

Foot & Ankle Research Review™

Making Education Easy

Issue 21 – 2014

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Abbreviations used in this issue

BMI = body mass index
ED = emergency department
EMG = electromyography
HAA = hallux abductus angle
HR-QOL = Health-related quality of life
IMA = intermetatarsal angle
LLLT = low-level laser therapy
MI = motivational interviewing
MTP = metatarsophalangeal
ROM = range of motion
RA = rheumatoid arthritis

Welcome to the latest issue of Foot & Ankle Research Review.

I have chosen a range of clinical topic areas that you will find interesting to read. There are several articles that look at the impact of hallux valgus. There is also a very interesting Australian article looking at needling versus liquid nitrogen cryotherapy for the treatment of pedal warts and an article exploring the issues of treating young children with flatfeet.

I hope you enjoy reading Foot & Ankle Research Review and any feedback will be most welcome.

Kind Regards,

Professor Keith Rome

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Correlates of foot pain severity in adults with hallux valgus: a cross-sectional study

Authors: Hurn SE et al.

Summary: This cross-sectional study examined structural factors that might explain foot pain in hallux valgus, including radiographic hallux valgus angle and joint degeneration, in 60 hallux valgus patients aged 20-75 years (53 were female). Poor general health status, lower educational attainment and increased occupational physical activity levels, explained 20 to 30% of the variance in foot pain when considered in combination with dynamic physical characteristics including hallux plantar flexion weakness and reduced second metatarsal force-time integral during gait. Increasing lateral deviation of the hallux and first MTP joint osteoarthritis were not associated with foot pain.

Comment: This Australian article examined potential explanatory factors associated with foot pain in people with hallux valgus. Hallux valgus is a substantial problem, and investigation into factors that may explain associated foot pain would be welcomed by health professionals and their patients. Rather surprisingly, patient characteristics were more likely to be associated with foot pain than foot structure or function. An interesting study with an unusual finding that neither hallux valgus severity angle nor presence of first MTP joint osteoarthritis was associated with level of foot pain, and that the resulting comprehensive models predicted only modest amounts of variation in foot pain (20-33%). A major limitation of the study is that the foot pain measures were not specific to the hallux valgus/first MTP joint region. With only 1 of 20 plantar pressure variables showing a significant association with foot pain, might the lack of standardised footwear during testing explain this finding? Using participant's own footwear is more a measure of footwear pressure attenuation than an inherent foot pressure profile, especially considering the range of footwear people wear in any given week.

Reference: *J Foot Ankle Res.* 2014;7:32

[Abstract](#)

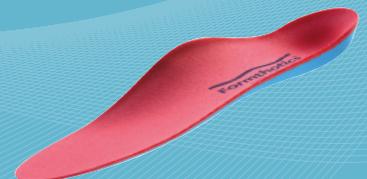
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Motion analysis to track navicular displacements in the pediatric foot: relationship with foot posture, body mass index, and flexibility

Authors: Kothari A et al.

Summary: This study in children (8-15 years), 25 with flatfeet and 26 with neutral feet, analysed navicular motion with respect to foot posture, and identified motion patterns that indicate midfoot dysfunction. Normalised navicular drift (NNDri) and normalised navicular drop (NNDro) were strongly correlated in children with neutral feet ($r = 0.56$; $p = 0.003$) but not in those with flatfeet ($r = 0.18$, $p > 0.05$). Those with flatfeet demonstrated reduced NNDri compared to those with neutral feet (0.7 vs 1.6, $p = 0.007$); no between group difference was found for NNDro.

Comment: This UK three-dimensional study will be of interest to clinicians and researchers in foot function relating to children with flatfeet. Excessive calcaneal eversion/pronation have been linked to foot problems during walking and running in adults. In children, dynamic navicular motion in straight walking was similar to sit-to-stand navicular motion; thus, measurement of dynamic NNDro and dynamic NNDri did not necessarily give any added information. This study demonstrated that motion of the navicular in the transverse as well as the sagittal plane is important when investigating foot function. The uncoupling of these movements observed in a flatfooted population may indicate an impairment of midfoot biomechanical function, with the reduced medial translation of the navicular observed in flatfeet probably related to altered alignment of the talonavicular joint. Pediatric flexible flatfoot continues to be routinely treated by clinicians despite much evidence demonstrating functional dysfunction. The findings of this study add biomechanical rationale to the treatment of flexible flatfeet in certain individuals.

Reference: *Foot Ankle Int.* 2014;Jun 24 [Epub ahead of print]

[Abstract](#)

Elevated plantar pressure in diabetic patients and its relationship with their gait features

Authors: Amemiya A et al.

Summary: These researchers examined the relationships between elevated plantar pressure, gait features, and patient characteristics in order to identify individuals at high-risk of developing diabetic foot ulcers. The definition of elevated plantar pressure was more than the mean plus one standard deviation of the corresponding segment in non-diabetic subjects; plantar pressure distribution in the stance phase was divided on the four plantar segments. Gait features were measured with wireless motion sensors on the sacrum and feet, and the distribution of plantar pressure was measured using an F-scan® system. In 57 diabetic patients, during mid-stance, yaw motion of the foot and small roll and yaw motions of the body were found to be related to elevated plantar pressure, sensory neuropathy, diabetes duration, patient weight, ankle range of motion and toe-gap force.

Comment: This is an interesting study from Japan. The authors reported that small rolling during the mid-stance phase was related to elevated plantar pressure. Several gait features were related to the elevated segment and its plantar pressure in diabetic patients. During walking, the foot performs a rolling motion, in which the plantar surface rolls over the ground during the mid-stance phase. When this motion is small, a small area of the plantar surface receives highly concentrated plantar pressure. The authors suggest from these findings that in clinical settings, to prevent elevated plantar pressure, passive exercise is recommended for expansion of ankle ROM. In addition, increasing muscle strength of the lower limbs may be effective. Although exercises to expand ankle ROM may also be effective, it is known that diabetic patients cannot move their ankles until maximum ROM. Diabetic patients can possibly prevent elevated plantar pressure by increasing awareness of gait and using large rolling motion during walking. A precautionary note, the diabetic patients in this study may have been at a lower risk for foot ulcers because most patients were classified as grade 0 or 1 according to the classification of the International Working Group on the Diabetic Foot.

Reference: *Gait Posture* 2014;Jun 12 [Epub ahead of print]

[Abstract](#)

Podiatrists' perspectives on their role in promoting self-care in high-risk patients with diabetes

Authors: Gabbay R et al.

Summary: This study employed a 19 question online survey to explore how US podiatrists promote self-care in high-risk patients with diabetes and if they use motivational interviewing (MI) techniques. Among 843 participating podiatrists, the majority (86%) considered foot self-care to be very important for these patients and 90% considered it was their role to discuss self-foot care with them. While 49% of the podiatrists considered that they had training and were successful in promoting behavioral change in their patients, the majority were possibly (46%) or definitely (38%) interested in learning more regarding this technique. Only 24% of podiatrists scored $>15/20$ on the MI index. Higher MI scores were not found to be associated with the podiatrist's gender, age, geographic location, years in practice or percentage of time in surgery; however, they were associated with more face time and more time discussing foot self-care.

Comment: Screening of diabetic patients for high-risk foot characteristics and consequent provision of enhanced professional and foot self-care are considered to be essential to prevent foot ulcerations and lower-extremity amputations, but patient adherence to recommended foot self-care is typically not optimal. This US study found that most of the responding podiatric physicians felt that foot self-care is very important to at-risk patients, and, more importantly, that it is their role as podiatric physicians to discuss proper foot self-care with their patients. Would the same results be found in New Zealand podiatrists? Interestingly, barriers to discussing self-care with patients reported by the podiatric physicians participating in this study reflect those reported in other similar studies and include lack of time (which is often taken up by other pressing issues) and lack of reimbursement. Importantly, lack of patient interest/cooperation/awareness is also cited, and these are precisely the barriers that MI addresses. However, it is an interesting article and podiatrists have the potential to play a key role in promoting behaviour change using approaches such as MI in high-risk diabetic patients because they have unique access to, and focus on, such patients.

Reference: *J Am Podiatr Med Assoc.* 2014;Jun 25 [Epub ahead of print]

[Abstract](#)

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Disclaimer: This publication is not intended as a replacement for regular medical education but to assist in the process. The reviews are a summarised interpretation of the published study and reflect the opinion of the writer rather than those of the research group or scientific journal. It is suggested readers review the full trial data before forming a final conclusion on its merits.

Research Review publications are intended for New Zealand health professionals.

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

Keith is currently leading podiatric research at AUT University and his current research interests relate to chronic gout, rheumatoid arthritis and the effects of foot orthoses/footwear on postural stability in long-term chronic conditions.



For full bio [CLICK HERE](#)

Plantar fasciitis and its relationship with hallux limitus

Authors: Aranda Y and Munuera PV

Summary: This study involving 66 women and 34 men divided into two groups (controls and those with plantar fasciitis) investigated whether patients with plantar fasciitis have limited dorsiflexion in the first MTP joint and which type of foot (supinated or pronated) is most frequently associated with plantar fasciitis. Individuals with plantar fasciitis exhibited a slight limitation in dorsiflexion of the hallux compared with controls ($p < 0.001$). Furthermore, hallux dorsiflexion and the Foot Posture Index were found to be inversely correlated; Spearman correlation coefficient -0.441 ; $p < 0.01$). The pronated foot was the most common foot type in those with plantar fasciitis.

Comment: The relationship between the plantar fascia and dorsiflexion in the first MTP joint has been well documented. This Spanish study sets out to determine whether there was reduced dorsiflexion of the first MTP joint in patients with plantar fasciitis compared with individuals without plantar fasciitis. Previous studies describe foot pronation as a risk factor for the limitation of hallux dorsiflexion, pointing to the plantar fascia and the peroneus longus muscle as two of the most important stabilising elements of longitudinal arch and first-ray support. The authors report that the reduced hallux dorsiflexion in most of the patients with plantar fasciitis suggests that stretching the plantar fascia by means of passive dorsiflexion of the hallux and lesser toes could well be an important exercise to include in the treatment of mild hallux limitus. The procedure could increase this structure's elasticity and achieve more degrees of movement in the first MTP joint in the case of hallux limitus. The issues with exercise are self-motivation and not all patients adhere to exercise and stretching. An interesting observation from this study is the use of static measures rather than dynamic measures. Further work should be conducted to evaluate dynamic measures as this represents a true representation of heel pain when undertaking physical activity.

Reference: *J Am Podiatr Med Assoc.* 2014;104(3):263-8

[Abstract](#)

Needling versus liquid nitrogen cryotherapy for the treatment of pedal warts: a randomised controlled trial pilot study

Authors: Cunningham DJ et al.

Summary: Researchers from Australia compared the efficacy of needling (to induce a cell-mediated immune response against human papillomavirus) with standard liquid nitrogen cryotherapy for the treatment of pedal warts, and determined if the cell-mediated immune response induced by needling is effective against satellite pedal warts. At 12-weeks' follow-up, 11 of 17 (64.7%) individuals in the needling group compared with 1 of 16 (6.2%) in the liquid nitrogen cryotherapy group exhibited regression of the treated primary pedal wart ($p = 0.001$). Primary pedal wart regression rate was significantly higher in the needling group compared to the liquid nitrogen cryotherapy group. No significant relationship was observed between needling of the primary pedal wart and complete pedal wart regression ($p = 0.175$) or regression of satellite pedal warts ($p = 0.615$), nor was there a significant difference in satisfaction, cosmesis or pain between the two groups.

Comment: This study will be of interest to clinicians. Cutaneous verrucae (warts) are caused by an infection of the epidermal tissue with certain strains of the human papillomavirus. A Cochrane systematic review of topical treatments for cutaneous warts published in 2009 reported little evidence to support any one wart treatment over another. This clinical trial from Australia compared the effectiveness of needling versus liquid nitrogen cryotherapy in the treatment of pedal warts and the results suggest that needling is more effective in treating the primary pedal wart compared with liquid nitrogen cryotherapy. The pilot study does illustrate the characteristics of an ideal treatment. However, further work is needed as participants should be recruited from a more demographically diverse population to increase the generalisability of the findings. Based upon the findings, the authors recommend participants be treated over a 12-week period, with a final follow-up to occur 6 months later to assess for any incidence of recurrence. Given the preliminary evidence reported in this study for the effectiveness of needling against the primary pedal wart, further studies should be undertaken to test the effectiveness of needling applied to all of the pedal warts compared with liquid nitrogen cryotherapy or the more popular choice of salicylic acid.

Reference: *J Am Podiatr Med Assoc.* 2014;Jun 25 [Epub ahead of print]

[Abstract](#)

Effects of the Lapidus arthrodesis and chevron bunionectomy on plantar forefoot pressures

Authors: King CM et al.

Summary: Preoperative and postoperative plantar pressures after two specific bunionectomies (the chevron bunionectomy and Lapidus arthrodesis) were evaluated in 68 subjects, 34 in each group. Both procedures resulted in radiographic improvements in the mean hallux abductus and intermetatarsal angles, and a significant decrease in the mean hallux plantar pressure was observed in both groups ($p < 0.001$). In the Lapidus group, the pressure under the second metatarsal as a percentage of the total forefoot pressure decreased significantly ($p = 0.01$) and an increase in the mean fifth metatarsal head plantar pressure ($p = 0.008$) and pressure under the fifth metatarsal as a percentage of the total forefoot pressure ($p = 0.01$) was observed.

Comment: Although hallux valgus has been implicated in the development of metatarsalgia, the pathomechanics are not clearly understood. In the normal foot with congruent MTP joints, the greatest plantar pressures exist under the first, second, and/or third metatarsal heads. The greater the incongruity of the first MTP joint, the greater the intermetatarsal angle (IMA) and hallux abductus angle (HAA) and the greater the peak pressures under the central metatarsals. The US-based study reported that the chevron and Lapidus procedures both effectively corrected the IMA, HAA, and sesamoid position to normal values. This is a well conducted study. Several limitations should be noted. The patients were not randomised to which bunion procedure was performed. Procedure selection was determined by each surgeon's indications for surgery, raising the concern for selection bias. However, the purpose of the present study was to evaluate the effects of these procedures, given the appropriate indications for each procedure. Patients who underwent concomitant lesser metatarsal osteotomies and gastrocnemius recession were excluded, because these procedures could have confounded the data, although certain hammertoe procedures were not. It is possible that these could have had an effect on the plantar pressures. In summary, the article does illustrate surgical procedures can have an immediate impact on plantar pressure. A prospective study may be beneficial to observe the long term effects.

Reference: *J Foot Ankle Surg.* 2014;53(4):415-9

[Abstract](#)

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Characteristics associated with hallux valgus in a population-based study of older adults: The Framingham Foot Study

Authors: Dufour A et al.

Summary: The association of hallux valgus with foot pain and other characteristics in older adults was assessed in this cross-sectional analysis involving 1352 men and 1725 women (mean age 66 years) involved in the Framingham Foot Study, in which 22% of men and 44% of women had hallux valgus and 3% of men and 11% of women had hallux valgus with pain. Foot pain was found to increase the odds of hallux valgus in both sexes ($p < 0.05$) while a BMI $> 30 \text{ kg/m}^2$ decreased the odds by 33% in men and 45% in women ($p < 0.05$). The odds of pain and hallux valgus versus no pain and no hallux valgus were greater with older age and planus foot structure in women only. Women also exhibited an association between older age and past high heel use; 27% and 47% increased odds of hallux valgus, respectively ($p < 0.01$). A cavus foot structure decreased the odds of hallux valgus by 26% ($p = 0.02$) in women only.

Comment: Hallux valgus is common in older adults, but its association with foot pain and other factors is unclear in a population setting. The results from this US study demonstrate strong relations between hallux valgus and foot pain in both men and women. In women only, age and high heel shoe use were strongly related, with additional protective associations with cavus foot structure and obesity. The study is limited by the fact that this is a cross-sectional study of hallux valgus and potential risk factors which cannot determine temporality and thus cannot comment on cause and effect. The study is also limited by the definition of foot pain, since the authors report they are unable to determine whether the foot pain used to define hallux valgus with pain was actually pain caused by the hallux valgus. The authors used pain at the toes and forefoot to define hallux valgus with pain, it is possible that the hallux valgus caused pain in other parts of the foot or that pain in the first MTP joint was not captured by pain at the toes or forefoot. Additionally, the Framingham study is primarily Caucasian, so the results are not generalisable beyond this ethnic group. This study also has important strengths. The study has a large population-based sample which includes both men and women. This article will be of interest to both clinicians and students looking at factors associated with a very common condition.

Reference: *Arthritis Care Res (Hoboken)* 2104;June 25 [Epub ahead of print]

[Abstract](#)

Comparing the immediate effects of UCBL and modified foot orthoses on postural sway in people with flexible flatfoot

Authors: Payehdar S et al.

Summary: This study involving 20 young adults (mean age 23.5 years) with flexible flatfoot investigated the immediate effect of a rigid University of California Berkeley Laboratory (UCBL) foot orthosis, a modified foot orthosis, and a normal shoe on the postural sway of such individuals. Standing balance tests under three testing conditions (shoe only, UCBL and modified foot orthosis) were undertaken using the Biodex Stability System and evaluated total, medial-lateral and anterior-posterior sway. No statistical differences in the medial-lateral and anterior-posterior stability indices were found between foot orthoses and shoed conditions. However, the overall stability index with the UCBL foot orthosis was significantly lower than that with the modified foot orthosis.

Comment: Foot plantar mechanoreceptors provide detailed information about contact pressure which is used for feedback mechanisms of the postural control system and balance. Interventions such as a foot orthoses may optimise sensory information from plantar soles and may improve balance. This study from Iran reported no significant difference between the sway of standing with shoe only and standing with shoe plus orthoses. The orthoses were not able to reduce sway instantly compared to the shoe only. The authors suggested that a supportive pair of shoes (laced, sport shoe type) may reduce sway and improve balance, and an accommodation period of a few weeks may reduce the aforementioned effect of the shoes. There are a number of limitations to the study. The study was limited by only 20 healthy young adults being evaluated. As the authors stated in the article foot orthoses are prescribed to reduce pain, discomfort and fatigue by improving the foot posture distribution pattern, keeping the foot in a proper position, correcting bone spatial orientation, and altering activity patterns of the lower extremity muscles. The combination of a shoe and an orthoses can enhance the sense of proprioception, thus improving balance and reducing the probability of sprain or fall. A shortfall of this article is that there is no commentary on future directions or limitations.

Reference: *Prosthet Orthot Int.* 2014;Jun 18 [Epub ahead of print]

[Abstract](#)

Effects of custom-made rigid foot orthosis on pes planus in children over 6 years old

Authors: Soo-Kyung B et al.

Summary: These researchers investigated the effects of a custom-made rigid foot orthosis in 39 children aged over six years old (mean age 10 years) with pes planus. Prior to intervention, foot alignment of both feet was measured via evaluation of the resting calcaneal stance position (RCSP), anteroposterior talocalcaneal angle (APTCA), lateral talocalcaneal angle (LTTCA), the lateral talometatarsal angle (LTTMA) and the calcaneal pitch (CP). Children were then fitted with a pair of rigid foot orthoses and recommended to walk with heel strike and reciprocal arm swing to normalise the gait pattern. Clinical and radiological assessments were undertaken at 12, 18 and 24 months. All radiological indicators changed in the corrective direction except LTTCA, with RCSP and CP in the third measurement showing significant improvement in comparison with the second and baseline measurements, and LTTMA and APTCA exhibiting improvements at the third measurement versus the baseline measurements.

Comment: Conservative (non-surgical) interventions for children with flatfeet have been reported in the literature and include professional advice, foot orthoses (shoe inserts), stretching exercises, appropriate footwear selection and modifications, activity modifications, manipulation, serial casting, appropriate weight reduction, and anti-inflammatory medications. This Korean study in children over 6 years of age with no history of pain, illustrates the contentious debate about treating children with flatfeet. The criteria for entry were based upon radiographic evidence with no clinical information about how children were recruited or included into the study. The authors report the effects of the custom-made foot orthoses on the position change of the talus and calcaneus, allowing the development of the medial arch in flexible flatfoot. At the second measurement, calcaneal pitch and resting calcaneal stance position improved significantly compared with baseline. At the third measurement, 24 months after foot orthoses application, all radiological measurements had improved significantly compared with the second measurement and with baseline values. There is a major limitation in the current study. Specifically, there was no control group. Because changes in radiological parameters occur normally in childhood, a control group is required. The authors further reported that 10 years of practice experience indicated the beneficial effects of foot orthoses. These two issues are major concerns in foot orthotic intervention and future studies need to address both before we can see the effectiveness of foot orthoses in this very common musculoskeletal observation.

Reference: *Ann Rehabil Med.* 2014;38(3):369-75

[Abstract](#)

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