

Foot & Ankle RESEARCH REVIEW™

50TH
ISSUE

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Issue 50 – 2021

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Abbreviations used in this issue

BMI = body mass index
CI = confidence interval
NHS = National Health Service
OA = osteoarthritis

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Welcome to Issue 50 of Foot and Ankle Research Review.

In this issue I highlight some recent publications related to the diabetic foot. I was particularly interested to read the study by Littman et al., who investigated delays in patient care in patients who underwent toe amputation. Zhang et al's., investigation of factors associated with delayed healing of diabetes-related foot ulcers also has some very significant findings. Of particular note is the identification of the negative influence of younger age to potentially be a surrogate for younger-onset type 2 diabetes, emerging as a more severe phenotype for (foot) complications.

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

Noho ora mai

Associate Professor Matthew Carroll

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Research Review thanks Foot Science International for their sponsorship of this publication and their support for ongoing education for healthcare professionals.

The appropriateness of X-ray referrals of osteomyelitis and its timely management with antibiotics: A service evaluation

Authors: Linsley J and Reel S

Summary: This evaluation of 40 X-ray referrals questioning the presence of osteomyelitis, requested at a community podiatry service in the NHS between April 2020 and April 2021, aimed to ascertain whether clinicians are safely and appropriately referring patients for X-ray with suspected osteomyelitis, and whether suitable management is instigated at the point of clinical diagnosis. Overall, 2 (5%) referrals provided no clinical detail to rationalise referral, while 18 (45%) outlined one reason, and 20 (50%) outlined more than one reason; the most common clinical finding supporting referral was the presence of a chronic wound (n = 21, 53%). Osteomyelitis was confirmed in 12 (30%) patients, a positive probe-to-bone test being found to be the most indicative rationale (n = 7, 64%). At the time of referral for X-ray, only 4 (10%) patients had commenced bone-penetrating antibiotics.

Comment: This UK study analysed X-ray referral within a community podiatry service with an aim to investigate the rationale of which clinicians are writing on X-ray referrals when suspicious of osteomyelitis. Data showed there was a wide disparity in clinical details outlined on the X-ray request forms and subsequent rationale for referral. Of the 40 patients referred for X-ray for suspicion of osteomyelitis, only 30% returned with radiological signs of bone infection. The results reinforce the need for clinicians to provide clear rationale for their X-ray referral when bone infections are suspected. Additionally, knowledge must be strengthened surrounding clinical tests such as the probe-to-bone test and an understanding of the signs and symptoms of infection in the high-risk foot. In particular, clinical signs of infection are often dampened due to the underlying pathophysiology, subduing the usual inflammatory response.

Reference: *The Diabetic Foot Journal* 2021;24(3):10-15

[Abstract](#)

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How patients interpret early signs of foot problems and reasons for delays in care: Findings from interviews with patients who have undergone toe amputations

Authors: Littman AJ et al.

Summary: This study involving semi-structured interviews of 61 male Veterans (mean age 66 years) from across the US who had diabetes mellitus and who had undergone a toe amputation, aimed to describe how they responded to early signs of foot problems and to identify factors resulting in delays in care. Patient-level factors related to delayed care included: not knowing something was wrong; misinterpreting symptoms; “sudden” and “unexpected” illness progression; and competing priorities getting in the way of care-seeking. System-level factors included: asking patients to watch it; difficulty getting the right type of care when needed; and distance to care and other transportation barriers.

Comment: An interesting American study that revealed patient-based and system factors that affect access to services in patients who have undergone digital amputation. One of the key findings was that patients did not understand the signs of ulceration or infection. Consequently, when advised by their medical practitioner to monitor their toe, referred to as the “watch it” approach, patients were not sure what they were actually watching for. The authors also challenged the usefulness of one-on-one education post amputation, with recent research indicating there is no strong evidence that structured patient education reduces the risk of ulceration or amputation. This is well worth your time to read as there are some very important messages contained within the text.

Reference: *PLoS One.* 2021;16(3):e0248310

[Abstract](#)

Reduction in diabetes-related major amputation rates after implementation of a multidisciplinary model: An evaluation in Alberta, Canada

Authors: Basiri R et al.

Summary: This Canadian retrospective (2007-2017) analysis of anonymised diabetes-related lower limb amputations (LLAs) reports examined the reduction in LLAs when using the multidisciplinary Toe and Flow model (TFM) used in Calgary versus the provincial standard of care (SOC) used in Edmonton. Overall, LLA numbers remained relatively similar (Calgary 2238; Edmonton 2410), but Calgary had fewer major (45%) and more minor (42%) amputations than Edmonton. The trend of increasing minor and decreasing major LLAs in Calgary were negatively and significantly correlated ($r = -0.730$; $p = 0.011$).

Comment: This Canadian study investigated the effectiveness of the TFM of care between high-risk foot services in two Canadian provinces (Calgary and Edmonton). In the TFM, podiatric surgeons (toe) and vascular surgeons (flow) form the backbone of the multidisciplinary service, which has a goal of reducing complications such as major diabetes-related LLA. Study data indicated a significant negative correlation between increasing rates of minor LLAs and a decreasing rate of below the knee amputations. In other words, minor LLA increased but major LLAs decreased. Interestingly, reductions in major LLAs were greater in Calgary; this was attributed to the multidisciplinary team having access to a podiatric surgeon and consequently acute patients being able to easily access a clinic with a podiatric surgeon.

Reference: *J Am Podiatr Med Assoc.* 2021;111(4):Article_1

[Abstract](#)

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Independent commentary by Associate Professor Matthew Carroll

Matthew is Associate Professor of Podiatry at the Auckland University of Technology. He graduated in podiatry at the CIT in Wellington. Matthew undertook his postgraduate study and research at Otago University, Dunedin, New Zealand, Curtin University, Western Australia and Auckland University of Technology, Auckland, New Zealand. His research areas include investigating lower limb function in chronic diseases. He is Associate Editor for BMC Musculoskeletal Disorders and is an Editorial Board Member for the Journal of Foot & Ankle Research.



Healing rate of diabetic foot wounds when treated with serial debridement in the presence of antithrombotic therapy

Authors: Route J

Summary: This retrospective analysis examined the effect of 4 weeks of antithrombotic therapy (ATT) on wound healing rates in 37 patients with uncomplicated diabetic foot ulcerations. There was a negative correlation between antithrombotic therapy and diabetic foot wound healing rate and wound area, and depth improvement was better in patients not receiving antithrombotic therapy for comorbidities not associated with peripheral arterial disease.

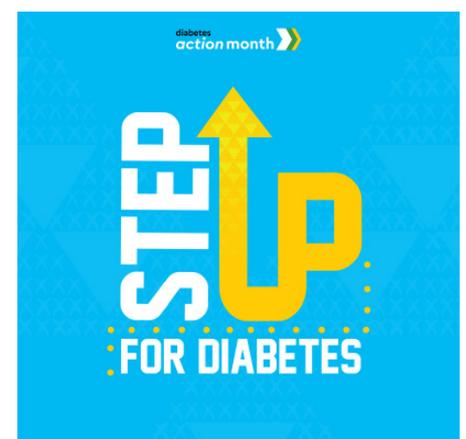
Comment: This American-based, retrospective, multicentre study analysed 37 patients with diabetic foot wounds. Wounds treated with standard of care in the presence of clinical anticoagulation were compared to control wounds. For the purposes of this study, ATT included both antithrombotic and anticoagulant medications. The authors postulated that the haemostatic phase of acute diabetic foot ulcer healing is affected by the presence of ATT. The study found a statistically significant negative affect of ATT on area and depth healing rate of uncomplicated diabetic foot ulcers.

Reference: *J Am Podiatr Med Assoc.* 2021;111(4):Article_4

[Abstract](#)

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Frequency of sharp wound debridement in the management of diabetes-related foot ulcers: Exploring current practice

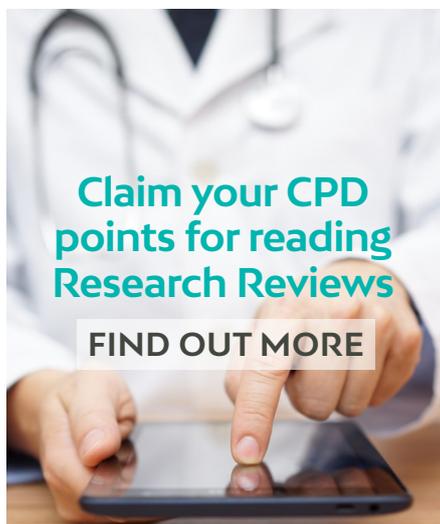
Authors: Nube VL et al.

Summary: This survey of 53 NSW Health-employed podiatrists, 11 privately practicing podiatrists and 11 nurses, examined conservative sharp wound debridement (CSWD) practices for wound bed preparation of diabetes-related foot ulcers. CSWD was the most common debridement method and was performed at every visit by 84% of podiatrists. Callus, slough, and infection were the most important determinants of frequency, with staff time, as a limiting factor, ranked 4th. Regional or remote podiatrists practiced less frequent debridement than those in metropolitan areas (≥ 2 weekly 71% vs 45%; $p = 0.024$).

Comment: This survey of Australian podiatrists investigated debridement type and frequency, and if CSWD was routinely used. Data indicated that CSWD was the predominant form of debridement. All podiatrists in the public health system used CSWD on non-ischaemic diabetes-related foot ulcers. Data indicated variation in CSWD use between metropolitan and rural clinics. Patients in rural settings receiving CSWD less frequently. These differences were attributed to access issues created by staff resourcing problems in rural clinics and distances patients were required travel to attend clinics.

Reference: *J Foot Ankle Res.* 2021;14(1):52
[Abstract](#)

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Clinical foot measurements as a proxy for plantar pressure testing in people with diabetes

Authors: Chuter VH et al.

Summary: This study investigated the contribution of joint range of motion and foot deformity measures on plantar pressures in 136 community dwelling adults (mean age 68.4 years; 52.2% male) with diabetes. Assessments of barefoot (Tekscan HR Mat™) and in-shoe (Novel Pedar-X®) plantar pressure variable, weight bearing ankle dorsiflexion, hallux range of motion, lesser toe deformities and hallux abductus (HAV) scale were undertaken. Nearly one-third of patients had ≥ 2 foot biomechanical pathologies and these individuals displayed significant increases in all barefoot plantar pressure regions (except forefoot), compared to those with < 2 pathologies. There were no significant changes for the in-shoe plantar pressure variables. Multivariate multiple linear regression assessing the effect of the four biomechanical factors plus neuropathy and BMI on plantar pressure variables, explained between 9.9% (95% CI 8.4-11.4%) and 29.6% (95% CI 28.2-31%), and between 2.5% (1.0-4.0%) and 43.8% (95% CI 42.5-44.9%), of the variance in the barefoot and in-shoe plantar pressure variables, respectively.

Comment: The premise of this Australia study was to examine if the presence of foot deformity could indicate likely increases in plantar pressure readings in people with diabetes. As not all clinicians have specialised equipment to measure plantar pressures, knowledge of how specific foot deformities may contribute to elevated plantar pressures is invaluable. Importantly the study demonstrated that people with two or more biomechanical pathologies displayed significant increases in plantar pressures in all areas of the foot, with the exception of the forefoot. The main biomechanical pathologies associated with elevated plantar pressures included hallux valgus (greater than stage 2), digital deformities, and decreased hallux range of motion. In addition, BMI was associated with significantly elevated pressures in the midfoot. The main takeaway messages from this study are that in the absence of specialised measurement equipment to quantify plantar pressures, patients with decreases in ankle joint dorsiflexion and hallux ROM will likely have elevated pressures to the hallux and lesser digits. Patients with neuropathy, high BMI and changes to hallux ROM will likely have elevated pressures in the plantar forefoot.

Reference: *J Foot Ankle Res.* 2021;14:56
[Abstract](#)

Factors associated with healing of diabetes-related foot ulcers: Observations from a large prospective real-world cohort

Authors: Zhang Y et al.

Summary/Comment: This prospective study analysed 4709 consecutive patients with diabetes-related foot ulcerations who presented to 1 of 65 secondary or tertiary diabetic foot services, across Queensland, Australia. The aim of the study was to investigate factors that influenced healing in the patient cohort. Seven factors were negatively associated with diabetic foot ulcer healing at both 3- and 12-months post first visit: (1) younger age (< 50 years), (2) geographical remoteness, (3) smoking, (4) peripheral arterial disease, (5) large ulcer sizes, (6) deep ulcers, and (7) infection. Receiving knee-high offloading treatment at baseline was positively associated with healing. The results emphasize the harmful effects of smoking and negative effects of remoteness as a likely surrogate for delayed access to treatment. Perhaps the most significant finding of this research was the factor of younger age influencing healing of diabetic foot ulcers. The author's postulating the negative influence of younger age to potentially be a surrogate for younger-onset type 2 diabetes, emerging as a more severe phenotype for (foot) complications. Interestingly, data indicated that indigenous status was not associated with diabetic foot ulcer healing.

Reference: *Diabetes Care.* 2021;Jun 1 [Epub ahead of print]
[Abstract](#)



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Effects of orthotic insoles on gait kinematics and low-back pain in patients with mild leg length discrepancy

Authors: Menez C et al.

Summary: This study examined the effects of orthotic insoles on gait kinematics and low-back pain in eight patients with mild leg length discrepancy (LLD; ≤ 2.0 cm). Orthotic insole use reduced low-back pain in all patients ($p < 0.05$), and the reduction in pain was correlated with changes in ankle kinematics ($r = 0.80$; $p = 0.02$). Effects of orthotic insoles on gait symmetry were unpredictable and specific to each patient's individual biomechanical compensation.

Comment: I was not surprised by the findings indicating that all participants likely respond to LLD correction differently. The discussion covers numerous points that the clinician needs to consider when correcting an LLD through wedging/orthoses. I was particularly interested in the correction strategy used by the researchers. They chose to implement a 50% correction strategy (wedge made to half the height of the identified deformity), was this too conservative to see a change? There is no consensus about correction strategies when managing LLD. The researchers also chose to use the commonly applied clinical measurement methods to quantify LLD which may have contributed to data variability. It would be great to see more research into LLD as they are commonly treated in clinical practice. I am left wondering about how people with true anatomical LLD versus those with functional LLD respond differently to treatment. Currently there is no guidance surrounding differences in treatment strategies for these two groups.

Reference: *J Am Podiatr Med Assoc.* 2021;111(4):Article_9
[Abstract](#)

Efficacy of a single corticosteroid injection for Morton's neuroma in adults: A systematic review

Authors: Edwards SR et al.

Summary: This systematic review examined the effectiveness of corticosteroid injections for Morton's neuroma based on 10 studies (quality rated low and subject to bias) in 695 patients. Overall, the studies suggested a moderate short- to medium-term benefit in terms of pain from a corticosteroid injection and a low adverse event rate. Corticosteroid injections appear superior to usual care, but not to local anaesthetic, and they are inferior to surgical excision. A very low adverse event rate was noted throughout, suggesting the intervention is safe

Comment: The exact cause of a Morton's neuroma is controversial. Currently trauma, ischaemia, intermetatarsal bursitis and entrapment are four main recognised mechanisms of injury. This systematic review provides an evidence-based perspective and draws three main conclusions. Firstly, corticosteroid therapy is an acceptable first-line treatment that provides temporary pain relief but should not be considered as curative treatment. Secondly, a single corticosteroid injection appears to provide relief for approximately 6 months. Thirdly, surgical excision is still considered the gold-standard treatment.

Reference: *J Am Podiatr Med Assoc.* 2021;111(4):Article_13
[Abstract](#)



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An exploration of changes in plantar pressure distributions during walking with standalone and supported lateral wedge insole designs

Authors: Tse CTF et al.

Summary: Plantar pressure distribution between standalone lateral wedge insoles (LWI) and those with medial arch support (supported-LWI) was examined in 40 healthy individuals. Medial rearfoot and forefoot pressures were reduced by all LWIs, with a variable-stiffness medial arch supported LWI producing greater reductions than the standalone LWI. Lateral rearfoot and forefoot pressures were reduced by both variable- and uniform-stiffness supported-LWIs but were unchanged by the standalone LWI. In the midfoot, the standalone LWI maintained pressure but reduced regional contact area, while both supported-LWIs increased midfoot pressure and contact area. All LWI increased the medial-lateral pressure index of the whole foot, suggesting a lateral shift in plantar pressure distribution during the weightbearing gait phase. Lateral shifts in plantar pressure distribution occurred in all laterally wedged conditions, including one supported-LWI previously shown to be biomechanically ineffective for modifying knee load distribution.

Comment: LWIs are commonly used to modify gait biomechanics in the management of medial compartment knee OA. This intervention has typically been associated with reduction in the magnitudes of the knee adduction moment (KAM), a surrogate of knee load distribution linked to structural and clinical worsening of knee OA. This study investigated changes in foot pressures with the addition of LWI and medial arch supports. Medial rearfoot and forefoot pressures were reduced by all LWI, with the variable-stiffness supported-wedge (lateral wedge plus arch support) showing greater reductions than the standalone LWI. The message from the authors is that when using LWI in the management of knee OA, co-existent foot pathologies must be considered. Data demonstrated that the addition of medial arch support to a lateral wedge increased plantar pressure into the midfoot. Selecting a LWI to minimise regional pressures based on patients' existing foot symptoms may also be less likely to elicit adverse reactions to insole treatment.

Reference: *J Foot Ankle Res.* 2021;14(1):55
[Abstract](#)

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