

Foot & Ankle Research Review™

Making Education Easy

Issue 11 – 2012

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Foot and Ankle
Research Review

Welcome to the eleventh edition of Foot & Ankle Research Review.

I have put together a series of articles that you may find interesting. There are three articles which illustrate the wide range of articles published specifically on the foot and ankle. The first article relates to paediatrics and the impact of foot and ankle characteristics associated with obesity (Shultz et al: *Consequences of pediatric obesity on the foot and ankle complex*). The second article relates to the impact of foot orthoses in anterior knee pain associated with running (Shih et al: *Application of wedged foot orthosis effectively reduces pain in runners with pronated foot: a randomized clinical study*). The third article looks at the evaluation of foot health education from a clinician's perspective in patients with rheumatoid arthritis (Graham et al: *Foot health education for people with rheumatoid arthritis: the practitioner's perspective*). I believe the evidence base for many foot conditions is growing. The need to review and reflect on the articles is important for both clinicians and patients.

I hope you enjoy reading the latest edition of Foot and Ankle Research Review and welcome any feedback.

Kind regards,

Professor Keith Rome

keithrome@researchreview.co.nz

Consequences of pediatric obesity on the foot and ankle complex

Authors: Shultz SP et al

Summary: The structural and functional characteristics of the foot and ankle complex in 10 obese and 10 non-obese children were compared in this cross-sectional study. Anthropometric parameters were measured to evaluate foot type (malleolar valgus index), foot alignment (resting calcaneal stance position and forefoot-rearfoot alignment in loaded and unloaded positions), arch height (arch height index, arch rigidity index ratio and arch drop) and active ankle dorsiflexion. Obese children had significantly ($p = 0.011$) greater mean arch drop and a trend toward lower mean arch rigidity index ratios compared with non-obese children (5.10 ± 2.13 mm vs 2.90 ± 1.20 mm and 0.92 ± 0.03 versus 0.95 ± 0.02 , respectively). Obese children also exhibited significantly ($p < 0.001$) less mean active ankle dorsiflexion at 90° of knee flexion compared with non-obese children (19.57 ± 5.17 vs 29.07 ± 3.06). All other evaluated anthropometric measurements were similar between the two groups.

Comment: Obesity in children is on the increase and this US study investigated the foot and ankle characteristics in obese and non-obese children aged 8–12 years. A reduced active ankle dorsiflexion and a more flexible foot when weight-bearing were observed. Previous studies indicate that obese children have a lower longitudinal medial arch and a lower mean arch height, which are associated with a decrease in the integrity of the foot as a weight-bearing structure. Although the results are interesting there are a number of limitations. The case-control nature of the analysis limits the ability to determine causality between foot pain and foot function. Only 20 subjects were included and therefore the ability to generalise the results to all children with obesity is limited. We do not know if different age groups demonstrate different foot and ankle characteristics, so clinicians should be aware of the limitations. Finally, although not a criticism, the authors used the malleolar valgus index to quantify the degree of pronatory misalignment in the rearfoot while weight-bearing; a technique not commonly used in podiatric research. However, I do recommend you read this article.

Reference: *J Am Podiatr Med Assoc.* 2012;102(1):5-12

<http://www.jpmaonline.org/content/102/1/5.abstract>

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In-shoe plantar pressures within ankle-foot orthoses: Implications for the management of Achilles tendon ruptures

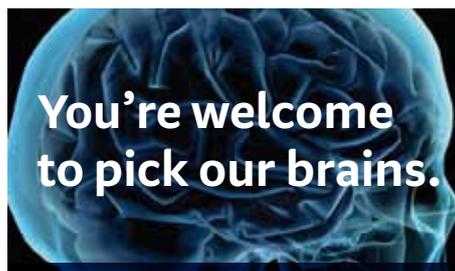
Authors: Kearney RS et al

Summary: This UK study evaluated plantar pressure measurements and temporal gait parameters in 15 healthy subjects with three different ankle-foot orthoses (AFOs), using four different levels of inserted heel wedges (a total of 12 conditions were randomly allocated to each participant). An in-shoe F-Scan pressure system was used to measure pressure and temporal gait parameters and an electrogoniometer was used to evaluate range of movement. AFOs that were restrictive in design, combined with a higher number of inserted heel wedges, significantly ($p \leq 0.029$) increased heel pressures, reduced forefoot pressures and decreased the amount of time spent in the terminal stance and pre-swing phase of the gait cycle. The findings revealed that a carbon-fibre AFO, with 1 heel raise, protects against excessive dorsiflexion while facilitating the restoration of near-normal gait parameters. The study authors concluded that research within a clinical context would be required to ascertain if these biomechanical advantages translate into a functional benefit for patients, and that the results should be considered in relation to the amount of force a healing Achilles tendon can withstand.

Comment: This article is of interest to clinicians involved in the management of Achilles tendon rupture. However, in this study only healthy subjects were assessed and therefore difficulty arises when trying to relate the findings to the management of patients with this condition. To evaluate biomechanical data without knowing any history of pain, impairment or disability is somewhat limited and therefore the relevance of the paper to clinicians is restrictive. Nevertheless, the use of ankle-foot orthoses may be beneficial and investigations into the use of such orthoses in patients with Achilles tendon rupture is merited. Further studies are clearly needed in this important area of rehabilitation.

Reference: *Am J Sports Med.* 2011;39(12):2679-85

<http://ajs.sagepub.com/content/39/12/2679.abstract>



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Application of wedged foot orthosis effectively reduces pain in runners with pronated foot: a randomized clinical study

Authors: Shih Y-F et al

Summary: This Taiwanese randomised, controlled study examined the effects of foot orthosis intervention in runners with pronated feet who had experienced overuse anterior knee or foot pain during running. Twenty-four such individuals were randomly assigned to receive either a soft insole with a semi-rigid rearfoot medial wedge (treatment group) or a soft insole without corrective posting (control group). Pain onset time and intensity were evaluated using a 60-minute treadmill test. Pain incidence significantly ($p = 0.04$) decreased in the treatment group, but not the control group, immediately after wearing the foot orthosis. Assessment at 2 weeks revealed significantly ($p = 0.01$) more subjects free of pain in the treatment group than in the control group; 7 (58%) vs 1 (8%). Furthermore, the pain intensity score significantly decreased following use of the orthosis, from 35.5 to 17.2 (immediate effect; $p = 0.014$) and subsequently to 12.3 (short-term effect; $p < 0.001$).

Comment: This study will be of interest to clinicians dealing with runners with knee pain associated with flatfeet. This interesting paper evaluated 24 runners with pronated foot who experienced anterior knee pain during running. The pronated foot was defined by navicular height difference between weight-bearing and non-weight-bearing stance >10 mm; non-weight-bearing rearfoot varus $>5^\circ$ or weight-bearing calcaneal valgus $>5^\circ$. A soft insole made from 2 mm Poron with a semi-rigid rearfoot medial wedge made from 5 mm EVA was given to the treatment group, and a soft insole without corrective posting was applied to the control group. The results demonstrated a decrease in pain with the foot orthoses with wedging. The study is a good example of simple interventions used to reduce pain with anterior knee pain and I recommend this article for further reading.

Reference: *Clin Rehabil.* 2011;25(10):913-23

<http://cre.sagepub.com/content/25/10/913.abstract>

Safety and efficacy of tinea pedis and onychomycosis treatment in people with diabetes: a systematic review

Authors: Matricciani L et al

Summary: This Australian systematic review aimed to determine the best evidence-based treatment interventions for tinea pedis and onychomycosis in people with diabetes, a group in which such infections may lead to foot ulcers and secondary bacterial infections resulting in eventual lower limb amputation. The review sought to answer the question: 'What evidence is there for the safety and/or efficacy of all treatment interventions for adults with tinea pedis and/or onychomycosis in people with diabetes?' A systematic literature search identified six relevant studies on onychomycosis, but none on tinea pedis. Four of the studies were case series and two were randomised controlled trials. Those studies suggested that while oral terbinafine is as safe and effective as oral itraconazole for the treatment of diabetic patients with onychomycosis, efficacy results are poor.

Comment: This review article will be of great interest to clinicians who deal with tinea pedis and onychomycosis in diabetic patients. A surprising finding from the study was that only six studies were found relating to the safety and/or efficacy of treatment for onychomycosis and no studies were identified for tinea pedis. Given the complications that may arise if tinea pedis and onychomycosis are not treated, the effectiveness of antifungal treatment interventions is of great importance. While it is often suggested that patients with diabetes are more resistant to antifungal treatment interventions than non-diabetic patients, the studies identified in this review presented cure rates that were comparable to people who did not have diabetes. I strongly recommend clinicians to read this article.

Reference: *J Foot Ankle Res.* 2011;4:26

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3248359/?tool=pubmed>

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Foot health education for people with rheumatoid arthritis: the practitioner's perspective

Authors: Graham AS et al

Summary: This study set out to identify the nature and content of podiatrists' foot health education for people with rheumatoid arthritis (RA) and explored potential barriers to its provision. A focus group involving 12 experts in the field from the North West Podiatry Clinical Effectiveness Group for Rheumatology was conducted. At the meeting, six overarching themes emerged: (i) the essence of patient education; (ii) the content; (iii) patient-centered approach to content and timing; (iv) barriers to provision; (v) the therapeutic relationship; and (vi) tools of the trade. The study identified aspects of patient education that this group of podiatrists consider most important in relation to its content, timing, delivery and barriers to its provision. Key aspects of its content were general disease and foot health information in relation to RA together with a potential prognosis for foot health, appropriate self-management strategies and the role of the podiatrist in the management of foot health. Factors viewed as strongly influencing foot health education provision were financial constraints and difficulties in establishing effective therapeutic relationships.

Comment: The article is a series of publications from the same authors based in the UK relating to education and clinicians' perspective of RA. This is an interesting paper that provides important data relative to the perceptions of foot health education for RA patients and the barriers to its provision. It is well recognised that foot health is often neglected in rheumatology and as such foot health education for such patients is of considerable importance. This is not a new or novel idea, as several studies have previously demonstrated sustainable benefits of general health education in RA patients. Further, a previous randomised controlled trial has evaluated the clinical and cost effectiveness of foot health education as part of a complex intervention of 'self-care' to improve levels of foot disability. However, this study goes one step further by attempting to gather information on current attitudes and perceptions of foot health education for RA patients from the relevant active clinicians in the field, which could possibly be utilised to optimise foot health education provision in this patient group. This has the potential to be a highly cost-effective strategy for improving foot health outcomes in RA. For those clinicians interested in RA, I recommend you read this paper.

Reference: *J Foot Ankle Res.* 2012;5(1):2

<http://www.jfootankleres.com/content/5/1/2/abstract>

Effect of a metatarsal pad on the forefoot during gait

Authors: Koenraadt KL et al

Summary: Previous studies investigating the use of metatarsal pads in patients with metatarsalgia have shown reduced pain and reduced plantar pressure just distal to the metatarsal pad. Only part of this pain reduction may be explained by reduced plantar pressure under the forefoot. This study hypothesised that the observed reduction in pain is due to a widening of the foot and the creation of extra space between the metatarsal heads. A motion analysis system was used to measure 16 primary metatarsalgia feet and 12 control feet while walking with and without a metatarsal pad. When the metatarsal pad was worn, a significant mean increase in forefoot width during the stance phase of 0.60 mm was seen. The mean increase in forefoot width was 0.74 mm during midstance. Furthermore, a mean increase of 0.62 mm in the height of the second metatarsal head was measured while walking with a metatarsal pad. There were no significant differences in these measurements between patients and controls.

Comment: I have included this Dutch study in the review, as metatarsal pads are commonly prescribed for patients with forefoot problems. Although the authors found the width of the forefoot increased during the stance phase of walking with a metatarsal pad, the increase was very small (0.60 mm) and if you consider the accuracy of the equipment was 0.50 mm you can see major issues with the interpretation of the data. If you also consider the very small number of subjects within the study, the conclusions reported by the authors that the increase in space between metatarsal heads may play a role in pain reduction is rather speculative. Overall, it is a disappointing article and I would like to see further work on the role of metatarsal pads undertaken, especially in the rheumatoid population.

Reference: *J Am Podiatr Med Assoc.* 2012;102(1):18-24

<http://www.japmaonline.org/content/102/1/18.short>

Foot pain, impairment and disability in patients with acute gout flares; a prospective observational study

Authors: Rome K et al

Summary: Twenty patients with acute gout flares were recruited from emergency departments, hospital wards and rheumatology outpatient clinics throughout Auckland, New Zealand in this observational study designed to evaluate the impact of acute gout on foot pain, impairment and disability. Patients were assessed at their baseline visit and then reassessed at a follow-up visit once the acute flare had resolved (6-8 weeks after the initial assessment). C-reactive protein levels, serum urate levels, joint counts, general and foot-specific outcome measures (pain visual analogue scale, Health Assessment Questionnaire [HAQ]-II, Lower Limb Tasks Questionnaire and the Leeds Foot Impact Scale) were also recorded at each visit. Acute gout affected the feet in 14 (70%) patients. High levels of foot pain, impairment and disability were reported at the baseline visit. Swollen and tender joint counts and C-reactive protein levels significantly improved at the follow-up visit, as did all patient-reported outcome measures of general and foot-specific musculoskeletal function. Pain, impairment and disability scores, however, had not entirely normalised after resolution of the acute gout flare.

Comment: This New Zealand study looks at foot problems in acute gout. Gout is on the increase in New Zealand and little is known about the associated foot pain, impairment and disability. The study found patients with acute gout flares experience severe foot pain, impairment and disability. The primary limitation of this study was its small sample size. Despite this, clear differences in foot parameters were observed across the baseline and follow-up visits. Another limitation was that recruitment was primarily from secondary care facilities/providers and it is possible that acute gout flares treated within the primary care environment may have produced different levels of severity and impact. The majority of patients in this study were of Maori and Pacific ancestry, with low rates of allopurinol use. This finding is consistent with other previous studies of poorly controlled gout in New Zealand. Analysis of the impact of gout flares from other units and in primary care will be of great interest. Although only 20 patients were assessed, the article does provide data for further support for improved management of gout to prevent the consequences of this poorly controlled disease.

Reference: *Arthritis Care Res.* 2011
[Epub ahead of print]

<http://tinyurl.com/77pfbcz>



Independent commentary by Professor Keith Rome, School of Podiatry, AUT University, Auckland.

For full bio [CLICK HERE.](#)

Research Review publications are intended for New Zealand health professionals.

Hallux limitus and its relationship with the internal rotational pattern of the lower limb

Authors: Lafuente G et al

Summary: This study evaluated 80 individuals (35 with normal feet and 45 with mild hallux limitus) to determine whether individuals with mild hallux limitus exhibit diminished capacity for internal rotation of the lower limb compared with those without hallux limitus and whether those with mild hallux limitus exhibit an increased foot progression angle. The capacity of internal rotation of the lower limb (internal rotational pattern), hallux dorsiflexion and the foot progression angle were assessed. Patients with mild hallux limitus exhibited significantly ($p < 0.001$) less capacity for internal rotation of the lower limb. The two groups did not significantly differ in their foot progression angle. The relationship between internal rotational pattern and hallux dorsiflexion had a Spearman correlation coefficient of 0.638 ($p < .0001$), with the more limited the internal rotational pattern of the lower limb, the more limited the hallux dorsiflexion.

Comment: This interesting Spanish article reviews the relationship between mild hallux limitus and internal rotation of the lower limb. The authors state that many patients observed with mild hallux limitus further presented with limited internal rotation of the lower limb. From the results the limited internal rotation of the lower extremity was found in patients with mild hallux limitus. The study will be of interest to clinicians. However, similar to many clinical studies a limitation is the concept of reliability. In this case, the accuracy of measuring internal rotation using digital callipers and the utility of defining mild, moderate or hallux rigidus has not yet been established. However, the article is interesting and is recommended for further reading.

Reference: *J Am Podiatr Med Assoc.* 2011;101(6):467-74

<http://www.japmaonline.org/content/101/6/467.abstract>

Custom foot orthoses for rheumatoid arthritis: A systematic review.

Authors: Hennessy K et al

Summary: These researchers systematically reviewed the literature in order to identify and critically appraise the evidence for the effectiveness of custom orthoses for the foot and ankle in rheumatoid arthritis (RA). Relevant quantitative longitudinal studies (randomised controlled trials, case-control trials, cohort studies and case series studies) undertaken between 1950 –2011 were included. The Cochrane Collaboration criteria were utilised for quality assessment. A total of 17 studies met the inclusion criteria and six outcome domains were identified. Meta-analysis revealed weak evidence for custom orthoses reducing pain and forefoot plantar pressures. Evidence was inconclusive for walking speed, foot function, gait parameters and reducing hallux abductovalgus angle progression. The authors concluded that the evidence suggests custom orthoses may be beneficial in reducing pain and elevated forefoot plantar pressures in the rheumatoid foot and ankle, but more definitive research is required.

Comment: This UK systematic review will be of interest to clinicians who prescribe foot orthoses for foot and ankle conditions in RA. The authors reported there was weak evidence for custom orthoses reducing pain and forefoot plantar pressures. Evidence was inconclusive for foot function, walking speed, gait parameters and reducing hallux abductovalgus angle progression. From a clinical perspective, patients and clinicians are aware that foot orthoses are beneficial, especially if an early diagnosis has been established and there is good range of motion at the rearfoot and forefoot. The debate still continues as to the use of customised or pre-fabricated foot orthoses and further research into the clinical and cost-effectiveness of both devices should be undertaken with both early and established RA.

Reference: *Arthritis Care Res.* 2011 [Epub ahead of print]

<http://onlinelibrary.wiley.com/doi/10.1002/acr.21559/abstract>

First metatarsophalangeal joint replacement: Long-term results of a double stemmed flexible silicone prosthesis

Authors: ter keurs EW et al

Summary: This retrospective Dutch study evaluated the long-term results after total joint replacement by a Swanson double-stemmed prosthesis with and without the use of grommets in the first metatarsophalangeal joint. Subjective and clinical findings were scored according to the AOFAS-HMI (American Orthopedic Foot and Ankle Society-Hallux Metatarsophalangeal-Interphalangeal) score. The results in fifty-nine joints (followed up for an average of 9 years) demonstrated 95% of patients had relief of pain. Clinical findings revealed a reasonable function (range of motion >300) in 77% of the metatarsophalangeal joints. X-ray evaluation showed that reactive bone areas around the implant were decreased by the use of grommets.

Comment: This article will be of interest to foot and ankle surgeons. The implant is used to restore function, stability and relieve pain in metatarsophalangeal joints disabled by rheumatoid, degenerative or post-traumatic arthritis. It is interesting to note from the article that titanium grommets seem to decrease the incidence of osteolytic bone reaction around the implant. The use of grommets in other joints exhibiting degeneration, such as the interphalangeal joint of the hand has also demonstrated good radiographic outcomes.

Reference: *Foot Ankle Surg.* 2011;17(4):224-7

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