Foot & Ankle Research Review™

Making Education Easy

Issue 37 – 2018

In this issue:

Welcome to Issue 37 of Foot and Ankle Research Review.

I recently attended the Podiatry New Zealand Conference in Auckland and it was great to hear the positive feedback about the Foot and Ankle Research Review. In this issue I have a focus on paediatrics and footwear. I was particularly interested in the Davies et al., study that investigated gait in idiopathic toe walking with a follow-up period of 13 years. The review on children's footwear by Morrison et al., is also very thought provoking – it is definitely time to rethink our long-held conception surrounding children's footwear.

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

Kind regards,

Dr Matthew Carroll

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The identification and appraisal of assessment tools used to evaluate metatarsus adductus: a systematic review of their measurement properties

Authors: Marshall N et al.

Summary: This systematic literature review investigated the tools available to identify and measure the metatarsus adductus congenital foot deformity in newborns. Nine publications were identified that contained data that could be analysed using the COSMIN critical appraisal tool. Techniques identified included the heel bisector method, photocopies, ultrasound, footprints, dynamic foot pressure and radiographs; however, quality data reporting the reliability, validity or responsiveness in the measurement of metatarsus adductus is scarce. Several radiographic angles were found to have good reliability (intraclass correlation coefficient 0.84, 0.97) in adults during pre-operative planning.

Comment: Whilst there are numerous assessment techniques published to quantify the presence of metatarsus adductus, there is little research assessing the validity, reliability or responsiveness of these measures. This review provides a good insight into the problem faced by clinicians with many clinical tests used to assess deformity. As reported in the study, the Bleck's heel bisector method was the most frequently reported measure for assessing metatarsus adductus in the paediatric population, but the reliability, validity or responsiveness of the method has not been reported. Although this method is commonly used in research it would be interesting to know how frequently this method is actually employed in clinical practice. Of note is the finding surrounding the potential use of ultrasonography to assess classification and progression of this condition. Hopefully more research will be conducted surrounding the use of ultrasonography to classify and monitor metatarsus adductus.

Reference: J Foot Ankle Res. 2018;11:25

Abstract

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When, why and how foot orthoses (FOs) should be prescribed for children with flexible pes planus: a Delphi survey of podiatrists

Authors: Dars S et al.

Summary: This three-round Delphi consensus survey undertaken by a panel of 15 podiatry experts from Australia, New Zealand and the United Kingdom sought consensus and agreement among podiatrists on the use of foot orthoses for paediatric flexible pes planus (flat feet). 83 statements were identified by consensus and agreement for directing the diagnosis of pes planus (using Foot Posture Index [FPI-6] and/or rearfoot measures) and common signs and symptoms that direct when to intervene (pain, fatigue, abnormal gait, functional concerns). Prefabricated orthoses were the preferred intervention when their use provided adequate control, when customised orthoses are prescribed, the prescription variables of choice include a vertical (heel) cast pour (71.4%) and minimal arch fill (76.9%) plus or minus additional variables (medial heel [Kirby] skive, University of California Biomechanical Laboratory device or medial flange) dependent on disorder and plane of excessive motion.

Comment: The study sought to provide a framework applicable in the clinical environment on how best to assess diagnosis and treat paediatric flexible pes planus. Data indicated when management was required, prefabricated orthoses were preferred. Presenting symptoms guided the podiatrist's decision to intervene along with clinical signs and the presence of pain. There is no accepted framework that describes when and how foot orthoses should be used in the management of paediatric flexible flatfeet. Consequently, the authors developed a three-stage clinical protocol that combines diagnosis and signs and symptoms to provide clinical guidance surrounding specific interventions for paediatric flexible pes planus. It will be interesting to hear from clinicians as to the usefulness of this protocol to aid the decision-making processes surrounding management.

Reference: PeerJ 2018;6:e4667
Abstract

Long-term gait outcomes following conservative management of idiopathic toe walking

Authors: Davies K et al.

Summary: This study examined differences in longer-term outcomes between children with idiopathic toe walking undergoing casting and ankle foot orthotics with or without Botulinum Toxin A (n = 23; active treatment group) versus recommendations for stretching exercises (n = 20). In the casting cohort, initial contact ankle angle, peak stance dorsiflexion and toe walking severity were improved. Peak ankle power and timing of ankle kinematics and kinetics in the gait cycle were improved in both groups; however, changes in the active treatment group were larger. Both groups demonstrated improved internal plantar flexor moments, however, knee extension increased in stance and passive ankle dorsiflexion decreased in both groups (p = 0.001). Intermittent toe walking occurred in 49% of participants.

Comment: The authors provide insight into the long-term effects on gait of various management strategies for idiopathic toe walking. The study compared gait outcomes between those who received active (serial casting with or without Botulinum Toxin A injections and ankle foot orthotics) and inactive (stretching program) treatment. In consideration of the small follow-up sample size, data indicated that children with mild-to-moderate idiopathic toe walking who are actively treated demonstrate significant improvements in ankle kinematics, ankle kinetics, and severity of deformity. Also of note is that irrespective of the treatment strategy, idiopathic toe walking in childhood led to no restrictions in participation in adolescents. It seems that early diagnosis and active treatment may be advocated in the management of idiopathic toe walking.

Reference: Gait Posture 2018;62:214-19
Abstract

Gait and footwear in children and adolescents with Charcot-Marie-Tooth disease: A cross-sectional, case-controlled study

Authors: Kennedy RA et al.

Summary: This cross-sectional study examined differences in spatiotemporal gait variables and gait variability between children with (n = 30) and without (n = 30) Charcot-Marie-Tooth disease (CMT). The CMT children walked more slowly (mean -13.81 cm/s; $p < 0.001$), with shorter steps (mean -6.28 cm; $p < 0.001$), a wider base of support (+2.47 cm; $p < 0.001$) and greater base of support variability (0.48 cm; $p = 0.002$) versus control children. In the combined group of children, gait was slower in suboptimal than optimal footwear (-7.55 cm/s; $p < 0.001$) and faster than when barefoot (-7.42 cm/s; $p < 0.001$).

Comment: This study is one of a few that have investigated the effects of footwear in children with CMT. Gait characteristics in typically developing and children with CMT were examined whilst wearing optimal (defined as footwear that enclosed the foot, had a heel cup, fastened firmly with a low heel height <25 mm) and suboptimal footwear (footwear that slipped on, didn't fasten securely around the foot, didn't enclose the heel, or had a high heel height ≥25 mm). Study data demonstrated that footwear choice affected gait in both study groups. Base of support was wider in optimal and suboptimal footwear compared to barefoot. The magnitude of difference was almost double in suboptimal footwear compared to optimal footwear. Gait in suboptimal footwear was also slower with reduced step length. The study has some important clinical considerations. First, walking in suboptimal footwear results in worse gait performance. Second, fitting optimal footwear for children with compromised gait is important, particularly in the case of CMT where they may be less able to successfully compensate for such changes brought about by loose or unfastened footwear. Third, footwear is an important factor when considering children's functional gait performance, suboptimal footwear characteristics leading to reduced gait performance.

Reference: Gait Posture 2018;62:262-67
Abstract

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.

Big issues for small feet: developmental, biomechanical and clinical narratives on children's footwear

Authors: Morrison SC et al.

Summary: This narrative review assessed developmental, biomechanical and clinical studies to examine the role of footwear on foot development. Findings support the need for advances in paediatric footwear science and in understanding the interaction between the foot and shoe.

Comment: What education do you provide to parents surrounding footwear, particularly for younger children? The review presents the current evidence surrounding children's footwear from three perspectives, developmental, biomechanical and clinical. Of interest to many is the evidence surrounding the use of soft and flexible or hard and stiffer footwear for the developing foot. However, there is currently no body of evidence informing guidance on shoe stiffness, with few studies exploring this issue. Literature suggests that footwear influences gait parameters, but whether these effects are important in terms of function or longer-term foot health and development remains to be determined. As determined by the McRitchie study (see right) in adult footwear, the social dimension (what the footwear means to the child) and an understanding what factors influence parental footwear selection, also warrant important consideration by the practitioner. This review provides some great thoughts surrounding a move away from some long-held beliefs surrounding children's footwear, due to the many pre-held conceptions not being supported by a base of evidence.

Reference: J Foot Ankle Res. 2018;11:39
Abstract

Footwear choices for painful feet – an observational study exploring footwear and foot problems in women

Authors: McRitchie M et al.

Summary: This study examined whether footwear purchased by 67 female participants who routinely received podiatric treatment were associated with foot pain, and used a questionnaire to assess determinants of purchase decisions. There was a high prevalence of structural foot pathology among participants aged over 61 years who preferred slip on shoes who also wore shoes that were narrower than their feet, with the width difference correlated to the presence of hallux abductovarus. Individual footwear advice was important as footwear worn to podiatry appointments were not always worn on a daily basis.

Comment: The difficulty of providing sound education surrounding footwear is highlighted by this study. The study provides some pertinent clinical findings. First, younger women were more likely to have feet measured prior to purchasing shoes and would alter the sizing of the shoe to fit compared to the older women who rarely had the foot measured and would not change the shoe size. Second, purchasing factors differed between younger and older women. Younger women citing comfort and activity as the purchasing reasons, whereas older women citing shape of the heel, comfort, colour and fit. Third, it is not uncommon for people to wear the wrong size of shoe; 60% of participants within both age groups from this study had a difference of more than 0.5 shoe sizes between right and left foot. Finally, data suggested that women's body image is significant when choosing footwear. With this in mind, clinicians need to place greater emphasis on image and style of suggested footwear, particularly where compliance is required to achieve optimal clinical outcomes.

Reference: J Foot Ankle Res. 2018;11:23
Abstract

Chronic Achilles tendinopathy treated with eccentric stretching program

Authors: Verrall G et al.

Summary: This study examined use of a modified 6-week eccentric heel-drop program (reduced time and increased duration of stretch) in 190 patients with chronic (>12 weeks) Achilles tendinopathy (168 mid-substance, 22 distal insertional). Visual Analogue Scale (VAS) assessment of pain indicated a reduction from a mean of 7.2 to 2.9 ($p < 0.01$) after 6 weeks stretching; mean VAS pain rating was 1.1 after 6 months. Patient satisfaction was ≥7 (excellent) in 80% of patients.

Comment: This article provides a concise update related to the current evidence for management of Achilles tendinopathy. The evidence update summarises the current evidence with regard to exercise and injectable therapies as well as other interventions including electrotherapy, manual and soft tissue therapy, external support and orthotics and insoles. Currently, loading protocols combined with other modalities are supported by literature to reduce pain associated with Achilles tendinopathy. Although progressive muscle/tendon loading is advocated, it is unclear what programs and progressions are best. It is, however, clear that the wait and see approach and other passive treatments such as ice therapy have poorer outcomes and rehabilitation should be based on progressive loading of the muscle-tendon unit.

Reference: Foot Ankle Int. 2011;32(9):843-9
Abstract

Plantar pressure measurements and geometric analysis of patients with and without Morton's neuroma

Authors: Naraghi R et al.

Summary: This study examined differences in plantar pressure measurements and geometric variables between 52 patients with Morton's neuroma and 31 controls. No differences between patients with Morton's neuroma and control subjects were observed in peak pressure, contact time, and pressure-time integral under the metatarsal heads, forefoot width, foot length, coefficient of spreading or foot progression angle.

Comment: The study compared plantar pressure measurements between patients with asymptomatic neuromas and an asymptomatic control group. Whilst data indicated no significant differences in forefoot plantar-pressure measurements and force-time integrals between the two groups, this should not detract clinicians from using plantar pressure analysis in patients with suspected forefoot neuromas. Although the participants in this study with Morton's neuroma were asymptomatic, many patients present for treatment due to pain stemming from the neuroma. It would be expected that plantar pressure measurements in a painful forefoot neuroma would be altered due to pain guarding. In these cases, pressure measurements can be used to monitor the effectiveness of therapy. The results from this study also point towards a potential footwear influence, in the development of neuromas. It would have been interesting to examine the in-shoe plantar pressure measurements in the same population.

Reference: Foot Ankle Int. 2018;39(7):829-35
Abstract

Intratissue percutaneous electrolysis vs corticosteroid infiltration for the treatment of plantar fasciosis

Authors: Iborra-Marcos Á et al.

Summary: This study compared intra-tissue percutaneous electrolysis (EPI; n = 32) with corticosteroid infiltration (n = 32) for the treatment of plantar fasciosis. After 12 months, both ultrasound-guided EPI and corticosteroid infiltration were associated with clinical and echographic improvements ($p < 0.001$) improving VAS pain and Foot and Ankle Disability Index (FADI) score, although corticosteroid infiltration required fewer visits and gave somewhat better VAS and FADI results.

Comment: EPI is a technique that involves the use of a high-intensity galvanic current sent through an acupuncture needle that acts as a negative electrode. It has been shown experimentally to provoke an electrochemical reaction at the point of application, which causes a change in the extracellular pH. This leads to the destruction of the tissue and the induction of phagocytosis, and eventually biological repair. The inflammation provoked is very localised and healing is reported to be rapid. Both techniques investigated in this study demonstrated significant reductions in fascial thickness and significant improvements in pain and functionality. Whilst the study does demonstrate the potential usefulness of EPI, due to methodological limitations, the study does not demonstrate the effectiveness of the technique as a frontline treatment for plantar fasciosis. As with all newer injectable treatments for plantar fasciosis, more research examining long-term outcomes is required.

Reference: Foot Ankle Int. 2018;39(6):704-11
Abstract

Current concepts review: Plantar fibromatosis

Authors: Espert M et al.

Summary/Comment: Plantar fibromatosis is characterised by slow-growing nodules that accumulate in the medial plantar aponeurosis due to local proliferation of abnormal fibrous tissue within the plantar fascia. This review provides a good overview of diagnosis and the role of imaging. Non-operative treatment options are detailed including hormonal therapy, radiotherapy, corticosteroid injections, collagenase injections and percutaneous ultrasonic treatment. Operative treatment options are also detailed. The review concludes with a summary of management recommendations based on evidence. Orthotics and in-shoe modifications are recommended as an initial treatment option, but lack the support of studies demonstrating efficacy. Likewise the efficacy of corticosteroid and collagenase injection remains unknown. Operative treatment options including local excision are recommended in recalcitrant cases and are supported by fair evidence.

Reference: Foot Ankle Int. 2018;39(6):751-57
Abstract