoperatively was calculated in each case.

### **Results**

There were fourteen males and two females, with a mean age of 55.8 years ranging from 30 to 70 years. The mean period of ulceration prior to surgical intervention was 4.2 years. Eleven ulcers healed completely with a mean duration of three months and a maximum of six months. One ulcer is improving, three have failed to heal and none have gone on to have amputations so far.

# **An anatomical and radiological study of the fascia cruris and paratenon of the Achilles tendon**

**Carmont M, Highland A, Rochester J, Paling E. Davies M**

The Sheffield Foot & Ankle Unit, The Northern General Hospital, Sheffield, UK

Minimally invasive repair of the Achilles tendon has been shown to be a safe and effective means of repair. The Achillon jig permits the placement of sutures beneath the fascia cruris and the paratenon and yet through the substance of the ruptured tendon itself facilitating an intra paratenon repair. Occasional placement of the prongs of the jig outside the paratenon suggests that these two layers may not be as clearly delineated as first thought or may merge/separate at an as yet undefined level.

We performed an anatomical and radiological study of the layers of tissue superficial to the Achilles tendon: the fascia cruris and the paratenon, in 4 paired and 4 non-paired cadaveric specimens, 12 in total.

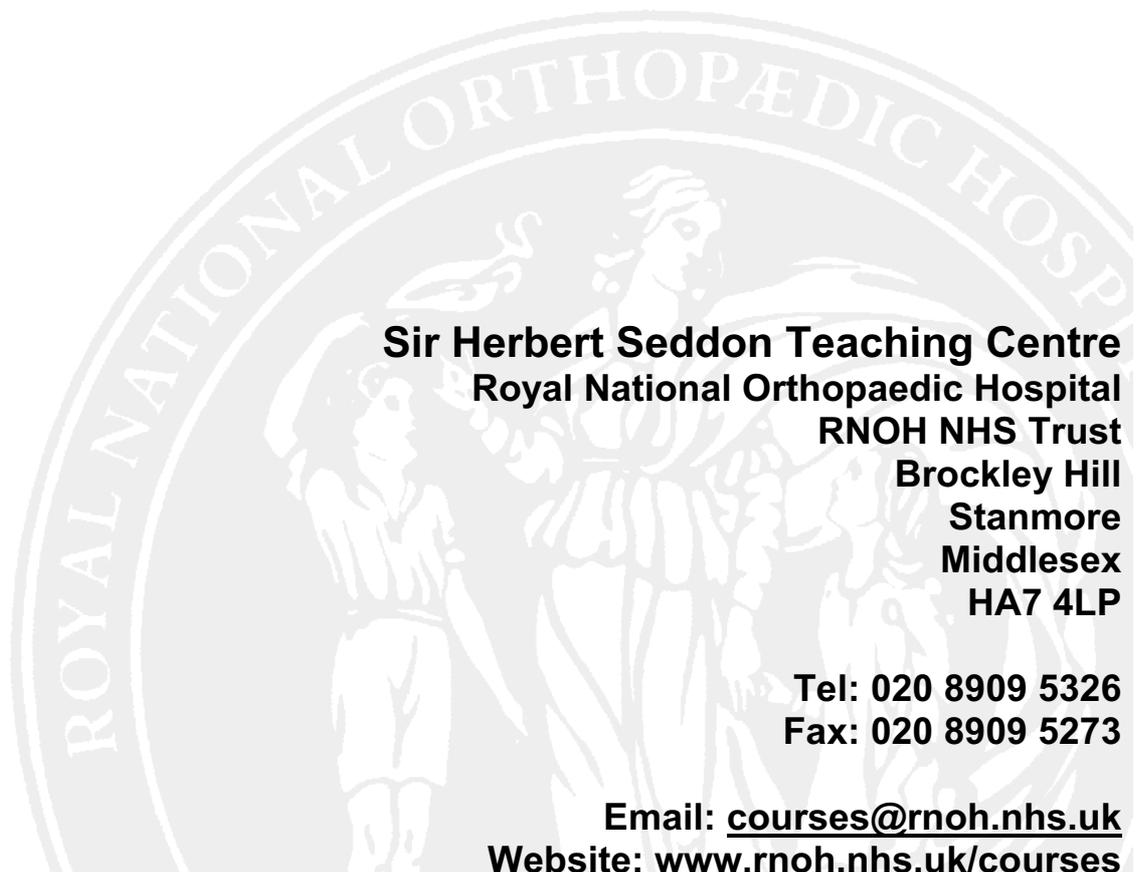
The mean distance for the merging of the fascia cruris and paratenon from the PSCT was found to be 3.73cm (range 1.7-5.8cm). Ultrasound was less distinct than MRI scanning and the mean distances of the confluence to the PSCT were found to be 3.53cm (range 2.78-4.4cm) and 3.81cm (range 2.32-5.37cm) respectively.

The mean thickness of the Achilles tendon was found to be 5.59mm at 3cm proximal to the PSCT. The sural nerve met the lateral border of the Achilles tendon at a mean distance of 8.5cm (range 5.5-12.3cm) from the posterosuperior tubercle of the calcaneum.

We recommend careful scrutiny for these layers when performing surgery on the Achilles tendon and careful placement of the prongs of the Achillon jig beneath the paratenon, when using this method to repair the tendon.

## **CPD Accreditation**

BOFAS Annual Meeting, 4<sup>th</sup> – 6<sup>th</sup> November 2009 has been registered with 17 credits for CPD purposes by the BOA.



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## **Artwork commissioned for BOFAS**

### **Carole Smollan – Artists Portfolio**

Textile artist Carole Smollan began her career 35 years ago by making large ceramic murals for civic buildings. When her hands began to show wear and tear, she converted to art making in textiles, but missed the excitement of the unknown when opening the kiln. This led her to study and learn Japanese Shibori, a resist technique of making marks on natural fabrics such as silk and cotton which was first used to pattern the emperor's clothing.

Shibori uses techniques of shutting sections of the material to remain undyed by puckering, folding, stitching or pleating: the outer fold will absorb the dye but the inner fold will resist to some degree. The binding and folding techniques and the tension used by string binding dictates the outcome of the design.

Shibori is about balance, technique, the relationship of space, a sense of restraint and spontaneity. Deceptively simple designs repeated give of the impression of a more complicated design. In this process one learns to control the making of marks on fabric but there is an element of the unexpected when unraveling the piece.

Carole Smollan has just completed a 7- month exhibition at the Yeshiva University Museum in New York, USA. She specializes in KUMO SHIBORI and these pieces commissioned for the BOFAS Windsor 2009 Annual Scientific Meeting are from Shibori wall hangings using this method.

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The British Orthopaedic Foot and Ankle Society (BOFAS) is a registered charity dedicated to the management of and research into problems affecting the foot and ankle. It is affiliated to the British Orthopaedic Association and the European Foot & Ankle Society.



**British Orthopaedic Foot & Ankle Society**  
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