

Foot & Ankle Research Review™

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Issue 35 - 2018

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Abbreviations used in this issue:

IQR = interquartile range
OR = odds ratio
RA = rheumatoid arthritis



Podiatrists Board of New Zealand

Welcome to Issue 35 of Foot and Ankle Research Review.

In this issue I review a broad mix of recent publications. I am particularly interested to see the continued development of guidelines surrounding footwear for people with diabetes. The article by Wilson et al., also raises some interesting points around the access of foot care services for people with rheumatoid arthritis (RA). For those interested in dermatology there is a good article surrounding melanoma of the foot and advanced disease, which again highlights the importance of early detection. The article by Dando et al., also provides clinical guidance on the diagnosis of forefoot neuroma.

I hope you enjoy this issue and please keep the feedback coming in.

Kind regards,

Dr Matthew Carroll

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The clinical diagnosis of symptomatic forefoot neuroma in the general population: a Delphi consensus study

Authors: Dando C et al.

Summary: This four-round Delphi consensus study, involving 16 expert health professionals from a clinical or clinical academic background (mean clinical experience 19.5 years), developed an assessment protocol for the clinical diagnosis of forefoot neuroma. Expert consensus was sought on the optimal methods to achieve this diagnosis and after the fourth round, 21 recommendations were selected by the participants to form the expert-derived clinical assessment protocol. A set of themes was established: location of pain; non-weight bearing sensation; weight bearing sensation; observations; tests and imaging. It is believed that this core set will assist clinicians in forming a clearer diagnosis of forefoot neuroma.

Comment: Using a Delphi methodology the study developed a clinical assessment protocol for forefoot neuroma. A single clinical protocol emerged that incorporated the 21 recommendations derived from expert opinion. The recommendations that received the most votes from the expert panel included: the use of ultrasound imaging for a diagnosis, paraesthesia radiating distally in the toes, the presence of Mulders click and burning sensations reported by the patient. The presence of these four recommendations will be no surprise to those who routinely manage forefoot pain. If you are looking to develop a clinical protocol around the diagnosis of this condition this article is well worth a read to guide your clinical practice.

Reference: *J Foot Ankle Res.* 2017;10:59

[Abstract](#)



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Diabetic Foot Australia guideline on footwear for people with diabetes

Authors: van Netten JJ et al.

Summary: The study authors reviewed new footwear publications, (inter)national guidelines, and consensus expert opinion alongside the 2013 Australian footwear guideline to formulate updated recommendations on footwear for people with diabetes. The following are the 10 key recommendations to guide health professionals to select the most appropriate footwear to meet the specific foot risk needs of an individual with diabetes: (1) Advise people with diabetes to wear footwear that fits, protects and accommodates the shape of their feet. (2) Advise people with diabetes to always wear socks within their footwear, in order to reduce shear and friction. (3) Educate people with diabetes, their relatives and caregivers on the importance of wearing appropriate footwear to prevent foot ulceration. (4) Instruct people with diabetes at intermediate or high risk of foot ulceration to obtain footwear from an appropriately trained professional to ensure it fits, protects and accommodates the shape of their feet. (5) Motivate people with diabetes at intermediate- or high-risk of foot ulceration to wear their footwear at all times, both indoors and outdoors. (6) Motivate people with diabetes at intermediate- or high-risk of foot ulceration (or their relatives and caregivers) to check their footwear, each time before wearing, to ensure that there are no foreign objects in, or penetrating, the footwear; and check their feet, each time their footwear is removed, to ensure there are no signs of abnormal pressure, trauma or ulceration. (7) For people with a foot deformity or pre-ulcerative lesion, consider prescribing medical grade footwear, which may include custom-made in-shoe orthoses or insoles. (8) For people with a healed plantar foot ulcer, prescribe medical grade footwear with custom-made in-shoe orthoses or insoles with a demonstrated plantar pressure relieving effect at high-risk areas. (9) Review prescribed footwear every three months to ensure it still fits adequately, protects, and supports the foot. (10) For people with a plantar diabetic foot ulcer, footwear is not specifically recommended for treatment; prescribe appropriate offloading devices to heal these ulcers.

Comment: This study updates the earlier Australian Diabetes foot Network 2013 practical guidelines for the provision of footwear for people with diabetes. Specific footwear recommendations are made for all people at risk of foot ulceration, for people at intermediate- or high-risk of foot ulceration and for people with diabetic foot ulceration. The article contains pivotal information surrounding footwear for people with diabetes. Table 1 provides a great list of definitions related to footwear, Table 2 summarises the 10 recommendations on footwear for people with diabetes and Table 3 defines specific features and requirements for footwear for people with diabetes. Each recommendation made by the authors is supported with a detailed rationale. A review of this article is a must for those who manage the at-risk foot through the provision of footwear.

Reference: *J Foot Ankle Res.* 2018;11:2

[Abstract](#)

Reliability of doming and toe flexion testing to quantify foot muscle strength

Authors: Ridge ST et al.

Summary: Three novel methods for measuring foot strength, doming (previously unmeasured), hallux flexion, and flexion of the lesser toes were assessed in this study involving 21 healthy volunteers. Each volunteer performed each of the three strength tests four times during the first testing session (twice with each of two raters) and two times during the second testing session (once with each rater); the testing sessions were undertaken 1-5 days apart. The reliability of results between raters during the same testing session on the same day (inter-rater, intra-day, intra-session), between raters on different days (inter-rater, inter-day, inter-session), between days for the same rater (intra-rater, inter-day, inter-session), and between sessions on the same day by the same rater (intra-rater, intra-day, inter-session) were investigated and intra-class correlation coefficients (ICCs) calculated. ICCs were found to show good to excellent reliability for all tests between days, raters, and sessions. The average doming strength was 99.96 ± 47.04 N, the average hallux flexion strength was 65.66 ± 24.5 N and the average lateral toe flexion was 50.96 ± 22.54 N. The authors concluded that these simple tests can be used for research or clinical purposes, but the same researcher or clinician should perform the testing each time for optimal reliability if repeated testing is to be conducted on the same participant.

Comment: The quantification of foot and ankle muscle strength has long been a challenge for the clinician. This study examined the reliability of strength during three movements: doming, hallux flexion, and lesser toe flexion using a dynamometry. Doming has been defined as a movement that activates the muscles to pull the metatarsal heads towards the heel of the foot. Although this study demonstrates high reliability of some novel techniques for measuring intrinsic muscle strength, there are still numerous limitations for the clinician when measuring muscle strength of the intrinsic foot muscles. Restrictions on joint range of motion in the digits will affect the results of any assessment of intrinsic muscle strength, limiting the ability to grip and pull. It is also questionable with the small ranges of motion available at the digits whether a true maximal contraction can be developed. The relevance of these static tests in relation to dynamic movements is also a dilemma the clinician must consider.

Reference: *J Foot Ankle Res.* 2017;10:55

[Abstract](#)

Prevalence, impact and care of foot problems in people with rheumatoid arthritis: results from a United Kingdom based cross-sectional survey

Authors: Wilson O et al.

Summary: This UK study determined the prevalence, impact and care of foot problems in patients with RA in one geographical area and identified factors associated with accessing foot care. A cross-sectional survey of a random sample of patients with RA (n = 739), residing within a single community-based National Health Service (NHS) podiatry service, revealed that among 413 survey respondents (mean age 63.5 years; 74.1% female; median disease duration 10 [IQR 5-20] years) 92.1% experienced current foot problems (articular 73.8%, cutaneous lesions 65.4%, structural 57.6%, extra-articular 42.6%). Respondents were found to have a median Health Assessment Questionnaire score of 1.5 (IQR 0.75-2.0), a median Foot Impact Scale (FIS) impairment/footwear score of 10 (6-14), a median FIS activities/participation score of 16 (7-23), and 37.8% reported that their foot symptoms impacted on their work. Overall, 69.5% of respondents had accessed foot care, but there were differences in the route of access (by gender and whether independent or NHS provision). Those accessing foot care services were older (64.9 years vs 60.4 years; $p=0.001$), had longer disease duration (12 years vs 7 years; $p<0.001$) and comprised a greater proportion of females (72.2% vs 61.7%; $p=0.04$) than those not accessing care.

Comment: This study adds to the growing evidence that patients with RA experience a wide range of foot complications with many patients suffering multiple foot problems. The study also notes the considerable impact foot problems have on this patient group and provides new insight into the specific and substantial impact of foot problems on work-related disability. The study discusses access to foot care service, reporting that whilst people are routinely reviewed by the specialists, a specific foot assessment is not always conducted. Whilst the study provides further evidence surrounding foot care services in the UK, I am left to think about the foot care services that are available to patients with RA in the New Zealand context. Reading the study highlights there must indeed be a very large unmet need for those with RA in New Zealand.

Reference: *J Foot Ankle Res.* 2017;10:46

[Abstract](#)

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The effects of shoe-worn insoles on gait biomechanics in people with knee osteoarthritis: a systematic review and meta-analysis

Authors: Shaw KE et al.

Summary: This systematic review and meta-analysis summarised the known effects of different shoe-worn insoles on biomechanical variables during level walking in patients with knee osteoarthritis. A total of 27 studies of moderate-to-high methodological quality containing biomechanical data from shoe-worn insole devices in the knee osteoarthritis population were included. A random effects meta-analysis was performed on biomechanical variables reported in three or more studies for each insole and the primary findings were consistent reductions in the knee adduction moment with lateral wedge insoles, however, increases in ankle eversion with these insoles were also found.

Comment: If you are routinely involved in the management of knee arthritis and use footwear or foot orthotics then this systematic review will provide you with the most recent evidence update. The review provides a good summary of evidence pertaining to lateral wedge insoles, lateral wedge insoles without support and medial arch supports, and shock absorbing insoles. Pooled data from the study indicates that lateral wedge insoles produce small to medium reductions in knee adduction moments whilst the addition of arch supports to the wedges produces no significant reductions to the knee adduction moment. Interestingly, the study also highlights the recent focus on ankle and subtalar joint function with the use of lateral wedge to insoles. Noting the effect of increasing eversion on the ankle/subtalar joint is unclear. Subsequently, the authors advocate caution when prescribing lateral wedge insoles due to this unknown effect.

Reference: *Br J Sports Med.* 2018;52(4):238-53

[Abstract](#)

Associations of occupational standing with musculoskeletal symptoms: a systematic review with meta-analysis

Authors: Coenen P et al.

Summary: The epidemiological evidence on associations of occupational standing with musculoskeletal symptoms was reviewed and quantified in this systematic review and meta-analysis involving 50 articles reporting 49 studies (45 cross-sectional and five longitudinal; n = 88,158 participants). The included studies described the associations of occupational standing with musculoskeletal symptoms, including low-back (39 articles), lower extremity (14 articles) and upper extremity (18 articles) symptoms. 'Substantial' (>4 hours/workday) occupational standing was associated with low-back symptoms (pooled OR 1.31; 95% CI 1.10-1.56) via the meta-analysis. It was not possible to evaluate the association of occupational standing and lower and upper extremity symptoms, as the data were too heterogeneous for meta-analyses. However, the majority of included studies reported statistically significant detrimental associations of occupational standing with lower extremity, but not with upper extremity symptoms. The study authors emphasised that their conclusions are tentative as only limited evidence was found from high-quality, longitudinal studies with fully adjusted models using objective measures of standing.

Comment: The meta-analysis conducted in this study demonstrated that greater than 4 hours per day of occupational standing was associated with an occurrence of lower back symptoms. With regard to specific lower extremity symptoms, the study identified 14 articles that reported associations between occupational standing and lower extremity symptoms, however, due to heterogeneity issues these studies were not pooled for data analysis. The available evidence with regard to lower extremity injuries and occupational standing suggests an association between the two, albeit inconclusive. For those who have managed occupational workers who stand for extended periods of time you will undoubtedly understand that this is no simple matter to manage, with a complex interplay between the type of activity while standing, footwear requirements and foot comfort. There is definitely a need for further research investigating this phenomenon in people who are required to stand for extended periods due to their occupation.

Reference: *Br J Sports Med.* 2018;52(3):176-83

[Abstract](#)

Calf muscle performance deficits remain 7 years after an Achilles tendon rupture

Authors: Brorsson A et al.

Summary: This prospective, randomised controlled trial evaluated calf muscle performance and patient-reported outcomes at a mean of 7 years after Achilles tendon rupture in 66 patients (13 women; 53 men; mean age 50 years). A secondary aim was to evaluate whether improvement in calf muscle performance continued after the 2-year follow-up period. Overall, 34 patients had undergone surgery. At 7-year follow-up, the injured side exhibited significantly ($p < 0.001-0.012$) decreased values in all calf muscle performance tests (single-leg standing heel-rise test, concentric strength power heel-rise test, and single-legged hop for distance). A significant improvement in calf muscle performance was not observed after the 2-year follow-up. A significant ($p = 0.002$) increase in heel-rise height between the 1-year (10.8 cm) and the 7-year (11.5 cm) follow-up assessments was seen. Minor patient-reported symptoms and fairly high physical activity were evident with an Achilles tendon Total Rupture Score (ATRS) of 96 (of a possible score of 100) and a median Physical Activity Scale (PAS) of 4 (of a possible score of 6). There were no significant differences in calf muscle performance or patient-reported outcomes between the treatment groups except for the Limb Symmetry Index (LSI) for heel-rise repetitions.

Comment: Athletes who return to full activity participation following an Achilles tendon rupture have affected performance with approximately 20% of patients unable to return to their previous levels of physical activity. Optimising calf muscle performance has been a priority to minimise impairments post Achilles tendon rupture. This prospective cohort study demonstrated that after 7 years post Achilles tendon rupture there were still significant deficits in calf muscle performance compared to the non-injured side. Whilst the study did uncover some quite significant findings, there are a few limitations that must be taken into account. First, the mean patient age in the study was 50 years at 7-year follow-up, therefore the effect of increasing age on changes in tendon stiffness must be considered. Second, it was unclear what type of activities the participants participated in pre- and post-Achilles tendon rupture, that is, whether they were professional or recreational athletes. Interestingly, the study also reported that calf muscle function did not change between the two-year and seven-year follow-up assessments, highlighting that the majority of improvements in function may only occur during the first 2 years post Achilles tendon rupture.

Reference: *Am J Sports Med.* 2018;46(2):470-7

[Abstract](#)



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Does first ray amputation in diabetic patients influence gait and quality of life?

Authors: Aprile I et al.

Summary: This case-control study evaluated gait in a sample of first ray amputee diabetic patients (n = 6) and compared them with a sample of non-amputee diabetic patients (n = 6) and a group of age-matched healthy subjects (n = 6). Amputee patients displayed a lower walking speed and greater variability and lower ankle, knee, and hip range of motion values as well as a tendency to have a more flexed hip profile compared with the two other groups. Worsening biomechanical data were associated with pain and lower quality of life.

Comment: Although it does seem logical that first ray amputation in diabetic patients would lead to altered gait and reduced quality of life this phenomenon had not been previously investigated. Importantly, but unsurprisingly, this study identified reductions in quality of life, alterations in spatiotemporal gait parameters and alterations in joint kinematics at the hip, knee and ankle in diabetic patients. The study noted the significant differences were not only between patients with amputation compared to healthy subjects, but also between diabetic patients who had undergone amputation and those who had not. The study is limited by the very small sample size, however, the results are significant from a management perspective. Diabetic patients with 1st ray amputation require a treatment regime that focuses not only on the foot, but also the ankle, knee and hip.

Reference: *J Foot Ankle Surg. 2018;57(1):44-51*
[Abstract](#)

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Research Review publications are intended for New Zealand health professionals.

Melanoma of the foot is associated with advanced disease and poorer survival

Authors: Adams BE et al.

Summary: Outcomes and prognostic factors associated with foot melanoma were assessed in this study. The 5-year survival rate for melanoma of the toe was 50%. On univariate analysis, significant prognostic variables identified included Breslow thickness, sentinel node positivity, ulceration, and localised presentation on the toe. Cox proportional hazards analysis produced a model of foot melanoma with ulceration and location on the toe as independent prognostic variables. It is recommended that physicians should have a low threshold to biopsy suspicious lesions of the foot and ankle.

Comment: The results of this study suggest that ulcerated lesions of the foot are associated with worse outcomes. The five-year survival of invasive melanoma of the foot was 68.4%, significantly less than the five-year survival of 91.7% when the entire body is considered. The study infers that the increased presentation of melanomas at the advanced disease stage in the foot results from multiple factors, including the absence of pain, the difficulty of visualisation and the fact that melanoma can mimic diabetic or neuropathic ulcerations. Most significantly, this study again highlights the importance of early detection and its relationship to prognosis.

Reference: *J Foot and Ankle Surg. 2018;57(1):52-5*
[Abstract](#)

Factors associated with early loss of hallux valgus correction

Authors: Shibuya N et al.

Summary: This retrospective cohort study evaluated predictors of lateral deviation of the hallux associated with actual early loss of correction after hallux valgus corrective surgery. The recurrence rate was approx. 50% and approx. 60% when the postoperative tibial sesamoid position was >4 and >5 on the 7-point scale, respectively. The only factor (after adjusting for covariates) found to be associated with recurrence, was the postoperative tibial sesamoid position.

Comment: This study retrospectively reviewed 151 patients who had undergone hallux valgus surgery. Of the 151 patients, 32% developed recurrence post-surgery. The mean final hallux valgus angle of the recurrence group was 24°. The mean hallux valgus angle and the non-recurrence was 11.3°. Statistical analysis demonstrated that postoperative sesamoid position >4 as measured by the 7-level grading system described by Hardy and Clapham, was associated with hallux valgus recurrence in patients treated with proximal osteotomies. It would be interesting to note for those who manage patients who have had recurrence of hallux valgus post-surgery what position the sesamoid has now assumed.

Reference: *J Foot Ankle Surg. 2017;Dec 15 [Epub ahead of print]*
[Abstract](#)

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Independent commentary by Dr Matthew Carroll

Matthew graduated in podiatry at the CIT in Wellington. He undertook his postgraduate work at Otago University, Dunedin, New Zealand, Curtin University, Western Australia and Auckland University of Technology, Auckland, New Zealand. He is Head of Postgraduate Programmes within the School of Clinical Sciences and Senior Lecturer at Auckland University of Technology. Matthew is Associate Editor for BMC Musculoskeletal Disorders and an Editorial Board Member for the Journal of Foot and Ankle Research. He is active in research with a special interest in musculoskeletal conditions affecting the lower limb.



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