Foot & Ankle Research Review™

Making Education Easy

Issue 9 – 2011

In this issue:

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

In this latest edition I have tried to put together a collection of articles that clinicians would find interesting. I have focused on long-term chronic conditions that have an impact on the foot. Dealing with long-term chronic conditions such as diabetes has serious consequences to the patient but also a burden upon the health service. I have included three articles related to diabetes that clinicians will enjoy reading (*Lazzarini et al. Is simulation training effective in increasing podiatrists' confidence in foot ulcer management? J Foot Ankle Res. 2011;5;4(1):16; Lázaro-Martínez et al. Foot biomechanics in patients with diabetes mellitus: doubts regarding the relationship between neuropathy, foot motion, and deformities. J Am Podiatr Med Assoc. 2011;101(3):208-14*; *Wang et al. Treatment of diabetic foot ulcers: a comparative study of extracorporeal shockwave therapy and hyperbaric oxygen therapy. Diabetes Res Clin Pract. 2011;92(2):187-93*).

Finally, I have included two articles that use extracorporeal shockwave therapy for chronic diabetic ulcers and Achilles tendinopathy. Extracorporeal shockwave therapy (ESWT) has been in use for the treatment of tendinopathies since the early 1990s. The exact mechanism by which ESWT relieves tendon-associated pain is not known; however, there is an increasing body of literature that suggests that it can be an effective therapy for patients who have had repeated nonsurgical treatment failures. The highest strength of evidence is shown in randomised controlled trials, of which there are a small number.

I hope you enjoy reading the latest edition and any feedback is most welcome.

Kind regards,

Professor Keith Rome
keithrome@researchreview.co.nz

Is simulation training effective in increasing podiatrists' confidence in foot ulcer management?

Authors: Lazzarini PA et al

Summary: This paper reports the effects of a two-day Foot Ulcer Simulation Training (FUST) course on podiatrists' clinical confidence in the management of foot ulcers. Post-training, a confidence survey revealed an overall 42% improvement in clinical confidence among the 16 participants (mean scores increased from 3.10 at baseline to 4.40 post-FUST; $p<0.05$). Participants rated the course highly in terms of satisfaction, relevance and fidelity (realism) of all course elements.

Comment: This is an Australian study that would be of interest to clinicians dealing with diabetic foot ulcers but also to pre- and post-graduate educators in the field of diabetes. The results from the pilot study suggest simulation training programmes can improve participants' clinical confidence in the management of foot ulcers. The authors concluded that the approach has the potential to enhance clinical training in diabetes-related foot complications and chronic wounds in general. It is important to train and educate clinicians and students about key indicators of a diabetic foot ulcer. Although the study is only pilot work the potential benefits of educating clinicians and students has enormous potential. The only negative comment about the article is the educational terminology. Although the study was conducted in Australia it could be undertaken in New Zealand. I strongly recommend you read the article.

Reference: J Foot Ankle Res. 2011;4(1):16.

http://www.jfootankleres.com/content/4/1/16/abstract

Effect of children's shoes on gait: a systematic review and meta-analysis

Authors: Wegener C et al

Summary: These researchers systematically analysed the evidence for biomechanical effects of shoes on walking and running gait, compared to barefoot, in healthy children aged ≤16 years. Of the 11 included studies, five randomised shoe order and six standardised footwear. Shod walking increased: velocity, step length, step time, base of support, double-support time, stance time, time to toe-off, sagittal tibia-rearfoot range of motion (ROM), sagittal tibia-foot ROM, ankle max-plantarflexion, Ankle ROM, foot lift to max-plantarflexion, 'subtalar' rotation ROM, knee sagittal ROM and tibialis anterior activity. Shod walking decreased: cadence, single-support time, ankle max-dorsiflexion, ankle at foot-lift, hallux ROM, arch length change, foot torsion, forefoot supination, forefoot width and midfoot ROM in all planes. Shod running decreased: long axis maximum tibial-acceleration, shock-wave transmission as a ratio of maximum tibial-acceleration, ankle plantarflexion at foot strike, knee angular velocity and tibial swing velocity.

Comment: This systematic review highlights key biomechanical gait components relating to children's shoes. Clinicians would be interested in this article only from the perspective of knowing that gait does impact on shoes. Parents/guardians are always requesting further information about the most appropriate shoes for their child. The authors report that impact of footwear on gait should be considered but given the variable nature of the shape of feet, even if a standard footwear type (across all sizes) was available, the practical problem of fit would still exist. Furthermore, it is important to evaluate any intervention in the footwear that the child is most likely to wear, as the differing characteristics of footwear will affect function and the impact of in-shoe intervention will therefore vary across individuals. Differences between footwear types in this current paper were largely not analysed and clinicians may find this disappointing.

Reference: J Foot Ankle Res. 2011;4:3.

http://www.jfootankleres.com/content/4/1/3

Ankle tourniquet pain control in forefoot surgery: a randomized study

Authors: Burg A et al

Summary: Fifty-six patients undergoing forefoot surgery under ankle block anaesthesia were randomised to receive either subcutaneous local anaesthetic mixture under the tourniquet or no additional anaesthetic. Local tourniquet pain score (on a 0–100 VAS) and skin condition were assessed during and after the procedure.

Comment: This American study may be of interest to clinicians who undertake forefoot surgery. Tourniquet use is very common in foot and ankle surgery. The results demonstrated no difference between one group undergoing forefoot surgery under ankle block to receive either subcutaneous local anaesthetic mixture under the tourniquet or no additional anaesthetic. No correlation between VAS scores and procedure length or patient's age or gender was found. The study has a number of limitations. Patients were asked to rate the pain and discomfort from the tourniquet itself and not pain of the forefoot from the surgery. Patients were only included into the study that agreed to regional anaesthesia without sedation; there may be a bias towards relatively tolerant patients whose pain and discomfort perception and possibly anxiety levels are lower than the general population. Finally, no placebo group of injections for the control group was used. The tentative conclusion makes it difficult to ascertain any definitive findings for clinicians.

Reference: Foot Ankle Int. 2011;32(6):595-8.

http://www.docguide.com/ankle-tourniquet-pain-control-forefoot-surgery-randomized-study?tsid=5

Pressure-relieving properties of various shoe inserts in older people with plantar heel pain

Authors: Bonanno DR et al

Summary: This study assessed the effects of foot orthoses and heel inserts on plantar pressures in older people with plantar heel pain. Plantar pressure data were recorded while participants walked along an 8 m walkway wearing a standardised shoe and 4 different shoe inserts (a silicon heel cup, a soft foam heel pad, a heel lift and a prefabricated foot orthosis). The prefabricated foot orthosis reduced heel peak plantar pressure by the greatest amount and it was the only shoe insert that did not increase forefoot pressure.

Comment: This Australian study is of interest to clinicians who frequently prescribe foot orthoses to older adults with a history of heel pain. The results from 35 adults aged over 65 years demonstrate that a prefabricated foot orthoses decreases plantar pressure when compared to a range of commonly prescribed foot orthoses for plantar heel pain. The authors report only on plantar pressure measurements and therefore only provide evidence from a biomechanical perspective. Measurements such as a patient's perception of comfort of each device and pain reduction would indicate a more global perspective on the use of foot orthoses in older adults. The unknown quantity of footwear was briefly mentioned but any footwear will play a major role in understanding the interaction between foot orthoses and the ground. Further work is required in this area.

Reference: Gait Posture. 2011;33(3):385-9.

http://www.gaitposture.com/article/S0966-6362%2810%2900422-4/abstract

Foot biomechanics in patients with diabetes mellitus: doubts regarding the relationship between neuropathy, foot motion, and deformities

Authors: Lázaro-Martínez JL et al

Summary: These researchers explored biomechanical alterations in the feet of patients with diabetes mellitus and the interrelationship with diabetic neuropathy. A cohort of 281 patients with diabetes underwent neurological and vascular examinations, joint mobility studies, and assessments for foot deformities and hyperkeratosis locations. Joint mobility did not differ substantially between patients with and without neuropathy, while mean ankle joint mobility values were similar between the groups (82.8° vs 83.0°, respectively; p=0.826). However, the passive range of motion of the first metatarsophalangeal joint was reduced in patients with neuropathy, compared to those without neuropathy (mean 50.3° vs 57.2°; p=0.008). Compared to those with diabetic neuropathy, patients without neuropathy had a higher rate of foot deformities (e.g., hallux abductus valgus, hammer toes), and a higher rate of calluses (82.8% vs 72.6%; p=0.039).

Comment: This Spanish study evaluated a number of biomechanical parameters in patients with diabetes. In this paper, range of motion was described as joint mobility and was measured in the ankle joint, the first metatarsophalangeal joint, the subtalar joint, the relaxed calcaneal stance position, and the neutral calcaneal stance position. A classic sign of joint mobility in diabetes is the inability to press the fingers together tightly in a palm to palm 'prayer sign'. However, the paper identifies a number of foot characteristics between those with and without diabetic neuropathy. This paper will be interest to those who undertake a biomechanical assessment of diabetics but the conclusions need to be interpreted with caution, as a number of measures such as measuring callus and observing clawed or lesser toes were undertaken based upon personal experience.

Reference: J Am Podiatr Med Assoc. 2011;101(3):208-14.

http://www.japmaonline.org/cgi/content/abstract/101/3/208

Guidelines for the management of the foot health problems associated with rheumatoid arthritis

Authors: Williams AE et al

Summary: This paper presents `best practice' guidelines issued recently by the UK-based North West Clinical Effectiveness Group for the Foot in Rheumatic Diseases (NWCEG), based on the available evidence from the literature and consensus expert opinion, intended to guide both specialist and non-specialist podiatrists in the management of foot health problems associated with rheumatoid arthritis (RA). The guidelines advise on the management of specific foot problems (callus, nail pathology, ulceration) and the use of specific interventions (foot orthoses, footwear, patient education, steroid injection therapy). A diagrammatic screening pathway is intended to guide non-specialist podiatrists in assessing and managing patients with problems who require input from a specialist podiatrist and other members of the rheumatology multidisciplinary team.

Comment: This UK paper will be of interest to those clinicians who deal with the management of the rheumatoid foot. The guidelines are based upon a consensus opinion of clinicians working within rheumatology departments based in the NHS. The aim of the guidelines is to provide all podiatrists and other foot health providers with pragmatic clinical recommendations for the management of RA-related foot and ankle problems. The authors acknowledge that there are limitations to the approach taken to guideline development, in that it is not based on a systematic review of the literature, but a pragmatic approach was taken, whereby the available evidence was synthesised with the clinical expertise of the team. Overall, it is an article that should be read and used for recommended guidelines in the management of foot-related RA problems.

Reference: Musculoskeletal Care. 2011;9(2):86-92.

http://tinyurl.com/424tfv4

Efficacy of an insole shoe wedge and augmented pressure sensor for gait training in individuals with stroke: a randomized controlled trial

Authors: Sungkarat S et al

Summary: These researchers investigated the effects of external feedback designed to promote symmetrical weight distribution during standing and walking on post-stroke gait performance and balance. Thirty-five patients with stroke (mean age 53 years) managed in a rehabilitation unit and physical therapy department were randomly assigned to an experimental (n=17) or control group (n=18). Time post-stroke was <6 months for most subjects (n=27, 77%). All patients participated in 15 rehabilitation sessions including 30 minutes of gait retraining per session. During gait retraining, the experimental group used an insole shoe wedge and sensors set-up (I-ShoWS) while the control group received a conventional programme. The I-ShoWS set-up consisted of a wedge insole and a footswitch for the non-paretic leg and a pressure sensor on the paretic leg. Compared with the conventional programme, the I-ShoWS set-up resulted in significantly greater improvements from baseline in standing and gait symmetry. The experimental group was also associated with a 3-fold greater improvement in gait speed and significantly greater improvement in balance, compared with the control group.

Comment: This study from Thailand indicates that an insole with a wedge and sensor can be beneficial to patients with a stroke. From a clinical perspective, the device would be difficult to replicate as the foot device is experimental. From a research perspective, the device allows extrinsic feedback including proprioception, pressure and auditory feedback to be simultaneously evaluated. While training with the experimental foot orthoses set-up in conjunction with standing and gait training resulted in better performance in standing and walking limb symmetry, balance and gait than a conventional gait training programme, issues with respect to the degree of improvement, patient considerations and additional measurements need to be considered. However, the use of a foot device in stroke patients is an area for future developments.

Reference: Clin Rehabil. 2011;25(4):360-9.

http://cre.sagepub.com/content/25/4/360.abstract

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

Research Review publications are intended for New Zealand health professionals.

Nonoperative care for the treatment of adult-acquired flatfoot deformity

Authors: Neilsen MD et al

Summary: These researchers retrospectively analysed data from 64 patients who had undergone nonoperative measures, including bracing, physical therapy, and anti-inflammatory medications, for the treatment of adult-acquired flatfoot. Over a 27-month observation period, nonsurgical treatment was successful in 56 patients. Although the majority (78%) of patients were obese (body mass index [BMI] ≥30) and 63% of the patients who failed nonsurgical therapy were obese, logistic regression analyses did not reveal any significant association between BMI and treatment outcome. Using any form of bracing was significantly associated with successful nonsurgical treatment (fully adjusted OR, 19.8621), while the presence of a split-tear of the tibialis posterior on magnetic resonance image scans was significantly associated with failed nonsurgical treatment (fully adjusted OR, 0.016).

Comment: This American study demonstrated an 88% successful non-surgical treatment of 64 patients diagnosed with adult-acquired flatfoot. The treatment regimen included bracing with a low articulating ankle foot orthoses, a walking boot, a foot orthoses and physical therapy. The authors concluded that the low articulating ankle foot orthoses was particularly effective in relieving the symptoms of adult-acquired flatfoot. With this recent publication there are now nine studies in the literature documenting the effectiveness of non-surgical treatment of adult-acquired flatfoot. There is growing evidence that at least 50% of patients with adult-acquired flatfoot can avoid surgery if they are properly braced and receive physical therapy. With this body of evidence, it is clear that conservative, nonoperative treatment is the standard of care before patients with adult-acquired flatfoot undergo surgery. With the known medical risks that accompany most patients with this disorder, and with the challenging nature of the surgery itself, taking the conservative route should be an easy decision for any practitioner.

Reference: J Foot Ankle Surg. 2011;50(3):311-4.

http://www.sciencedirect.com/science/article/pii/S1067251611000329

Extra-corporeal pulsed-activated therapy ("EPAT" Sound Wave) for Achilles tendinopathy: a prospective study

Authors: Saxena A et al

Summary: Outcomes are reported for patients with Achilles tendinopathy who underwent 3 weekly shockwave treatments. Of a total of 74 tendons in 60 patients (mean age 48.6 years) that were assessed at baseline and at least 1 year post-treatment, 32 (43%) were classified as paratendinoses, 23 (31%) as proximal tendinoses, and 19 (26%) as insertional tendinoses. Patients with paratendinosis were statistically significantly younger than those with proximal and insertional tendinopathy (41.44 years vs 53 years and 54 years, respectively). Overall, 58 (78%) tendons improved by at least 1 year post-treatment, including 75% in the paratendinosis, 78% in the proximal tendinosis, and 84% in the insertional tendinosis groups. No adverse effects were observed. The Roles and Maudsley score improved from 3.22 at baseline to 1.84 post-treatment ($p<0.0001$) in the paratendinosis group, 3.39 to 1.57 ($p<0.0001$) in the proximal tendinopathy group, and 3.32 to 1.47 ($p=0.0001$) in the insertional tendinopathy group.

Comment: This American study evaluates the use of low-energy extracorporeal shockwave therapy (ESWT) in Achilles tendinopathy. There has been much debate on its use. A recent systematic review on the nonoperative management of mid-portion Achilles tendinopathy concluded that further investigation was required in regard to the use of ESWT in this pathology *[Reference: Magnussen RA et al. Nonoperative treatment of midportion Achilles tendinopathy: a systematic review. Clin J Sports Med. 2009;19(1):54-64]*. However, the authors suggest that using ESWT may result in both a short-term analgesic effect as well as a longer-term resolution of the pathology, thus enabling continuation of activity during recovery, which enhances the attractiveness of this form of treatment. The results indicated statistically and clinically significant improvements in 79% of tendons treated with the low-energy radial shockwave device at least 1 year after treatment. This is a study that would be of interest for clinicians treating patients with Achilles tendinopathy and I recommend reading the full article.

Reference: J Foot Ankle Surg. 2011;50(3):315-9.

http://www.sciencedirect.com/science/article/pii/S1067251611000044

Treatment of diabetic foot ulcers: A comparative study of extracorporeal shockwave therapy and hyperbaric oxygen therapy

Authors: Wang CJ et al

Summary: The effectiveness of extracorporeal shockwave therapy (ESWT) was compared with hyperbaric oxygen therapy (HBOT) in chronic diabetic foot ulcers. The ESWT group (39 patients/44 feet) received shockwave therapy twice weekly for a total of six treatments, while the HBOT group (38 patients/40 feet) received hyperbaric oxygen therapy daily for a total of 20 treatments. Overall results for the ESWT and the HBOT groups were as follows: complete healing of ulcers in 57% and 25% ($p=0.003$); ≥50% improved ulcers in 32% and 15% ($p=0.071$); and unchanged ulcers in 11% and 60% ($p<0.001$). No ulcers worsened in either group during treatment. Blood flow perfusion rates were comparable between the two groups before treatment, but significantly better post-treatment in the ESWT group ($p=0.002$). Histopathological examination revealed considerable increases in cell proliferation and decreases in cell apoptosis in the ESWT group compared with the HBOT group.

Comment: This study from Taiwan concluded that ESWT is more effective than HBOT in chronic diabetic foot ulcers. ESWT-treated ulcers showed significant improvement in blood flow perfusion rate and cell activity, leading to better healing of the ulcers relative to HBOT in chronic diabetic foot ulcers. The use of ESWT has been debated in the literature and this is an example of how the technique is being used in a number of foot-related disorders. The study is promising and could be used as an adjunctive therapy to standard clinical practice. However, due to the low number of participants, further work is required specifically in patients where infection is a component of the problem. I recommend to those who are interested in managing diabetic foot ulceration that they read this article.

Reference: Diabetes Res Clin Pract. 2011;92(2):187-93.

http://www.sciencedirect.com/science/article/pii/S0168822711000209