

# ROUNDUP<sup>360</sup>

## Foot & Ankle

### Plantar pressures linked to radiographs

#### x-ref Research

■ Plantar pressures are said to determine outcome in hallux valgus surgery. While the relationship between overshortening, plantar pressures and transfer metatarsalgia is universally acknowledged, the scientific studies lag somewhat behind the widely accepted surgical dogma. A study team in **Vienna (Austria)**, noting that the pathoanatomy of hallux valgus with relation to plantar pressures is yet to be established, sought to determine loading parameters in hallux valgus feet.<sup>1</sup> They designed a study to correlate the widely recognised radiographic parameters for hallux valgus and the changes in plantar pressure. Their study included 61 patients with weight-bearing foot radiographs and the study team measured widely accepted radiographic parameters (intermetatarsal, hallux valgus and distal metatarsal articulation angles, as well as sesamoid position). These were subsequently correlated directly with plantar pressure assessment using the Emed® force plate system. The chief finding of the study was that (as perhaps could be predicted) the plantar pressures are determined by the radiographic measures of hallux valgus. The investigators found peak metatarsal pressure in the great toe, maximum force in the hallux and contact time all to be dependent on hallux valgus angle (all negatively correlated). The authors found a positive association between force

time integral, maximum force, contact areas and peak pressures over the fifth metatarsal head which are suggestive of functional transfer to the lateral ray of the foot. This study adds some biomechanical functional clinical data to support the supposition that plantar pressures are responsible for symptomatology in hallux valgus feet. It also provides a wealth of baseline data with which to compare other studies. Depending on the severity, hallux valgus angle and sesamoid subluxation load shows significant lateral transmission in hallux valgus feet.

### Strength training for ankle instability?

■ Ankle instability is a common complaint – easily acquired from a simple ankle sprain, the spectrum of disorders ranges from that of occasional pain through to full blown joint instability hindering activities of daily living. While initial operative intervention has been previously shown to be less effective than conservative management, there really is little high-quality research surrounding the various different rehabilitation regimes that are available, let alone randomised controlled trials. We were delighted here at 360 HQ when we read this paper from a research team in **Bloomington (USA)** reporting their study designed to establish the effects of strength training in chronic ankle instability on patient-perceived instability.<sup>2</sup> This prospective randomised controlled trial recruited 39 patients with established symptoms

of chronic ankle instability. Patients were screened with the Functional Ankle Instability Questionnaire and then randomly allocated to either a resistance-band protocol, a proprioceptive neuromuscular facilitation strength protocol or a control group. Rehabilitation programmes were three times a week for a total of six weeks. Outcomes were assessed at baseline and final follow-up of six weeks. A combination of objective (isometric strength testing, balance testing, functional tests) and patient-reported outcomes were administered. The investigators established that both interventions resulted in significant improvements in isometric strength and also reported improvements in perceived instability. Objectively, the investigators were unable to demonstrate any improvements in balance or functional testing. The follow-up for this study is rather short, reporting outcomes at the end of a course of physiotherapy. Based on the results of this study, rehabilitation can be recommended, but not one specific regime over another. Perhaps a longer follow-up interval will improve the clinical impact of this interesting study.

### Is weight loss good for your feet?

■ It seems that weight loss is good for almost every outcome imaginable, however, we were slightly bemused to read a study, not only randomised to weight loss or not, but examining the outcomes related specifically to foot function.

In what must perhaps be one of the most ambitious (and unusually designed) studies published recently, the study team in **Philadelphia (USA)** performed a randomised controlled trial designed to assess the impact of weight loss in obese patients on foot structure, gait and dynamic plantar loading.<sup>3</sup> This prospective randomised controlled trial allocated patients to either a portion control weight loss intervention or a delayed intervention. The study team recruited 41 obese adults to the study and undertook assessments of arch height index, malleolar valgus index, gait analysis (including plantar peak pressure) and weight. Outcomes were assessed at baseline, three and six months. Despite the ambitious design, the study outcomes were perhaps slightly predictable. The weight loss programme did effectively reduce body mass index, and this decrease in weight was associated with a reduction in peak pressures. However, they did not result in any appreciable change in foot biomechanics, just less force overall going through the foot.

### Diabetes and foot surgery complications

■ Diabetes and foot surgery go hand in hand. While not glamorous, diabetic foot surgery is crucially important to many patients for control of ulcers and infective complications. A less commonly discussed aspect of diabetic foot and ankle surgery is the effect of diabetes on ankle arthritis surgery. There is a higher rate of arthrosis in diabetics in general, and

with the difficulties associated with peripheral neuropathy, vascular disease and immunosuppression, one might expect that diabetic elective foot and ankle patients would be associated with excessive complication rates. A registry study querying the National Inpatient Sample database has been undertaken by researchers from **Chicago (USA)** with the aim of establishing the effect of diabetes on complication rates.<sup>4</sup> Their study included data concerning the outcomes of 12 122 patients who all underwent either ankle arthrodesis or total ankle arthroplasty between 2002 and 2011. The overall complication rates were significantly higher in patients with diabetes in the ankle arthrodesis group (16.4% vs 7.0%). A multivariate analysis correcting for other potential confounders confirmed diabetes to be independently associated with a risk of overall complications (Relative Risk 2.7), myocardial infarction (RR 3.2), urinary tract infection (RR 4.6), blood transfusion (RR 3.0) and post-operative washout and debridement (RR 1.9). Diabetic patients were found to have a significantly increased hospital length of stay (mean difference 0.35 days) and greater healthcare delivery costs, with nearly \$2000 of excess hospital expenses. A very similar picture was seen in the total ankle arthroplasty group, with increased overall complication rates (7.8% vs 4.7%). In this group, multivariate analysis revealed a significant independent association between diabetes and blood transfusion (RR 9.8) and overall complications (RR 4.1), however, the hospital costs were not significantly different between the groups. The morbidity associated with diabetes is underlined by this study and it does seem that whatever ankle intervention is chosen, there is an increase in complication rates. This study does not take into consideration the longer-term potential differences between arthrodesis and arthroplasty in patients with diabetes. Are the infection rates different? Is there a higher mid- or long-term revision

rate in the arthroplasty group? These questions remain currently unanswered.

### Tantalum for failed ankle arthroplasty?

■ The challenges facing the ankle arthroplasty surgeon are well described in this month's feature article. One of the major challenges is dealing with bone loss following arthroplasty failure, infection or loosening. While in most centres revision for failed arthroplasty is limited to arthrodesis, the bone loss can compromise function as a short stiff limb can be very disabling. One potential solution is to restore length using graft, either auto- or allograft. Bulk allograft causes issues with integration, and autograft runs the risk of donor site morbidity. Surgeons in **Beirut (Lebanon)** describe the use of tantalum to manage shortening associated with significant bone loss.<sup>5</sup> Tantalum augments have become commonplace in the management of bone loss in arthroplasty. The open porous structure of the tantalum augment allows for a bony through growth. The surgical team report a small series of three patients, all with failed ankle arthrodesis and all managed with tantalum trabecular metal. The salvage procedures were all performed at least six years following arthroplasty. While this article really serves as an illustration of a new technique, the authors do report some outcome measures including the American Orthopaedic Foot and Ankle Society (AOFAS) scores, time to arthrodesis and complication rates. Following arthrodesis, AOFAS score improved from 30.7 pre-operatively (range 20 to 39) to 72.7 at final follow-up (range 65 to 77), with a mean time to bony union reported as around three months, and the authors report that there were no complications observed in this small series.



### Steroids, costs and Morton's neuroma

■ The treatment of common, but tricky to cure, conditions (Morton's neuroma, tennis elbow, subacromial impingement, etc) has come under increasing scrutiny as a 'value' agenda is being pushed in most healthcare economies. While not expensive in themselves, steroid injections use large amounts of clinician and nursing time. Whether this is cost effective is a question that the study team responsible for the MortISE trial in **Bangor (UK)** are attempting to answer with their latest look at the MortISE dataset.<sup>6</sup> They have reported a cost-effectiveness and cost-utility analysis, utilising the results of 131 patients recruited to MortISE (a pragmatic randomised controlled trial of 131 patients randomised to either methylprednisolone injection or control). The original study was undertaken in **Edinburgh (UK)** and compared the injection under ultrasound guidance of steroid (methylprednisolone) versus local anaesthetic alone for Morton's neuroma.<sup>6</sup> This report of a subset of 109 patients (including 55 controls) concerns the health economic study of these patients. The incremental cost of intervention per point improvement in the area under the curve of the Foot Health Thermometer (FHT-AUC) was calculated up to three months following injection. Quality of life measures (EQ-5D-3L) in conjunction with the Foot Health Thermometer were used to conduct cost-utility analyses. The cost of the ultrasound-guided steroid injection was £149, with a higher mean cost to the NHS over three months in the intervention group (£280 vs £202). The estimated incremental cost-effectiveness ratio was £32 per point improvement in the FHT-AUC, with a threshold of £100/FHT-AUC improvement. The research team

report a 97.5% probability that steroid injection is cost-effective. A secondary cost-utility analysis was based on the FHT-enhanced EQ-5D. This estimated the corresponding incremental cost-effectiveness ratio as £6 400/quality-adjusted life year (QALY). The currently recommended UK threshold per QALY is between £20 000 and £30 000, meaning that there is 80% to 85% probability that steroid injection is cost-effective. For the moment at least, steroid injection can be considered a cost-effective intervention in treating Morton's neuroma symptoms.

### Ankle arthritis and subtalar joint

■ It is often said that given the considerable functional overlap in terms of movement, motion in one joint in the foot and ankle can compensate for arthritis-related stiffness at neighbouring joints. One area where this is thought to occur quite commonly is in the hindfoot where the ankle can compensate for subtalar stiffness and vice versa. Researchers in **Shanghai (China)** designed a study with the intention of clarifying the relationship between the ankle and subtalar joint in osteoarthritic change.<sup>7</sup> Using a mixed cohort of 419 patients on whom they had undertaken either arthrodesis or ankle replacement for an established diagnosis of ankle arthritis, the study team identified 233 ankles (in 226 patients) who met the inclusion criteria for their study (no prior subtalar arthrosis and primary surgery with a complete radiographic record available). The study team measured a battery of baseline radiographic parameters including alignment, tibial talar surface angle, talar tilt and tibio-calcaneal axis. These were compared with a control group of 60 normal ankles with no history of hindfoot pain or surgery. The research team were able to establish that in the majority of osteoarthritic ankles there is compensation for malalignment, with up to 53% compensating for varus and 35% compensating for valgus malalignment dependent on

the classification system used. The important role of the subtalar joint in compensating for arthritic malalignment could account for the relative tolerance of ankle arthroplasty to minor coronal plane malalignment. It certainly emphasises for us here at 360 the importance of anatomic alignment in ankle fusion where the subtalar joint is either stiff or likely to be fused later.

#### REFERENCES

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