• REHABILITATION • TRAUMA • DIABETES • BIOMECHANICS • SPORTS MEDICINE

ler

LOWER EXTREMITY REVIEW

February 16 / volume 8 / number 2

Texting while walking:

Gait adaptations and injury implications

+

O&P
AFO DESIGN CHANGE IMPROVES FOREFOOT MOTION IN PTTD

DIABETES
PATIENTS WITH AT-RISK FEET NEED COLLABORATIVE CARE

SPORTS MEDICINE
DYNAMIC LOAD ANALYSIS FOR INJURY PREVENTION

GAIT ANALYSIS
BIOMECHANISTS EXPLORE EFFECT OF OBESITY ON FALLS

Positive Outcomes for Successful Practitioners

IT SOFTEN HEAT PATC

IT CAN BE ON SITE.

Introducing EXOS® functional inserts featuring our proprietary carbon nano-tube shell for easier reform-ability. It will change the way you fit your patients because it softens with moderate heating from an exothermic patch, allowing you to make adjustments in front of your patient before it hardens back to a carbon graphite-like state when cooled.

NO.66

BLACK STRETCH PU

EST. 2015

ANODYNE SHOE MFG 2015 QUALITY GOODS

SHOE MFG

ANODYNE

PREMIUM QUALITY

NO.66 STRETCH PU

Finally, a stretch shoe that looks like leather. Diabetic shoes don't have to look like diabetic shoes.

TO LEARN MORE, visit
www.anodyneshoes.com

EST. 2015

SHOE MFG

ANODYNE

PREMIUM QUALITY

It seems everywhere we go, no matter the occasion; we're yearning for a sense of relief. A comfort in where we stand. And for many of us, it's not just where we stand. It's how we stand and what's keeping us going. It's easy to forget (and neglect) what allows us to stay active and on to our next venture. After all, the root of what keeps us stable, upright, and moving, is our feet.

An anodyne, by definition, is something that brings you a sense of soothing and comfort. The comfort we desire (and in some cases need) is unique to each of us. We believe that you deserve shoes that will meet your comfort and style needs, and allow you to maintain an active, healthy and productive lifestyle.

In a far too stagnant market of comfort-based footwear, we're bringing you an unparalleled collection of therapeutic and, at the very same time, refined footwear. At Anodyne, we've avoided the commercial vision of quick and easy comfort. Instead, we've returned to the fundamental roots of footwear – meticulous design, quality craftsmanship, and rigorous attention to detail. We're re-inventing the paradigm in comfort, and we want you to experience it firsthand.

1-844-637-4637

www.anodyneshoes.com

Acor Orthopaedic
www.acor.com

Allied OSI Labs
www.aolabs.com

ComfortFit Orthotic Labs
www.comfortfitlabs.com

Eastern Podiatry Lab
www.eplorthotics.com

Fiber Orthotics
www.fiberorthotics.com

Hersco Ortho Labs
www.hersco.com

Integrity Orthotics
www.integrityortho.com

JSB Orthotics
www.jsbinc.com

KLM Orthotic Labs
www.klmlabs.com

Marathon Orthotics
www.marathonortho.com

Root Lab
www.root-lab.com

SOLO Labs
www.sololabs.com

STJ Orthotic Services
www.stjorthotic.com

SureFit
www.surefitlab.com

For our distributor's bios, go to www.richiebrace.com

Celebrating 20 Years

In 1995 the Richie Brace was introduced and revolutionized the industry.

Over 20 years, many have attempted to emulate, but none have surpassed the proven quality and performance of the Richie Brace and its family of products.

Our success is founded on our innovative and dependable products which are delivered to the practitioner by our outstanding Richie Brace family of distributors.

Together, we look forward to the next 20 years of positive patient outcomes!

Thank you for your Support!

For more information visit:
richiebrace.com

THE Richie BRACE
RESTORING MOBILITY®

Lower Extremity Review

ler

February 2016

features

VOLUME 8 NUMBER 2 LERMAGAZINE.COM

Custom AFO Gauntlets FROM ACOR®

Standard Features

- Soft PORON®-padded collar
- Molded polypropylene inner shell with PORON® padding throughout
- Lined with leather or optional X-Static®-lined NeoSponge™
- PORON® + Multicork™ orthotic
- In-house turnaround time of 7-10 business days
- *PDAC Letters available at: www.acor.com/PDAC-Sadmerc.php

L1940
L2330
L2820
L5000 *(G9118)*

Standard

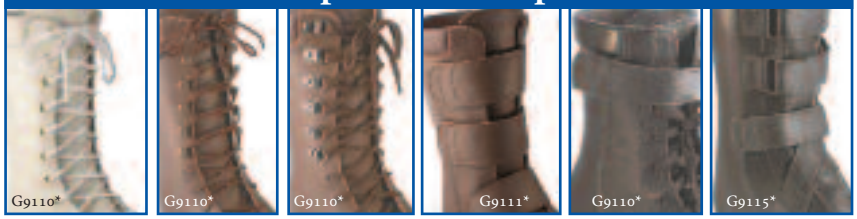
Flexure Joint Articulating

Dorsi-Assist Articulating

Chopart Toe Filler

ACOR AFO Gauntlets are available with your choice of three polypropylene reinforcements.

Multiple Closure Options



Lace | Boot Hooks | Speed Lacer | Velcro | Lace/Velcro | Navicular Strap

18 Color Options!

(natural leather - colors may vary)

black	brown	bone	white	taupe	navy blue
oak	sand	pink	red	orange	yellow
purple	royal blue	kelly green	light grey	medium grey	sky blue

www.acor.com
orderentry@acor.com

800-237-2267
(option 2)

Scan this barcode with your smartphone QR reader
or visit:
www.acor.com/downloads.php
to download our new catalogs

Look for us:

Lower Extremity Review

ler

Publisher
Richard Dubin | rich@lermagazine.com

Editor
Jordana Bieze Foster | jordana@lermagazine.com

Senior editor
Emily Delzell | emily@lermagazine.com

Associate editor
P.K. Daniel | pk@lermagazine.com

Operations coordinator
Melissa Rosenthal-Dubin | melissa@lermagazine.com

Social media consultant
Kaleb S. Dubin | kaleb@lermagazine.com

New products editor
Rikki Lee Travolta | rikki@lermagazine.com

Graphic design & production
Christine Silva | MoonlightDesignsNC.com

Website development
Anthony Palmeri | PopStart Web Dev
webmaster@lermagazine.com

Circulation
Christopher Wees | Media Automation, Inc

Our Mission:

Lower Extremity Review informs healthcare practitioners on current developments in the diagnosis, treatment, and prevention of lower extremity injuries. LER encourages a collaborative multidisciplinary clinical approach with an emphasis on functional outcomes and evidence-based medicine. LER is published monthly, with the exception of a combined November/ December issue and an additional special issue in December, by Lower Extremity Review, LLC.

Subscriptions may be obtained for $38 domestic. and $72 international by writing to: LER, PO Box 390418, Minneapolis, MN, 55439-0418. POSTMASTER: Please send address changes to LER, PO Box 390418, Minneapolis, MN, 55439-0418.

Lower Extremity Review
292 Washington Ave. Ext. #105, Albany, NY 12203
518/452-6898

GET INVOLVED AND STAY CONNECTED WITH THE GROWING LER SOCIAL MEDIA NETWORK!

Visit lermagazine.com today to stay up to date on critical lower extremity information, subscribe to our monthly e-newsletter, and join the conversation on our vast, ever-expanding social media network.

facebook.com/LowerExtremityReview
76,000 post views per month

@lowerextremity
2,849 Followers

youtube.com/user/LowerExtremityReview
137,000 video views

instagram.com/lowerextremity/
233 followers

pinterest.com/lowerextremity/
291 followers

With PolyMem®, finger and toe injuries don't have to slow you down.

Save time with PolyMem Finger/Toe dressings, which are easy to apply – even for patients themselves – and often require fewer dressing changes thanks to their unique design. Simply roll the dressing onto the injured digit and let PolyMem do the work. PolyMem dressings help reduce edema, bruising, pain and inflammation when applied to open or closed injuries.

THE IDEAL CHOICE FOR MANAGING:

- Sprains
- Strains
- Contusions
- Abrasions
- Lacerations
- Burns
- Ulcers
- Matricectomies

NEW, BIGGER sizes available – ideal for large toes!

CLEANSES
MOISTENS
PolyMem
FILLS
ABSORBS
more healing • less pain®

Ferris Mfg. Corp. 5133 Northeast Parkway, Fort Worth, TX 76106 USA • +1 817-900-1301 • www.polymem.eu

MKL-619, REV-1, 0913

Lower Extremity Review
ler

out on a limb: Arch triumphs

New research from the University of Western Australia will put some extra spring in a runner's step – but only if he or she is wearing the right kind of footwear.

In discussions of running mechanics, we hear a lot about the spring-like properties of the lower extremities, which are significantly dependent on the tendons' ability to store and release energy, reducing demand on muscles and in turn improving metabolic efficiency. What we don't hear as much about—although the concept is hardly new—are the spring-like properties of the arch of the foot and how those might also improve running economy.

Considerable effort has been made to design foot orthoses and other interventions that will help maintain the structural integrity of the arch of the foot. But during running, the arch of the foot becomes elastic, storing energy as it is compressed and releasing energy as it recoils. Those spring-like properties, like those of tendons, would seem to be beneficial for improving running economy.

But this raises the question of whether foot orthoses that limit arch compression will negatively affect the metabolic cost of running. That's what the new Australian study, published in mid-January by *Scientific Reports*, was designed to assess.

The researchers found that, during moderate-speed running in lightweight, zero-drop shoes, foot orthoses designed to limit arch compression by 80% increased metabolic cost by about 6%—a figure that would likely be higher at faster running speeds. Although forefoot-strike running is associated with greater arch compression than rearfoot-strike running, the study found that habitual foot strike pattern did not appear to influence the effects of the intervention.

The metabolic cost of walking was not significantly affected by limiting arch compression, which the authors hypothesized is because walking involves lower loads than running and is more dependent on the windlass function of the arch than its spring-like properties.

The authors concluded that runners will want to weigh the potential biomechanical benefits of footwear or orthotic devices that restrict arch compression against the potential negative effects on running economy. And that seems reasonable enough.

But what about the possibility that footwear or orthotic devices could be designed to enhance the spring-like properties of the arch rather than restricting them?

> The spring-like properties of the arch of the foot may improve running economy. Could the right footwear design help even more?

In the March 1996 issue of *Research Quarterly for Exercise and Sport*, investigators from the University of North Carolina-Greensboro assessed a prototype running shoe with a carbon fiber leaf-spring component in the midfoot area of the midsole precisely for this purpose. The prototype shoe, which also included an elastic strap designed to mimic the spring-like action of the Achilles tendon, was associated with up to 2% less oxygen uptake than a conventional running shoe—a difference that the authors said could take up to two minutes off an elite runner's marathon time.

Oddly, however, this type of approach to improving running performance does not appear to have gained much traction in the last 20 years. Perhaps that means the market is poised for what you might call a spring awakening.

Jordana Bieze Foster, *Editor*

2016
Early Spring Collection

Consummate style, superior comfort and industry-leading construction showcase this new collection of Apex footwear. Each pair is meticulously crafted with the highest quality materials and designed for agility and ultimate durability.

Apex is proud to offer this new collection while continuing its long tradition of manufacturing the finest foot health products available on the market today.

APEX®
An OHI Company

For our new catalog or to order
Call 800-252-2739 or log onto apexfoot.com

The OHI Family of Brands

APEX | AZafo ARIZONA | Langer Biomechanics | PedAlign | safestep PREVENTION PAYS | The Orthotic Group

Skipping hip surgery

FAI responds to conservative care

By John C. Hayes

A pilot study has found that conservative management of femoroacetabular impingement (FAI) can provide improvements in pain and function equivalent to those usually achieved with surgery.


Istockphoto.com #34142360

The study, epublished in January by the *Journal of Science in Medicine and Sport*, joins a growing effort by researchers to evaluate treatment options for FAI other than the traditional approaches used by orthopedic surgeons.

Future studies may establish that there is a population of FAI patients that could be conservatively managed and avoid surgery, said principal study author Alexis A. Wright, PhD, assistant professor and assistant chair of the Department of Physical Therapy at High Point University in North Carolina.

Fifteen patients (11 women) with FAI were randomized to two groups: eight patients received a combination of manual therapy and supervised exercise, plus advice on home exercise; seven patients received advice and home exercise alone. Outcomes included self-reported average pain and physical function as measured by the Hip Outcome Score (HOS).

After seven weeks, the researchers found no statistically significant differences between the two groups in either measure and also that outcomes were equivalent to what is found in the surgery literature. Functional outcomes under the HOS Activities of Daily Living subscale went from 74.3% at baseline to 81.1% for the therapy group, and from 73.8% to 85.1% for the home group. Mean pain scores fell from 39.9 to 22.3 on a 100-point scale for the therapy group and from 39.1 to 21.1 for the home group.

Continued on page 14

Risk of lower extremity injury increases after athletes return from concussion

Collegiate athletes who sustain a concussion have an increased risk of a lower extremity injury long after returning to play, according to two recent studies that strengthen the case for a brain-sprain connection.

Investigators from the University of Wisconsin-Madison tracked the incidence of lower extremity injury for each of 75 athletes in the 90 days following return to play, and in up to three matched uninjured athletes during that same 90-day period. Concussed athletes were 2.48 times more likely than uninjured athletes to sustain a musculoskeletal injury during that time.

The findings, epublished in January by the *American Journal of Sports Medicine*, are consistent with those of a study from the University of North Carolina at Chapel Hill. In the latter study, published in December 2015 by *Medicine & Science in Sports & Exercise*, collegiate athletes who returned to play after a concussion were 1.97 times more likely to sustain a lower extremity injury in the year following their concussion than in the year preceding it.

– Jordana Bieze Foster

Sources:

Brooks MA, Peterson K, Biese K, et al. Concussion increases odds of sustaining a lower extremity musculoskeletal injury after returning to play among collegiate athletes. Am J Sports Med 2016 Jan 19. [Epub ahead of print]

Lynall RC, Mauntel TC, Padua DA, Mihalik JP. Acute lower extremity injury rates increase after concussion in college athletes. Med Sci Sports Exerc 2015;47(12):2487-2492.

Preventive measures in cross-country runners should target ankle kinematics

Ankle kinematics prospectively predict injury risk in collegiate cross country runners, according to prospective research from the University of Memphis in Tennessee.

Investigators used a motion analysis system and a force plate to assess the running gait of 19 cross country athletes prior to the start of their competitive season; 10 of those runners sustained injuries during the season.

Ankle eversion range of motion and peak eversion velocity at baseline were significantly higher in the uninjured athletes than their injured counterparts, while peak eversion angle was significantly greater at baseline in the injured runners than the uninjured runners. Peak loading rate of the vertical ground reaction force, which is thought to be a risk factor for some running-related injuries, did not differ significantly between groups. Strike index, dorsiflexion range of motion, and eversion duration were also similar for the two groups.

The findings, epublished in January by *Human Movement Science*, suggest that interventions designed to address ankle eversion, eversion velocity, and eversion angle may help prevent running-related injuries in cross country runners.

– Jordana Bieze Foster

Source:

Kuhman DJ, Paquette MR, Peel SA, Melcher DA. Comparison of ankle kinematics and ground reaction forces between prospectively injured and uninjured collegiate cross country runners. Hum Mov Sci 2016 Jan 28. [Epub ahead of print]

Continued from page 13

"What this suggests is that, in this patient population, conservative treatment measures might be useful; even the ones with stretches and very basic strengthening exercises did show improvement," Wright said.

Although there are few published studies of conservative FAI management, Wright said there is a precedent in studies of shoulder impingement, which have found that the condition can be managed without surgery in its early stages. Unfortunately, the opportunity for early therapy is usually missed in FAI because the diagnosis is made an average of three years after the onset of symptoms. At that point, the patient is usually referred to an orthopedist and the solution is surgery.

"I do think we're fighting an uphill battle," Wright said of those who think conservative management might be a good option for FAI. "Once [patients] have in their mind that surgery is the only option, they are less likely to respond to or try physical therapy measures."

Improved clinical criteria so FAI is diagnosed earlier, along with studies that demonstrate to clinical therapists which nonsurgical measures might work, may help, Wright said.

Devyani Hunt, MD, an associate professor of orthopedic surgery at Washington University in St. Louis, MO, said her group's research on conservative management of FAI and other hip pathologies has led to change in management of patients.

Today at Hunt's facility it is common for such patients to receive conservative therapy and they may benefit from it even if they do proceed to surgery, she said. Conservative therapy, for example, can treat biomechanical issues associated with FAI and thus improve surgical outcomes, although there are no published data on this.

Their approach is to provide basic protocols for FAI but give therapists the option to vary the regimen because hip pathology can reflect a combination of factors for each patient, Hunt said. Wright et al's study, which examined different approaches to conservative therapy, adds to the evidence on which therapists base their treatment decisions, Hunt said. Larger studies are still needed, she added.

Although the High Point and St. Louis groups both found improved function and pain with conservative therapy, each group also found that more than half of conservatively treated patients went on to surgery. Part of this may reflect the needs and expectations of individual patients.

For example, Wright said one of the patients in her study was a Division I track and field athlete, for whom the improvements associated with conservative care did not allow him to compete at a high level. He was one of those who went on to surgery, Wright said. ler

Sources:

Wright AA, Hegedus EJ, Taylor JB, et al. Non-operative management of femoroacetablar impingement: A prospective, randomized controlled clinical trial pilot study. J Sci Med Sport 2016 Jan 6. [Epub ahead of print].

Hunt D, Prather H, Harris Hayes M, Clohisy JC. Clinical outcomes analysis of conservative and surgical treatment of patients with clinical indications of prearthritic, intra-articular hip disorders. PM R 2012;4(7):479-487.

Extension correction

AFO design improves PTTD mechanics

By Larry Hand

When a lamp cord doesn't quite reach an outlet, you reach for an extension cord. So when a custom ankle foot orthosis (AFO) didn't quite provide the corrected forefoot abduction desired in patients with posterior tibial tendon dysfunction (PTTD), researchers from Syracuse, NY, added a lateral extension.

The two orthotic devices used for testing: the standard-length AFO (left) and the AFO with lateral extension (right). (Reprinted with permission from Neville C, Bucklin M, Ordway N, Lemley F. An ankle foot orthosis with a lateral extension reduces forefoot abduction in subjects with stage II posterior tibial tendon dysfunction. J Orthop Sports Phys Ther 2016;46(1):26-33.)

Investigators from State University of New York Upstate Medical University found that an AFO with a lateral extension was associated with significantly greater forefoot abduction than a standard AFO while maintaining control over hindfoot inversion and eversion. The findings were published in the January 2016 issue of the *Journal of Orthopaedic & Sports Physical Therapy*.

"What has been lacking in findings from previous studies is this particular foot kinematic of forefoot abduction, which is noted in subjects with PTTD," said Christopher Neville, PT, PhD, associate professor of physical therapy. "What we've seen is that the forefoot abduction wasn't corrected well. This study looked at a new component of a device, being this lateral extension, as an attempt to try to correct

Continued on page 16

Study reports improved pain and gait with walker boot after ankle surgery

A walker boot is preferable to two other ankle devices for improving pain and gait after internal fixation for ankle fracture, according to research from the University of Oxford in the UK.

Investigators analyzed 18 patients six weeks after surgery under three ankle device conditions: a walker boot, a stirrup brace, and an elastic sleeve.

The stirrup brace and, to a greater extent, the walker boot were associated with less pain and single-limb support time asymmetry than the sleeve. The walker boot was also associated with a significantly wider step width than the sleeve, which may improve gait stability.

The findings, epublished in January by the *Journal of Orthopaedic & Sports Physical Therapy*, contrast with those of a similar December 2015 study of healthy individuals by the same research group. In that study, published by the *Journal of Electromyography & Kinesiology*, gait asymmetry was significantly worse in the walker boot than the two other devices. ler

– Jordana Bieze Foster

Sources:

Keene DJ, Willett K, Lamb SE. The immediate effects of different types of ankle support introduced 6 weeks after surgical internal fixation for ankle fracture on gait and pain: a randomized, crossover trial. J Orthop Sports Phys Ther 2016 Jan 26. [Epub ahead of print]

Keene DJ, Willett K, Lamb SE. The effects of ankle supports on gait in adults: a randomized cross-over study. J Electromyogr Kinesiol 2015;25(6):973-981.

Surgical shoe findings support limits on driving after bunion procedures

Patients should refrain from driving for at least six weeks after bunion surgery due to poor braking response times that are not improved with the use of surgical shoes, according to findings from the Medical University of Innsbruck in Austria.

The researchers assessed braking response time in 42 patients using a driving simulator immediately before and at two and six weeks after first metatarsal osteotomy for hallux valgus deformity on the right foot. Testing at two and six weeks included two orthotic conditions—a hallux valgus shoe and a typical forefoot relief shoe.

The mean braking response time for each of the orthotic conditions was significantly longer at two and six weeks postoperatively than at preoperative testing (in the patients' own footwear). The percentage of patients with a braking response time below the threshold level of 700 milliseconds (based on local road authority recommendations) was also higher preoperatively than at two and six weeks for all orthotic conditions.

The findings were published in January by the *Journal of Orthopaedic Surgery and Research*. ler

Source:

Dammerer D, Braito M, Biedermann R, et al. Effect of surgical shoes on brake response time after first metatarsal osteotomy—a prospective cohort study. J Orthop Surg Res 2016;11(1):14.

Continued from page 15

that one piece that was missing. In summary, the findings are that it seems to do that. It also seems to maintain correction of the medial longitudinal arch height."

Neville and colleagues evaluated the gait of 15 people with stage II PTTD under three conditions: a standard nonarticulated custom AFO, the same AFO with a lateral extension, and a shoe-only control condition.

Both AFOs consisted of a 3-mm polypropylene shell inside a leather cover. The standard AFO ended just proximal to the metatarsals; with the lateral extension added during fabrication, the experimental AFO rounded the fifth metatarsal head.

Each participant wore one AFO for an hour per day, alternating AFOs from one day to the next, for an average of eight days. Laboratory testing consisted of walking trials along a 5-m walkway at a self-selected speed, with the AFO conditions tested in random order.

The AFO with the lateral extension resulted in significantly greater forefoot adduction (1.3°) than the standard AFO (-1.3°) and the shoe-only condition (-2.8°).

Both AFOs were associated with more hindfoot inversion at terminal stance than the shoe alone, but the extended AFO also resulted in more hindfoot inversion at loading response than the shoe only. Both AFOs also improved upon the shoe-only condition in terms of forefoot plantar flexion, but the extended AFO was associated with more forefoot plantar flexion than the standard AFO.

The findings could have important clinical implications, Neville said.

"For me, as a practitioner, if I saw people that I thought had really significant forefoot abduction as part of the deformity, then this would be a good brace component to use," Neville said.

Adding the lateral extension did not adversely affect the fitting of the AFOs in the shoes used in the study, but shoes with a wide toe box are needed, he said.

"I think people should think about this as a concept. A lateral extension can likely be added to many orthotic designs to achieve greater control of excessive forefoot abduction," Neville said.

Leigh Davis, MSPO, CPO, prosthetist and orthotist at Children's Healthcare of Atlanta, GA, and treasurer of the American Academy of Orthotists & Prosthetists, agreed.

"It's really important for us as orthotists to know what specific orthotic design features are important for this patient population," Davis said.

The potential utility of the new design feature may extend beyond the PTTD population, she said.

"I think it's applicable to a lot of patient populations," Davis said. "They're really showing that a long lateral border can change the position of the forefoot. I think that anyone could integrate this right away into practice for any patient who has a forefoot abduction tendency and utilizes an AFO."

Source:

Neville C, Bucklin M, Ordway N, Lemley F. An ankle foot orthosis with a lateral extension reduces forefoot abduction in subjects with stage II posterior tibial tendon dysfunction. J Orthop Sports Phys Ther 2016;46(1):26-33.

Put Some Spring in Their Step

Posterior Spring AFO Stores & Releases Energy with Every Step

A Dynamic AFO with Progressive Flexibility from Heel to Toe

Ultra Light Carbon Fiber Construction

Made from Prepreg Carbon Fiber

Custom Foot Bed with Foam Padding

Or Custom Proflex® SMO for Enhanced Ankle Control

Easily Fits in Shoe

Dynamic Energy Return

Adjustable Anterior Shell

Overlapping posterior section allows for compression of the proximal tiba. Removable for easy donning.

Open Heel Design

Provides soft initial floor contact preventing sudden knee flexion

Suggested L- Codes: L1945, L2755, L2820

CustomComposite

Custom Composite Manufacturing, Inc.

www.cc-mfg.com | 866-273-2230

Texting while walking:

Gait adaptations and injury implications

It's not surprising that tactile interaction with a smartphone while walking can increase the risk of traumatic injury, but texting while walking also affects gait in ways that may ultimately have long-term effects.

By Shalmali Pal

Istockphoto.com #29794650

Texting fails are funny—at least that's the prevailing opinion on the Internet, which offers millions of videos and memes of ordinary folks tripping, falling, and face-planting while attempting to text, email, or engage in some other device-related activity, and walk simultaneously.

Of course, what these vignettes don't reveal are any injuries sustained from texting while walking. A 2013 study in *Accident: Analysis and Prevention* found that the number of pedestrian emergency department visits for injuries related to cell phones tripled from 2004 to 2010, although the total number of pedestrian injuries dropped during that period.[1] Texting while walking accounted for 9% of those injuries; given that the iPhone wasn't introduced until 2007, that percentage can be expected to have increased.

A recent survey of more than 2000 US adults by the American Academy of Orthopaedic Surgeons (AAOS) reported that 28% of the respondents admitted to using a smartphone for texting or other nontalking tasks while walking, while 85% said they had seen others doing so.[2] Nearly 40% said they had witnessed a distracted walking incident that resulted in an injury, and 26% had been involved in such an incident themselves.[2]

Distraction alone—not seeing a telephone pole until it's too late, for example—can account for some injuries related to texting while walking, but such mobile multitasking also influences gait in ways that may ultimately have long-term effects.

Does slow equal steady?

Numerous studies have analyzed the impact of dual tasks—specifically, tasks that cause cognitive distraction—on gait. With regard to texting as a dual task, many studies have consistently found that it does have an effect on gait, and that's mostly to slow a person down.

For instance, Italian researchers in the *Journal of NeuroEngineering and Rehabilitation* assessed 18 healthy young adults who did not have problems with vision, or neurological or musculoskeletal disorders that could affect their gait.[3] Barefoot participants walked a straight path of 15 meters (about 50 feet) for three minutes under two conditions: walking alone and walking while texting.

They found that texting while walking differed from walking alone in terms of muscle activation, kinematics, and spatiotemporal variables. Texting was associated with delayed activation of the gastrocnemius lateralis muscle and slightly increased ankle dorsiflexion followed by slightly reduced plantar flexion. It was also associated with a slower gait speed, reduced cadence and stride length, increased flat-foot contact, and decreased push-off. The researchers also found increased co-contraction of the ankle antagonist muscles during what

Continued on page 20

Istockphoto.com #29794650

Continued from page 19

they called the "critical" gait phase—from load response to midstance, corresponding to the transfer of body weight from one leg to the other.

They attributed the findings to a central nervous system (CNS) adaptation under the dual-task condition in response to an increased need for ankle stabilization.

Lead author Valentina Agostini, PhD, a research assistant in the department of electronics and telecommunications of the Politecnico di Torino in Italy, told *LER* that she was somewhat surprised by the small reduction in speed (10%) associated with texting while walking in her group's study, given that previous research put the reduction in walking speed during texting anywhere from 23% to 32%.[4]

But she also pointed out that the study design was different than previous experiments, which had participants type preassigned sentences or retype a phrase that appeared on the device's screen. In her group's study, the volunteers were asked to recall an event from the previous day, and then type a message about that event.

"This kind of [recall] activity is rather typical when using WhatsApp, Facebook, etc. It implies that the subject does not just 'type-type-type'...but rather 'think and type' while walking," Agostini explained. "The volunteers most probably spent some time just thinking (without typing) since they had to remember what happened the day before, and decide which events they wanted to describe and how. This might explain the small velocity reduction observed. When they were thinking, they had more time to look at the path."

In a paper in *PLoS One*, Sammy Licence, an MSc student at the University of Bath in the UK, and colleagues upped the ante by examining the impact of texting while walking and negotiating barriers, including a curb, uneven ground, traffic cones, stairs, and finally two dummies to maneuver around.[5] The parameters they looked at during the dual task included step count, time, frequency, and length and barrier clearance.

The participants were adults aged 18 to 50 years, were not on any medications that could induce dizziness, and did not have any known problems with foot health or gait

Shorter step length ⚠

problems, according to coauthor Conrad Earnest, PhD, a research scientist in the department of health and kinesiology at Texas A&M University in College Station, and director of clinical research at Woodbolt International, a nutritional supplement company in Bryan, TX.

Overall, they reported that it took significantly longer for participants to complete the course—because of slower walking speeds and shorter step lengths—while texting on their own phone, and while taking a math quiz on an iPhone supplied by the researchers (cognitive condition), versus walking alone. It also took people longer to negotiate the stairs during texting and the cognitive condition.

However, the volunteers also managed greater clearance heights while using a device versus walking alone. Notably, the incidence of making contact with a barrier—which would increase the risk of a trip or fall—did not differ significantly among the conditions, which surprised the researchers.

The results suggest "those who walk and text adopt a 'protective' gait pattern alteration in order to minimize the risk of potential accidents," they concluded.

Finally, a study out of Australia in *PLoS One* analyzed gait in participants who walked on a straight line for 8.5 meters under three conditions: walking alone at a comfortable pace, walking at the same pace while reading a passage on a mobile phone screen, and walking while typing a predetermined phrase.[6]

The researchers looked at basic gait parameters, such as stride cycles (from right heel strike to the following right heel strike), and also analyzed how dual tasking affected postural stability through the pelvis and thorax. The young adult volunteers reported no neurological or musculoskeletal disorders that would impact gait.

Not surprisingly, the participants walked at a slower speed when they texted, even more so than when they read and walked. The absolute change in lateral foot position per stride was greater during reading and texting than walking alone, but that did not differ between the two phone tasks, the study found.

As for postural stability, they noted more mediolateral head motion, which has been linked to a greater risk of falling in older adults with Parkinson disease,[7] during texting/reading while walking than during undistracted walking. The demands of manipulating a mobile phone may cause young healthy adults to prioritize movement of the head relative to the trunk at the expense of gait stability, the Australian researchers hypothesized. In short, the participants were more preoccupied with texting than they were with walking or maintaining balance and stability.

Continued on page 22

Visco-GEL®
Hammer ToeCrutch™, #1037

Visco-GEL®
ToBuddy®, #1033

Visco-GEL®
Little ToeBuddy®, #1035

Visco-GEL®
Stay-Put Toe Spacer®, #1031

Visco-GEL®
Stay-Put Toe Separators®, #1104

"Visco-GEL products are really great — consistently good quality, expert designs and my patients love them."
Dr. H., NY

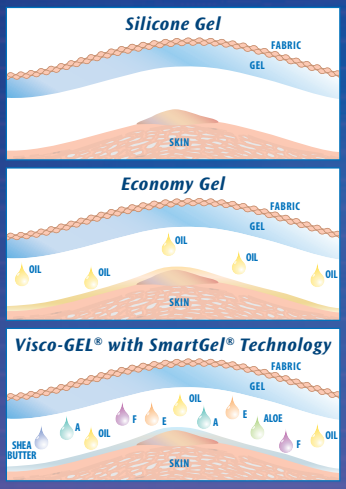
New!
ToeBuddy® Bunion Guard Combo™ #1038

- Protects 1st MP joint
- Contoured spacer separates crooked toes
- Dual toe loops align 2nd digit
- Washable, reusable, durable

Visco-GEL®
Foot Protection Products™ from PediFix® Now With SmartGel® Technology…

Nothing works better to relieve common foot conditions & deformities

Visco-GEL® conforms, cushions, protects and absorbs pressure and friction to relieve pain, often instantly. Exclusive SmartGel® formulas nourish skin to soothe and hydrate. See for yourself how these and dozens more devices will help you, your patients, and your practice. Get your free catalog and samples today.



Visco-GEL® with SmartGel technology from PediFix®

Effective. Economical. Easy.

PediFix® The Podiatrists' Choice®

To order, get a free sample, or more information…*

Call: 1-800-424-5561

Fax: 845-277-2851

E-mail: info@pedifix.com

Return this Coupon to:
Dept. LER116, 281 Fields Lane, Suite 1, Brewster, NY 10509

Contact your favorite PediFix distributor — Specify Visco-GEL® from PediFix®

Yes! Please send me: Visco-GEL® with SmartGel technology from PediFix®

☐ Free Catalog

☐ Free Visco-GEL® Sample* PRODUCT NAME / #

☐ 11-Piece Sample Kit, one each, every item above, just $9.95 ($25 value)* My

Name _____

Practice/Clinic Name _____

Address _____

City _____ State _____ Zip _____

Phone _____

Fax _____

Email _____

In our practice, we see approximately _____ (#) patients each week. My favorite supplier is _____ I prefer: ☐ to Dispense ☐ to Prescribe ☐ Patient Direct Order

Mail to: PediFix, Dept. LER116, 281 Fields Lane, Suite 1, Brewster, NY 10509

Fax to: 845-277-2851

Please provide all information requested. Allow 2 weeks for delivery.
*For healthcare professionals only.

Continued from page 20

A new way to walk

If texting while walking does lead to gait changes, should lower extremity practitioners prepare for a future in which patients come to them with biomechanical problems that could be tied to routine texting and walking?

Experts say that's not likely, and the "protective gait" that Licence and colleagues demonstrated is a big reason why.[5]

"I don't believe that gait would be affected in the long run," Earnest said. However, he noted that this protective gait shouldn't be taken as a green light to text and walk with abandon.

"It's much like...any healthy 'lifestyle habit.' Eventually one has to exercise due diligence and self-protection," he said. "It's probably too pollyannaish to suggest that people learn to enjoy their walks and let the text and emails wait. Perhaps a good middle ground is that, if a text or email really can't wait, then 'pull to the side,' stand still, answer the text or email, and continue along."

> An individual's ability to make gait-related compensations when texting while walking doesn't render the endeavor perfectly safe, because ambulation is a whole-body activity.

Absence of arm swing

Howard Osterman, DPM, a partner at Foot and Ankle Specialists of the Mid-Atlantic in Washington, DC, team podiatrist for the Washington Wizards of the National Basketball Association, and a spokesperson for the American Podiatric Medical Association, agreed that the protective gait will do its job the majority of the time. He also noted that the findings of Agostini et al demonstrate that gait changes during texting, but not necessarily for the worse.[3]

"In an effort to be a little more stable, everybody shortened their stride," he noted.

When walking without distractions, a person focuses on what is ahead and takes longer strides, which require more heel-to-toe push off, Osterman said. When that focus is on a handheld device instead of what's up ahead, a person will compensate with their gait.

"In an effort to counterbalance, you fire muscles that will plantar flex and dorsiflex to give you more stability, so you are getting a more rigid lever when you hit the ground," he said. "Those muscles stayed fired for a longer period of time, so the midfoot was extended when they were texting."

Agostini agreed with Osterman's hypothesis about midfoot extension during the dual-task condition, noting that the "tibialis anterior tendon originates from the midfoot and controls dorsiflexion." However, she cautioned that her group did not look specifically at midfoot extension in the study.

It's certainly not unheard of for cultural or environmental changes in behavior to lead to gait adaptations, Osterman noted, citing the often-discussed differences between habitually barefoot individuals and habitually shod individuals as an example (see "The truth about barefoot running: It's complicated," November 2010, page 20).

"I think it's the same...the body naturally adapts the gait for texting and walking," he said.

But Osterman also emphasized that the ability to compensate doesn't render texting while walking perfectly safe because ambulation is a whole-body activity.

"There are complimentary actions in the upper body that go along with gait, like the arm swing to help with stability," he said. "When we evaluate people's gait in the office, we'll look for arm swing—sometimes you'll see one arm swinging more than the other, and that's often a manifestation of limb length discrepancy or some other problem.[8,9] If you've got two-handed texting happening, then the arm swing is lost, and that can change whole-body dynamic stability during walking."

Agostini hypothesized that long-term gait changes may take place, but they won't necessarily be detrimental. She cited her teenage daughter as an example of how people adapt gait to their activities of daily living.

"She feels completely comfortable walking, typing on her smartphone, and talking to me at the same time," Agostini explained. "Young people probably spend most of their time double- or triple-tasking. If the double-task of texting and walking is practiced on a daily basis, it is most likely going to have a long-term effect on gait. It is an exercise, after all."

The more people text and walk, the more adept they become at that protective gait, and the CNS then adapts as well, Agostini hypothesized.

"Hence, it would not be surprising to observe a changed motor scheme in the walking pattern of young individuals who are constantly 'training' at walking while texting," she said.

Interestingly enough, in the AAOS survey, only 3% of the respondents reported breaking bones as a result of a distracted walking incident. This relatively low number would seem to jibe with the idea of a protective gait, said Alan Hilibrand, MD, an AAOS spokesperson, and director of medical education for the department of orthopedic surgery at the Rothman Institute in Sewell, NJ, and Jefferson Medical College in Philadelphia.[2]

Still, Hilibrand joined his colleagues in stressing caution.

"People are probably a little more careful [when texting and walking], but it's not going to prevent these injuries from happening. I'd recommend what the AAOS advocates for: If you need to text, stop, find a safe place that is out of the way, text or email, and then continue walking," he said.

The age issue

All of the studies above looked at relatively young adults (although Licence and colleagues did include participants up to age 50 years), so it remains uncertain how older people would fare under the same conditions.

But some data indicate this kind of dual task may be best left to younger folks. According to the AAOS survey, among those who reported injuries during distracted walking, women age 55 years and older were the subgroup most likely to have been injured, while millennials (18 to 34 years) were least likely.[2]

A study done in Israel in healthy people, aged 30-77 years, reported that when completing a dual task—walking while solving a simple math problem without the use of any device—older adults walked more slowly and with more stride variability than their younger counterparts. Also during the dual task, their arm swing decreased while arm swing asymmetry increased.[10]

Continued on page 24

Continued from page 23

"Healthy walking is characterized by pronounced arm swing and axial rotation...that arm swing improves stability especially in response to perturbations," the authors wrote.

If texting while walking is a type of perturbation, experts agree, it's an unwise activity in older people.

"As we age, balance becomes an issue," Osterman pointed out. "Then you add in concomitant risk factors, say a person with type 2 diabetes and a history of neuropathy. They have a loss of proprioception, and with that loss, the chance of a fall increases. Really, anything that changes our balance could put us at risk for falls and injury."

Asked if studies on texting and walking in older adults would be worthwhile, Agostini suggested that designing such a study would be "rather cumbersome," as all the comorbidities that can accompany aging must be taken into consideration.

"As an example, when trying to write on a smartphone (or just trying to read it, like many other middle-aged people, I suffer from presbyopia (plus myopia). So, when doing this while walking, I have to take my glasses off," she explained. "This means keeping glasses in one hand, and the smartphone in the other while trying not to stumble. As a matter of fact, I try to avoid this situation."

But it seems older people are following Agostini's lead. According to the AAOS survey, millennials are more likely to report engaging in common distracted walking behaviors than older people.[2]

From Osterman's perspective, the real area of concern isn't older people so much as children and adolescents, who are still developing physically. The long-term effect of texting while walking in these "digital natives"[11] may not happen directly in the lower limbs, but frther up the kinetic chain.

"When a person is in physical development, the activities they do can create long-term joint changes," Osterman noted. "Those changes may be happening because of long periods of sitting in front of a computer or video game, coupled with a lack of exercise. If texting while walking becomes so prevalent that it leads to neck, shoulder, and back issues, that could secondarily affect gait."

His main concern is with kyphosis, which studies suggest can have a negative impact on gait[12] and mediolateral dynamic stability of the trunk. The forces experienced by the cervical spine as the head is tilted forward for prolonged periods of device use[13] may also lead to gait-related fallout.

"That could change the gait pattern, although that happens over time. That may be a long-term risk," Osterman said.

Perhaps the ultimate answer to making texting while walking less hazardous would be for society to adapt. Agostini pointed out that in 2014, the National Geographic TV channel laid down "smartphone sidewalks," or lanes specifically dedicated to people who must walk and be on their devices at the same time, in cities in China and the US.[14,15] Although the lanes were temporary, as part of a TV show, dedicated spaces for "smartphone addicts" may be the best way to reduce the risks of texting while walking, Agostini said.

"In general, I would not encourage people to text while walking outdoors," she said. "The more our sight and attention is split among several tasks, the higher the risk."

Shalmali Pal is a freelance writer based in Tucson, AZ.

References are available at lermagazine.com.

igli® carbon insoles for active patient's feet.

igli Heel Spur Light insoles enable individual, targeted guidance of the foot. The lightweight insole reduces heel pain and plantar fasciitis conditions, with a low-profile design which permits use in lower volume shoes.

igliusa.com

medi. I feel better.

Plantar fasciitis: Clinical concerns in cleated sports

By Patricia Pande, MClScPT, CSCS, CPed

Cleated sports are associated with a high incidence of lower extremity injuries. American football and soccer are particularly troublesome due to unique risk factors involving footwear design, loading patterns, and sport-specific biomechanics.

Plantar heel pain is one of the most common ailments in athletic populations, presenting as pain with the first step in the morning and the sensation of walking on needles. The plantar fascia may become inflamed from repetitive stress or undergo degenerative changes, commonly called fasciosis.

Loss of playing time related to plantar fasciitis in highly compensated football and soccer players has been widely reported by the media, but such injuries are not limited to elite athletes.[1] Plantar heel pain is responsible for up to 10% of all visits to sports clinics.[2] Although little research has focused specifically on plantar fasciitis in cleated sports, numerous evidence-based hypotheses can be made.

In a study of intercollegiate American football players who participated in the National Football League (NFL) Combine, 72% reported a history of foot and ankle injury.[3] Although the study did not include plantar fasciitis, forefoot and midfoot injuries observed by the authors are likely due to the torsional bending and compression that results from pushing against 300 to 400 pounds of unyielding force in a lightweight shoe—a magnitude of loading that over time could also contribute to plantar fasciitis. The position of plantar flexion associated with playing football also engages the windlass mechanism of the plantar fascia and may put this tissue at risk for tearing.

Risk factors

There is a paucity of data on the cause of plantar fasciitis in cleated sports athletes, but findings related to a number of sport-specific risk factors lend themselves to extrapolation.

BMI. Van Leeuwen et al found a positive association between high body mass index (BMI) and plantar fasciitis,[4] and in an earlier plantar fasciitis study BMI was the only variable that predicted disability.[5] BMI has been correlated with plantar fascia thickness in symptomatic patients, but a causal relationship remains unclear.[6] Higher BMI theoretically causes increased vertical force during heel contact, with a concomitant increase in tissue stress.[7]

In the NFL, the average BMI is 31.35 kg/m^2, which meets the World Health Organization definition of obesity; nose tackles (40.20 kg/m^2) and defensive tackles (38.22 kg/m^2) have the highest averages.[8] Although the muscularity of football players makes BMI a poor measure of fitness, the magnitude of body weight in football players means foot and ankle injuries are not surprising. Simply put, "football players are heavy people that run a lot."[8] Reduction of body weight, though often recommended for nonathletes with plantar fasciitis, may not be a solution in certain football players.

Plantar loads. Studies show runners with plantar fasciitis have higher plantar loads and loading rates than uninjured runners;[9] this suggests the level of running required of many cleated sports athletes influences plantar fasciitis risk. Although the relationship between loading and plantar fasciitis in cleated sports is not established, the high plantar loads and peak pressures associated with pivoting, cutting, or jumping merit further study.

Wong et al found that soccer players had higher peak pressures under the medial heel and arch than runners because of the sideways and diagonal cuts required by the sport.[10] Pivoting and cutting in football also requires push-off from the medial aspect of the foot.[11] Extrapolating these findings to the cleated sports population as a whole supports the use of treatments that aim to reduce this medial pressure. However, the simultaneous need to avoid overloading the fifth ray (due to fifth-metatarsal fracture risk in cleated sports athletes)[12] necessitates a delicate treatment interplay; this need to balance the foot may be optimized by a more minimalistic approach to orthoses in athletic shoes.

Reducing shear stress may be as important as reducing plantar loads for preventing injuries to the plantar aspect of the foot and may also increase healing rates. Shear stress during gait is associated with foot pain in patients with rheumatoid arthritis;[13] however, few studies have studied shear in sports.[14]

Cleats. Modern cleats are much more lightweight and flexible than in the past; a coach and trainer, for example, claim cleats are akin to ballet slippers with spikes.[15] For many football players, the style and feel are the most important considerations when selecting cleats. In one study, 22% said they choose shoes based on weight, 21% on appearance, and 18% on safety.[16]

Although athletes often prefer a tight cleat that can confine the

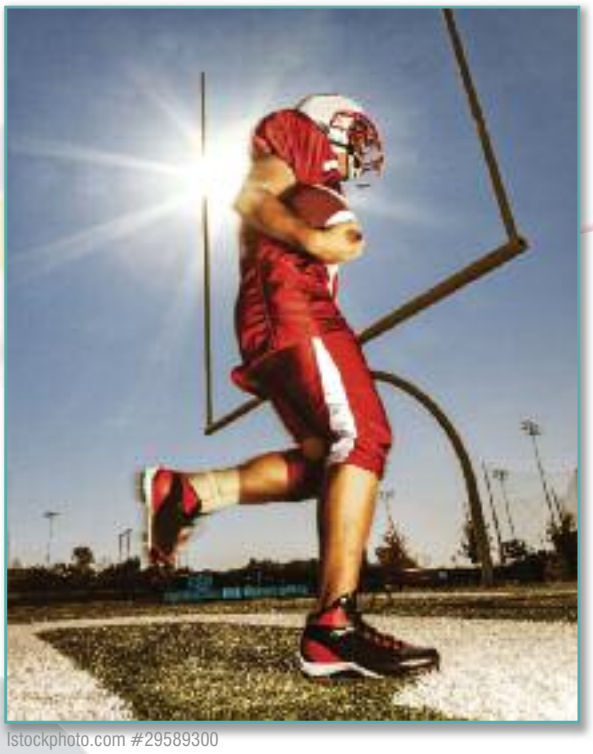
Sponsored by an educational grant from Medi USA.

foot, research suggests an improvement in balance with cleats versus a barefoot condition due to greater ground contact area, which could intuitively help with heel pain.[17] However, the limited volume in a cleated shoe—especially one that fits snugly—is an important consideration for orthotic management.

Contrary to popular belief, shoes with cleats that improve their grip on grass surfaces are likely to be associated with less stability than flat-soled shoes.[18] Certain shoes and orthoses designed to affect balance may provide some protection from sprains and strains of soft tissue,[19] and further study is required for implementation in these sports.

Because kinematics and kinetics during walking in individuals with plantar fasciitis differ from those of healthy volunteers,[20] shoes and inserts designed to address these issues may be beneficial in cleated sports athletes with plantar fasciitis. Several studies on rotational stiffness of football shoes found more rearfoot eversion with a flexible shoe than a stiffer shoe.[21] Additionally, carbon fiber inserts may shift pressure laterally.[14]

A personal communication between this author and a former professional football player shed some light on the problem of plantar fasciitis and footwear. Gerald Edwards, an American College of Sports Medicine-certified fitness trainer for high-level athletes in Los Angeles, believes that cleats—particularly those that screw in and are worn during game play—have an impact on foot pain. He suggested the rubber soles of molded cleats (worn primarily for practice) provide far more comfort than the hard plastic sole of screw-ins.[22]



Istockphoto.com #29589300

Edwards suggested that plantar fasciitis in football players is the result of continual pounding against cleats without proper time for myofascial work. In fact, Edwards believes, because of their regimented practice and training schedule, most football players do not focus on their foot health until they either have plantar fasciitis or torn fascia. As such, he recommends that trainers adopt preventive measures to stem the incidence of plantar injury at every level of the sport.

Biomechanics. The first ray is an important consideration for football and soccer players. Its role in the windlass mechanism is most effective when the first metatarsal, sesamoid apparatus, and hallux are aligned with the plantar fascia or aponeurosis.[23] Acceleration from a dead stop or rapidly changing direction—common maneuvers in many cleated sports—requires immense force at push off, which could impact the windlass mechanism at a higher speed, particularly if an athlete has not had proper time for warm up.

Warm up. In soccer, starting players are typically on the field for long periods and muscles remain in a lengthened position. Substitute players in soccer and football, however, are often sidelined for long periods, sometimes in extreme cold, allowing the body to cool and muscles to tighten. Proper warm up before and during activity has been associated with improved performance[24] and decreased injury rates,[25,24] though injury prevention studies have not included large numbers of plantar fasciitis cases.

Rosenbaum and Hennig have suggested decreased electromyographic activity and enhanced force development of the Achilles tendon after running on a treadmill for a 10-minute warm up could be a factor in injury prevention.[26] Given that Achilles tension affects strain on the plantar fascia through anatomical and myofascial connections,[27] warm ups may help mitigate the stress on this structure.

Treatment and prevention

The plantar fasciitis treatment paradigm of rest, cessation of activity, or both is often not feasible for high-level athletes. Furthermore, other strategies to reduce load on the foot, such as decreased stride length or change in walking or running pace,[28,29] could hamper performance.

Plantar fascia corticosteroid injections may have a negative effect on the health and performance of cleated sports athletes, as suggested by an account of rupture after two injections given to enable the athlete to continue playing.[30] Rupture rates increase with higher body mass and additional injections.[31,32] As such, the risk of rupture (or rerupture) must be weighed against the pressure to return to sports.

Treatment must focus on other ways to mitigate the deleterious forces on the foot and ankle, including:

1. Orthoses that reduce impact loading[33] as well as loads associated with high BMI and sport-specific movements;
2. Modifications to shoes or inserts that reduce plantar load (eg, cleats with deformable nubs);[34]
3. Orthoses that can be adjusted to address the different demands imposed by different playing positions (eg, backward vs forward running, predominantly playing on one side of the field) and symmetry issues related to limb dominance; and
4. Low volume inserts that fit comfortably and allow for biomechanical corrections within the constraints of a tight shoe without hindering performance.[15]

Plantar fasciitis in cleated sports will continue to gain prominence in the news as it affects more highly visible athletes. As healthcare practitioners, we need to help not just high-level athletes but also those who play recreationally for health benefits. Our level of knowledge and biomechanics must meet this challenge. ler

Patricia Pande, MCIScPT, CSCS, CPed, is a physical therapist, pedorthist, strength and conditioning specialist based in Durham, NC. She is the founder of FootCentric, an online continuing education company dedicated to comprehensive, multidisciplinary foot treatment.

References are available at lermagazine.com.

Sponsored by an educational grant from Medi USA.

Trust DARCO to Assist in the Healing Process.

Off-load wounds and ulcerations of the foot with our footwear and off-loading insoles.

DARCO Wound Care products are:

DARCO has worked with the global wound care community for over 30 years. Our collaboration with surgeons and care providers has helped us with the research and development of a wound care product line that is effective, efficient and economical. Our goal is to meet the special requirements of patients, prevent wounds and ulcerations around the foot as well as healing existing wounds. In doing this we can create an improved quality of life for your patients.

www.darcointernational.com/off-loading-wound-care

WOUNDCARE-CIRCLE
Get pressure ulcers under control

DARCO

ACTIVE STANCE

Patients with at-risk feet need collaborative care

By Terrence P. Sheehan, MD

In a recent editorial in *The Lancet Diabetes-Endocrinology*,[1] Lipsky and colleagues wrote that diabetic foot disease "…is not a one doctor disease—it demands multidisciplinary care. Furthermore, as a notoriously unglamorous problem, the disease depends on dedicated clinicians working together in a team of healthcare providers to care for a complex patient—a scenario some disparage, but we relish." I share this perspective.

Although a number of studies demonstrate the benefits of caring for patients with feet at risk using a multidisciplinary team approach, to my knowledge, with the exception of Veterans Administration (VA) hospitals, such teams are rare in the US. When Adventist Rehabilitation Hospital of Maryland opened in 2001, I established a collaborative care team for patients with limb loss, which we call an "amputee clinic." The team concentrates on supporting the person with limb loss and enabling him or her to achieve the best possible outcome, including preservation of the remaining limb after the amputation.

> Studies demonstrate the benefits of caring for patients with feet at risk using a multidisciplinary team approach. So why are such teams so rare in the US?

The success of the approach, coupled with evidence from the literature in support of multidisciplinary management of limb loss, prompted the Amputee Coalition to form a Limb Loss Task Force. In 2011, the task force drafted the *Roadmap for Limb Loss Prevention and Amputee Care Improvement*,[2] which included a call for the creation of prevention partnerships. This was followed in 2012 by the *Roadmap for Preventing Limb Loss in America*,[3] which advocated the use of multidisciplinary diabetic foot care teams to reduce the incidence of amputation. Currently, the Amputee Coalition is putting together a third report, based on the March 2015 meeting of the National Limb Loss Task Force. This report's focus is the formations of centers that serve as "model systems of care" for those with at-risk feet or limb loss. This is similar to what has been done for other vulnerable groups, such as those with spinal cord injury (1972), traumatic brain injury (1987) and burns (1994).[4] While our team is primarily focused on preventing a second amputation, another goal is to help patients with diabetes and other vascular conditions avoid a first amputation, in collaboration with the Adventist Acute Hospital System in Montgomery County, MD.

A time-honored approach

Sanders et al described the antecedents of the collaborative team approach to amputation prevention in a 2010 article in the *Journal of Vascular Surgery*.[5] The authors noted the first hospital-based foot clinic was established by Elliott P. Joslin, MD, and members of the Massachusetts Chiropody Association at New England Deaconess Hospital in 1928. Shortly thereafter, in the mid-1930s, Joslin established a team approach to diabetes care that included foot care, nutritional therapy, exercise, treatment of infection, and surgical treatment as needed. Several decades of team evolution (which included the addition of vascular surgical specialists and general surgeons) grew the clinic and the practice into a respected center for revascularization and limb preservation.

In the 1960s, Paul W. Brand, MD, pioneered hand and foot care for patients with Hansen disease in Carville, LA, and a number of his techniques and practices were adapted for the management of diabetic ulcers. Brand was joined by other medical practitioners in the 1980s, creating a model of interdisciplinary care that included orthopedics, podiatry, physical therapy, physical and rehabilitative medicine, and an on-site facility for the customization of footwear (new shoes, shoe modifications, and insoles). The team provided care throughout the process of ulcer healing, and offered lifetime rehabilitation after treatment based on the assumption that patients would always be at risk of a new ulceration.[5]

Sanders and colleagues acknowledged the contributions of the American Diabetes Association in promoting multidisciplinary diabetes care, and the successes in amputation prevention achieved by the VA (which built on the successes of Brand and his colleagues with Hansen disease patients).[5]

Reductions in amputations

A number of large-scale studies, mainly conducted in Asia and Europe, demonstrate the efficacy of a collaborative team approach in reducing lower extremity amputations (LEAs).

Chang Gung Memorial Hospital (Taiwan, China): In a 10-year retrospective study, Hsu et al reported significant declines in LEA

Continued from page 29

Figure 1. Adventist HealthCare Physical Health & Rehabilitation's physical therapist works with a patient during one of his outpatient therapy sessions, which are performed to improve physical strength, coordination and endurance after the loss of a limb. (All photos courtesy of Adventist HealthCare Physical Health & Rehabilitation.)

rates using a multidisciplinary team approach.[6] The researchers investigated the nontraumatic LEA rate in diabetic foot patients from 2004 to 2013. Patients were enrolled from inpatient populations, emergency department visits, and outpatient departments. Following the establishment of a wound-care protocol and an integrated multidisciplinary team, the LEA rates for hospitalized patients from 2010 to 2013 declined 60% compared with the period from 2004 to 2009, and rates for emergency and outpatient departments declined 62%. The authors attributed declines to the introduction of an efficient treatment pathway with on-time debridement and early intervention through the efforts of the multidisciplinary team.

Ipswich Hospital (Suffolk, UK): Krishnan et al showed significant reductions in the incidence of total, major, and minor LEAs after the introduction of multidisciplinary teams.[7] The reductions continued over 11 years, despite a significant increase in the number of people with diabetes treated at the hospital during the same period. In this prospective study, the incidence of total amputations fell 70% (81.6% for major amputations,

Continued on page 35

Levy® Diabetic Econ

Levy Diabetic Econ custom foot orthoses are manufactured using plaster cast, foam impressions or 3D scan. Levy Diabetic Econ I and Econ II are a cost-effective diabetic custom orthoses solution with a 3-5 day in house turn-around.

ECON I

A bi-laminate custom orthoses featuring 35 Tan EVA Base and Blue plastazote top cover

3 pair for $65

ECON II

A tri-laminate custom orthoses featuring 35 Tan EVA base, 1/16" PPT mid-layer and Blue plastazote top cover

3 pair for $75

Levy+Rappel

800/564-LEVY (5389)
www.levyandrappel.com

surestep

Introducing a new look for the brand!

We have freshened up our look to better represent our company mission and visually communicate what our brand is all about; mobility, innovation and fun. Have no worries, we are the same company you know and trust, striving to provide effective orthotic solutions for the children we serve. Our website has been redesigned to improve user experience, acting as a resource for orthotists, physical therapists, and parents alike. The new interface is easy to navigate and allows users to quickly find the information they are seeking. For the full explanation of our new identity, check out the blog on our website and let us know what you think of the new look.

17530 Dugdale Dr. South Bend, IN 46635 | 877.462.0711 | surestep.net

PILGRIM
SHOES

WORLD'S FINEST DIABETIC FOOTWEAR

areni ONE®
Made in USA

HOOPOE®
Ultimate comfort experience

TRUSTED QUALITY SINCE 1997

- Inspired by humans
- Reliable foot support & mapped protection
- PDAC A5500 & A5512 reviewed
- Evolved with podiatry and O&P needs in mind

1.888.493.2859
www.pilgrimshoes.com

Meticulously handcrafted
by environmentally friendly American
manufacturing fully dedicated to your wellbeing

Continued from page 30

21% for minor amputations) while the diabetic population grew by 76%. The authors attribute the significant LEA reductions to improved foot care services delivered via multidisciplinary teams.

Madigan Army Medical Center (Lakewood, WA): Driver et al[8] observed a significant decrease in LEAs after the establishment of a limb preservation team and foot care management plans for patients. According to the authors, "concern over the rate of lower extremity amputation in diabetic patients prompted the establishment of a specialized foot clinic (Limb Preservation Service or LPS)" in 1995. Since then, the medical center has been caring for people at high risk for diabetic foot problems. Patients undergo screenings to categorize their risk for ulceration and amputation (low, moderate, or high), and receive management plans appropriate to their risk levels. These plans include regular examinations (the higher the risk, the more frequent the examination), educational counseling, diagnostic tests, footwear modifications, and specialist referrals as needed.

From 1999 to 2003, the number of diagnosed diabetic patients increased by 48%, while the number of LEAs decreased by 82%. The authors cited "the benefits of a focused limb preservation team," and noted the temporal association between the establishment of the team approach and the decrease in LEA incidence. They further observed that "unlike private practice, MAMC presents few traditional barriers to specialist referral or to communications among specialists."

3rd Health Care Area of Madrid (Spain): Rubio et al documented a significant reduction in incidence of LEAs in people with diabetes after the introduction of a multidisciplinary team for managing diabetic foot conditions.[9] The researchers analyzed the incidence of LEAs before and after the 2008 introduction of the team, which was coordinated by an endocrinologist and a podiatrist. No change in the incidence of minor or total amputations was observed in either the diabetic or nondiabetic populations, but the incidence of major diabetes-related amputations was reduced by 34%. The success was attributed primarily to the multidisciplinary team.

Health Care Districts, Area 6 Murcia (Spain): Alcala et al[10] demonstrated a significant decrease in elective amputations and in major amputations following the establishment of two multidisciplinary teams. The first team, called the "Critical Pathway Committee," was established in 2000 to focus on patients admitted to hospitals with diabetic foot infections, ischemic gangrene, or both. The committee consisted of a diabetologist, emergency medicine specialist, anesthesiologist, surgeon, infectious disease specialist, radiologist, pharmacist, physical medicine and rehabilitation specialist, psychiatrist, family physician, and social worker.

In 2006, a diabetic foot clinic was established in the primary hospital, also incorporating a team approach. The team consisted of a general surgeon, physical medicine and rehabilitation specialist, diabetes nurse, physical therapist, orthotist, and orthopedic shoemaker, all of whom worked closely with the departments of endocrinology, orthopedic surgery, vascular surgery, and interventional radiology, and liaised with primary health care units in the area.

The retrospective study compared the number of amputations between 1998 and 2001 with the number of amputations between 2001 and 2012, and found a 47% decrease in all major amputations and a 66% decrease in

Continued on page 36

Continued from page 35

elective amputations. The combined effects of the Critical Pathway Committee and the diabetic foot clinic were credited with the improvements.

Helsinki Area Hospitals (Finland): Eskilinen et al[11] observed significant reductions in overall amputations in both diabetic and nondiabetic patients after a multidisciplinary team approach was adopted in 1993. A retrospective analysis of major LEAs in Helsinki from 1990 to 2002 showed a 23% reduction in mean annual incidence of major amputations in patients with diabetes toward the end of the study period compared with the early years of the study. The mean annual incidence of major amputations in nondiabetic patients declined 40% during the same period. The authors concluded the increased use of vascular surgery and the establishment of the multidisciplinary team both played important roles in the reduction of major amputations.

Bispebjerg Hospital (Copenhagen, Denmark): Holstein et al observed a significant reduction in major amputations in people with diabetes associated with an increase in revascularization procedures and the establishment of a multidisciplinary diabetic foot clinic.[12] The retrospective study, which covered the years 1981 to 1995, showed a 75% decrease in major diabetic leg amputations (59% decrease in type 1 patients, 84% decrease in type 2 patients). Specifically, the authors noted the decreases correlated with the increased use of infrapopliteal bypass reconstructions (starting in 1987) and the establishment, in 1993, of a multidisciplinary team consisting of a vascular surgeon, diabetologist, specially trained nurses, an orthopedic surgeon, and an orthopedic shoemaker.

University Hospital (Lund, Sweden): Larsson et al[13] observed a "substantial long-term decrease in the incidence of major amputations…as well as a decrease in the total incidence of amputations in diabetic patients" after the implementation of a medical and orthopedic program for prevention and treatment of diabetic foot ulcers via a team consisting of a diabetologist, orthopedic surgeon, diabetes nurse, podiatrist, and orthotist, all working closely with the departments of vascular surgery and infectious disease. According to the authors, the program led to a 78% decrease in the incidence of major amputations from January 1982 to December 1993 and a 49% reduction in the total annual number of amputations. In addition, the reamputation rate decreased by 17%.

The Dulwich Study (UK): Also worth noting is this study, which focused not on amputation prevention but rehabilitation and quality-of-life outcomes for amputees.[14] The collaborative team consisted of a physical therapy coordinator, a visiting prosthetist and medical officer from a local prosthetic supplier, and a surgeon. By the end of the study period (1985-1986), the team approach had reduced inpatient stays by 20 days compared with the baseline period (1981-1982) and the need for physical therapy by 94%, and increased the proportion of patients discharged with a prosthesis by a factor of five.

Examples from the clinic

I started working with an interdisciplinary team during my training in the VA hospitals, and my commitment to the approach was reinforced by the literature demonstrating

Figure 2. Terrence Sheehan, MD, chief medical officer for Adventist HealthCare Physical Health & Rehabilitation, checks in to observe and report on the progress of a recent amputee patient.

its benefits; both of these led me to institute a collaborative approach at Adventist. As a physiatrist specializing in physical medicine and rehabilitation, I coordinate a team consisting of a physical therapist, nurse, peer visitor (an amputee volunteering to help patients), prosthetist/orthotist, and, if needed, a mental health professional.

We hold care clinics every other week, during which patients are evaluated, managed, and educated by the team members sequentially—all with a view toward preventing further amputations and enabling patients to continue participating fully in their lives. While ensuring that a patient is appropriately fitted with a prosthesis and learns to use it properly, for example, I also educate him or her on how to protect the other foot. We reinforce the need to follow up with other team members, including vascular specialists and podiatrists, and make sure patients know there is a place to go if they have even the smallest skin breakdown or trauma—in which case, they know they have to see me quickly.

My colleagues and I recently applied for a Patient-Centered Outcomes Research Institute (PCORI) grant[15] to help document our success by comparing our collaborative approach with usual care in patients who have undergone an amputation. Meanwhile, we have plenty of examples from our practice that demonstrate the effectiveness of the approach in enhancing quality of life and potentially saving lives.

In my experience, when patients wake up after an amputation, the whole course of their lives depends on who counsels them at that point—a surgeon, a social worker, a family member, or a collaborative team. Take "John," for example. A 56-year-old patient with

Continued on page 38

Continued from page 37

diabetes, he chose to participate in Adventist's CARF (Commission on Accreditation of Rehabilitation Facilities)-accredited Amputee Specialty Program. The team guided him through the healing process, helping him adjust to the fact that he had lost a limb, and also giving him an idea of what to expect next, and a vision for the future.

When he came to us, John was convinced he would have to stay in a nursing facility for the rest of his life. The team flipped that expectation around by ensuring he remained as healthy as possible and was educated on what to expect day by day—meeting his therapist, meeting the peer visitor who would support him during this part of the rehabilitation process, and understanding that our expectation was that he would be up and around, learning to use a prosthesis, and back home within four to six weeks, if not sooner. And that's exactly what happened: He spent a week in a nursing facility while his prosthesis was being made, then we brought him back in, taught him to use the prosthesis and sent him home.

Figure 3. The clinic director of the outpatient clinic at Rio Sport&Health in Gaithersburg, MD, assists a patient on the antigravity treadmill, which helps reduce recovery time from a sports-related injury or orthopedic condition.

John has returned to the clinic several times since his discharge. He needed his prosthetic socket remade, which is common if a person's limb matures after limb loss, but otherwise he has done just as we planned—getting "back to his life" and helping take care of his mother.

Another example is a woman we nicknamed "Auntie Mame," after the 1955 novel about an eccentric woman who travels the world and has madcap adventures. She came to us from an acute-care hospital about 10 years ago, at age 83 years, after a below-knee amputation due to vascular disease. When I met her, she was lying in bed, convinced her life was over. We took her through the program, and she ended up volunteering weekly as a peer visitor at the hospital and ultimately fulfilled her goal of traveling to Israel, Italy, and Ireland.

We also had an 80-year-old woman with an above knee amputation due to diabetes who went to a nursing facility for a short period and then insisted she wanted to go home. Going home, however, involved negotiating a 44-step staircase. We taught her how to use a prosthesis with the latest technology, including a computerized knee, and she was eventually able to meet her goal of getting herself up those stairs independently so she could go home. She lived in the comfort of her home with her son for the next four years before succumbing to other medical issues.

Amputation rates are significantly higher for those 65 years and older than for younger age groups—and, shockingly, the rates for ethnic minorities are close to double the rate for whites, a major health disparity. Without a collaborative team that has a vision of a positive outcome and the wherewithal to make it happen, these patients, in particular, end up languishing at home or in a nursing facility, often unnecessarily.

In our experience, even younger people will benefit more from a collaborative team than from usual care. Several years ago, we worked with a young man (aged 18 years) who fell while skiing, breaking the tibia and disrupting the blood supply to his leg. He had an amputation at the knee and was despondent. We took him and his family through an educational process and made sure he got the right prosthesis. He went back to school and recently married and started working as an engineer. We remain in close contact with him and his family, dealing with any issues that may arise, because an amputation affects a person for the rest of his or her life.

Beyond adjusting a prosthesis, we monitor the person's overall health—physical, mental, and quality of life. All of this is much easier when all the providers and caregivers are on the same page, working collaboratively.

Moving the US forward

Why isn't collaborative care—not just postamputation, but also for anyone with feet at risk due to systemic issues—the norm in the US? Currently, hospital wound centers, with the exception of those in the VA system, are reimbursed for treating wounds, not for preventing them. If no one pays for a collaborative team effort to save a limb, it doesn't happen.

Yet, if we think about it, any person who experiences nontraumatic limb loss at one point was at risk. Within that risk period, their care most likely was fragmented, which can contribute to the risk of amputation. It is rare that a patient I'm treating says, "I knew I was at risk of losing my limb." The vast majority say, "I had no idea this could happen to me. It happened so quickly, and now my life is turned upside down." That's often because they didn't receive appropriate education—that is, they weren't told all people with diabetes have at-risk feet, or that a first callus can start the ulceration process, or

about regular foot exams and other preventive measures that might have facilitated prompt treatment and made amputation unnecessary.

As a patient goes down the "at-risk" road, not seeking foot care or doing daily foot inspections, something as seemingly benign as a callus persists. Bacteria can grow under the dead tissue, which leads to infection. Once an infection starts, untreated, it can spread quickly, often to the bone.[16] The person ends up in the emergency department, often because diabetes or peripheral vascular disease (PVD) kept the body's sensory alarm from switching on in the presence of severe injury. Asked why he or she waited to be treated, the patient says, "Oh, my foot didn't really hurt, it just got red and smelly and stuff like that." By that time, it's too late.

We clinicians know this; the literature is clear. The answer: We need to come together and collaborate to prevent the needless loss of a limb.

As my colleagues and I wrote in the June 2015 issue of the *Journal of Ethics*, losing a leg or foot is associated with increased risk of multiple health issues, including osteoarthritis, back pain, joint pain, and osteoporosis/osteopenia.[17] Amputation also negatively impacts body image, self-esteem and quality of life. Simply put, it's something we want to avoid. And if it happens, we want to ensure patients have access to all the medical and psychosocial resources needed to help them live a full life, despite an amputation. As noted earlier in this article, there is great disparity in the US with regard to the care of those who are at risk for limb loss as well as those who have already lost a limb to amputation.

As we consider how to move the US forward in the use of preventive and collaborative care approaches, Barshes et al provide some suggestions for research and practice efforts.[18] First, the role of primary prevention needs to be clarified. In addition, the recognition of PVD needs to improve, and treatments aimed at limb preservation begun as early as possible. Finally, more research aimed at diabetic foot complications and their prevention needs to be funded. The authors point to a "yawning gap" between the impact of these complications and the funding for research to improve their prevention and management.

I would add that we need more emphasis on prevention of originating events such as ulceration. This can be addressed through a focus on early use of skin and soft tissue protection and management protocols for the feet of patients at risk. It is not rocket science, and it is not expensive. For the most part, it means education; a footwear system that includes a padded sock, possibly a custom insert, and a well-fitting shoe; and regular monitoring.

We know that once a person is diagnosed with diabetes, PVD, or both, he or she is at risk of ulceration and amputation from that moment on and for the remainder of his or her life. The medical literature, as well as our clinical experience, indicates that collaborative care helps to significantly reduce that risk. Therefore, it is in the best interests of patients, practitioners, and the healthcare system to move quickly and collaboratively forward, providing treatment, education, and ongoing monitoring.

Terrence P. Sheehan, MD, is chief medical officer at Adventist Rehabilitation Hospital of Maryland, medical director for the Amputee Coalition, and a Scientific Advisory Board member for the Institute for Preventive Foot Health.

References are available at lermagazine.com

ohi

AFO | ESSENTIALS

The Patient Compliance Bundle

AFO Essentials marries a any custom-fabricated Arizona AFO that's worn in a shoe, with custom-fit, AFO-appropriate APEX footwear. The bundled products arrive in a single shipment – at a remarkably compelling price – and are dispensed and donned in a single follow-up visit. For the first time, patients exit your office with everything they need to achieve a successful outcome, and more likely than ever to remain compliant.

* Eligible Arizona AFO products include all AFOS that fit a shoe, with the exception of the Moore Balance Brace

THE BENEFITS?

- Sharply increase patient compliance and satisfaction
- Enhanced - and more rapidly achieved - patient outcomes
- Remarkably compelling 'Bundle' pricing plus vastly improved practice efficiency
- Receive a Brannock device, order forms, shoe selection guide and everything else needed to get started

GET STARTED WITH AFO ESSENTIALS TODAY!

VISIT OHI.NET/AFOE
OR CALL (877) 780-8382

The OHI Family of Brands

APEX | AZafo ARIZONA | Langer Biomechanics | PedAlign | safestep PREVENTION PAYS | The Orthotic Group


Istockphoto.com #73702875

Biomechanists explore effect of obesity on falls

Obese patients have an increased risk for falls and fall-related injury, not just because of the loads involved, but also because of the strategies they use to recover from a trip or slip. Findings from a growing body of research will help in developing interventions to minimize that risk.

By Hank Black

People who are obese fall and injure themselves at a higher rate than those who are normal weight,[1,2] and scientists and clinicians are working to identify the specific biomechanical variables involved in their falls in hopes of finding ways to prevent them. Identification of mediating factors as well as clinical interventions to help obese individuals safely recover from slips, trips, and other falls are also key research goals.

The combination of two major demographic trends in the US and other developed countries—aging populations and increasing incidence of obesity—are driving increased attention to this problem. About 35% of the US population is considered obese, up from only 13% in the 1960s.[3] The unintentional-fall death rate for adults 65 years and older increased more than 40% from 2004 to 2013.[4] A direct link is seen between obesity (body mass index [BMI] of more than 30 kg/m^2) and the risk of occupational injury due to falls.[5,6]

The consequences of falls among older individuals are well known. People 65 years and older make up 13% of the US population but account for three-fourths of all deaths caused by falls.[7] An estimated 31% of individuals 60 years and older are obese.[8] In recent years, obesity has started receiving major attention from the scientific community. In June 2013, the American Medical Association (AMA) House of Delegates adopted a resolution reclassifying obesity as a disease state requiring advances in treatment and prevention.[9] Even so, obesity is not yet included as a risk factor in many falls-prevention websites, including that of the Centers for Disease Control and Prevention.

"Epidemiological research indicates there is a higher rate of falling among those who are obese, but we don't understand why," said Michael L. Madigan, PhD, professor of biomedical engineering at Texas A&M University in College Station, TX. "We are trying to understand the underlying mechanisms and factors and develop interventions to target those factors."

He was among several researchers whose work on falls was presented at the most recent annual meeting of the American

Some research suggests interventions should focus on tasks that challenge mediolateral stability, such as unipedal stance and walking on a narrow path.

Continued from page 41

Society of Biomechanics (ASB), held in August 2015 in Columbus, OH. Madigan was senior author of ASB presentations[10,11] that found increased rates of falls for obese subjects after laboratory-induced trips and slips.

"We found obesity does not appear to cause more frequent slips or trips, but it does negatively affect the ability to recover balance and prevent a fall compared with normal-weight people," he said.

Strategies for fall recovery

After tripping—by stubbing a toe on an exposed tree root, for example—most people instinctively try to recover balance by stepping, Madigan said.

"Two stepping strategies are commonly used. In the lowering strategy, you immediately lower the stubbed foot to the ground and then step over the root with the contralateral foot," he said. "The elevating strategy is employed when the foot hitting the root is not put to the ground but instead is lifted over the root."

Successful trip recovery is achieved by slowing the forward rotation of the body/trunk[12] and maintaining sufficient hip height to allow subsequent steps.[13] These accomplishments require activation of the knee extensors, hip extensors, and ankle plantar flexor muscles. In a 2012 study of lab-induced trips of middle-aged and older women living in the community,[14] normal-weight fallers tended to be able to complete a recovery step attempt before falling into a support harness, while the majority of obese fallers were not. The study indicated these falls reflect obesity-related differences in reaction and response times, onset of support limb loading, and recovery limb power generation.[14]

"Recovery for either elevating or lowering strategy requires not so much strength as power, when you look at force recovery on the leg," said study coauthor Noah J. Rosenblatt, PhD, assistant professor in the Department of Podiatric Surgery and Applied Biomechanics at Rosalind Franklin University of Medicine and Science in Chicago. "There's not necessarily a relationship between lower extremity strength and recovery. It's more the ability to coordinate your muscles and the timing of their firing."

To safely study trips and slips in a laboratory setting, participants wear a harness supported from the ceiling so no one falls to the ground. Madigan's study of trips[10] recruited 21 young adults, 11 of whom were obese. While walking purposefully and looking straight ahead on a 10-m experimental walkway, the participants were tripped near midswing with a 7 cm-high obstacle. The resulting fall rate was 30% among obese adults and 0% among their nonobese counterparts.

The higher rate of obese-adult falls may have resulted from factors that contribute to trunk kinematics, the authors stated. These include an anterior shift of the trunk center of mass (COM) among obese adults,[15] which could increase the gravitational moment that rotates the body forward after tripping; greater trunk mass,[16] which increases trunk momentum; and relatively low trunk and lower extremity strength,[17,18] which could reduce the ability to slow trunk momentum.

Obese and nonobese participants who recovered balance and avoided falling into the harness tended to use similar recovery strategies, but there were differences between the obese fallers and the other participants. In particular, all three fallers employed a lowering strategy, while the 15 of 16 individuals who recovered used an elevating strategy. Madigan said, though, that there wasn't enough data to determine whether the choice of strategy contributed to these falls. Fallers also exhibited a larger trunk angle and angular velocity, and a lower hip height at the instant of foot strike of the first recovery step. Madigan said he hopes to use these preliminary results to plan a larger-scale study that would provide more definitive results.

istockphoto.com #75072815

Slips

Slips cause more than 25% of fall-related injuries in older adults[11] and 40% to 50% of occupational fall-related injuries.[19] Slips happen where there is too little friction or traction between a person's footwear and a walking surface.[20]

As people get older and frail, they walk slower, with smaller and wider steps and a stooped posture, said Thurmon E. Lockhart, PhD, professor of biomedical engineering and biomedical design at Arizona State University in Tempe.

"It's a kind of shuffling along flat-footed, because the elderly want to veer away from problems that would initiate a slip, especially if they have experienced a previous fall," he said.

The same types of adaptations, however, actually make an obese person more prone to initiate a slip, according to a 2012 study by Lockhart and colleagues.[21]

"Importantly, we found that obese people are more likely than the nonobese to slip in a sideways, transverse direction," Lockhart said.

At the recent ASB meeting, Madigan and colleagues addressed obesity and age in lab-induced slips and confirmed that obese individuals experienced a higher rate of falls, with 32% falling compared with 10% of nonobese participants.[19] After adjusting for age, gender, and gait speed, the researchers found obese participants who slipped were more than eight times more likely than nonobese individuals to experience a fall.

Continued on page 44

Continued from page 42

Balance

The degradation of postural balance is thought to be a major reason for most types of falls, according to Lockhart, though most of the research in this area has focused on aging.[22-27] Hue et al found a strong relationship between weight and postural instability and that young adults who are obese swayed at a faster velocity than a person of normal weight.[28]

Lockhart said that, for 20 years, most researchers have assessed balance control with linear measures such as COP speed, COP ranges, and sway density parameters. More recently researchers have found that nonlinear spatiotemporal measures may capture more subtle aspects of postural control.[29] An example is estimating the time required for the COP to reach the boundary of the base of support if it were to continue on its instantaneous trajectory and velocity.

"Traditional measures ignore the time-dependent stability and complexity of postural fluctuations," he said. "Together, both linear and nonlinear analyses provide a more complete understanding of adaptive strategies used in postural control than either could provide alone."

Falls and fractures

Also at the ASB meeting, Crenshaw et al looked at fall biomechanics in an attempt to answer why the incidence of wrist fractures in women plateaus or declines after age 75 years, when hip-fracture incidence begins to rise.[30] They evaluated 125 community-dwelling women aged 65 to 91 years using laboratory assessments and prospective tracking of falls over one year. Although not analyzing specifically for obesity, the study included participants who had a BMI greater than 30 kg/m^2.

Using motion-capture technology, the investigators assessed anterior and posterior falls and direction-specific fall risk. Older age was associated with impaired recovery strategies for both anterior and posterior falls. Because recovery from an anterior fall includes protective arm movements, this impairment led to fewer wrist fractures but increased the risk of other serious injury. Meanwhile, the increased rate of posterior falls with increasing age leads to more fractures of the pelvis or hip.

The study has important implications for the clinic, one of the study's coauthors said in an email. Kenton R. Kaufman, PhD, PE, professor of biomedical engineering and director of the Biomechanics/Motion Analysis Laboratory at Mayo Clinic in Rochester, MN, suggested therapists focus on tasks that challenge mediolateral stability, such as unipedal stance, obstacle crossing, and walking on a narrow path.

"If it is possible to use compensatory step training, focus on upper extremity reactions, not solely on foot placement," Kaufman added.

Interventions

Weight-loss programs, strength training, balance training, and other activity regimens have been shown to help lower the risk of falls in obese individuals older than 65 years.[31]

Controlled whole-body vibration training has been established to enhance neuromuscular performance and reduce risk of falls among elderly adults.[32] In a study presented at the recent ASB meeting, Munoz et al found that a six-week course of training significantly improved maximum isometric knee extensor strength as well as dynamic gait stability among young obese adults, which the authors suggest could help reduce the risk of falls.[33]

Other novel modalities that have shown promise for preventing or reducing falls in obese people include yoga[34] and horseback riding.[35]

"If improving a person's weight or balance doesn't sufficiently lower their risk of fall, we focus as a compensatory strategy on making the living environment safe and accessible," said American Occupational Therapy Association spokesperson Katie Riley, OTD, OTR/L, associate professor of clinical occupational therapy and director of Occupational and Speech Therapy Hospital Practice at the University of Southern California in Los Angeles.

And Mitchell et al, in a large, Australian population study of obese and older community-living people, determined that sleeping medications, sedentary behavior, and chronic health conditions were the strongest mediators of falls.[36] It and other studies suggested weight reduction through increased physical activity or bariatric

Continued on page 46

Continued from page 44

surgery as potential ways to prevent falls.[37,38] In fact, Handrigan et al have found that weight loss in people with a BMI greater than 40 kg/m^2 is more important than maintaining strength for improving balance control.[39]

While general exercise programs may reduce fall risk and rate of falling by about 30%,[32] those improvements may not be able to keep up with the rate at which the population of older adults—and the subpopulation of obese older adults—is increasing. Task-specific training (TST) may help prevent falls in obese older adults more effectively than do more general programs, Madigan said.[40]

"This type of training has shown some promise among people over the age of 65 years in our work and that of others. The evidence that this is a beneficial fall prevention strategy is growing, although it's not currently being used extensively outside the laboratory," he said.

TST allows individuals to experience and practice recovery strategies that are associated with a low risk of falling, said Rosenblatt, who also studies TST.

"It's critical that a person take a recovery step while sensing how to do that, and task-specific training allows you to sense how to do that," Rosenblatt said. "Basically, if you want to learn to throw a football, you practice with a football, not a baseball."

Diminished cognitive abilities may be expected with aging, of course, but possibly also with increased weight. Birdsill et al found an increased relationship between body fat, brain functioning, and volumes of gray and white matter in the brain in older females.[41]

Jeffrey Hausdorff, PhD, professor in the Sackler School of Medicine at Tel Aviv University in Israel and director of the Center for the Study of Movement, Cognition and Mobility, was senior author of a five-year prospective study that linked fall risk to executive function, which is responsible for allocating attention among several tasks, prioritizing activities, and the like.[42]

"We had shown that it's hard enough for some people to walk in a controlled environment, but in normal life we have many distractions while walking. If executive functioning is impaired, you are more likely to fall," Hausdorff said.

To more fully assess this relationship, and with hopes of including obesity as a variable, his group is using functional MRI and functional near-infrared spectroscopy (fNIRS), which allows a recording of an individual's brain activation during a walk.

A role for orthoses

Ankle foot orthoses (AFOs) can help improve postural stability and other variables associated with risk of falling (see "Can AFOs help prevent falls?" August 2012, page 16), but can be problematic for obese patients with regard to fitting issues and durability.

Eric Weber, LCPO, FAAOP, a national orthotics specialist with Hanger Clinic in Seattle, WA, said the introduction of composite materials such as carbon fiber or fiberglass in custom-made AFOs give more support to obese individuals than conventional thermoplastics.

"AFOs made with polypropylene or other thermoplastics are more susceptible to break down over time by compressive and tensile forces, becoming more flexible, decreasing any restriction on the joint, ultimately resulting in fracture or failure of the brace, and in a fall," Weber said. "When building custom AFOs for heavier people, the posterior strut itself is what's replacing the stress points around the ankle. I expect to see more designs of the posterior composite in the future because it provides increased flexibility without limiting the ankle motion."


Thinkstockphotos.com #200303838

In fact, he said, some designs allow for the posterior strut to be removed and replaced with different and/or stiffer struts. Others are incorporated into the laminate itself so the entire orthosis flexes and extends as a unit.

"The advantage is that so much of the stress, which can result in fracture points, can now be distributed through the posterior of the leg," Weber said. "I believe heavier people who have been dissatisfied with previous materials will find themselves more likely to use braces with these composite materials."

Vibrating insoles, he said, can be beneficial to balance by providing haptic feedback for an insensate lower limb, which can be an issue in obese patients with diabetes or vascular disease.

"Orthotists must be careful in adapting inserts," Weber said. "The insert may be haptic in feedback but not contour exactly to the plantar surfaces of the foot and cause undue pressures within a smaller area. The neuropathic foot requires a very accommodating insert that spreads out the plantar pressure evenly."

Hank Black is a freelance writer in Birmingham, AL.

References are available at lermagazine.com.

JSB

ORTHOTICS
&
MEDICAL SUPPLY, INC.

800-373-5935
www.JSBinc.com

Presenting our…

New Fall Prevention Brace

"ULTIMATE SB"

CPT Codes:
L1940
L2330
L2820

The Ultimate (SB) Stabilizer Brace functionality is to stabilize gait, improve postural balance/sway, provide stabilization in the ankle joint and to reduce the risk for falls.

It is anticipated that the patient will benefit functionally with the use of this device. The custom device is utilized in an attempt to reduce the mortality/ morbidity of falling.

$295* **Available in 9″* and 12″**

NOTE: The minimum casting requirements for all AFO and Gauntlets is a 14″ STS Bermuda Casting Sock.

VIONIC®

WALK. MOVE. LIVE.™

*Clinically proven to relieve heel pain**

A recently released peer-reviewed study reveals that Vionic® contoured sandals are comparable in effectiveness to our best-selling pre-fabricated orthotics in the short-term treatment of heel pain. The same study also shows that Vionic® contoured sandals offer more effective relief for heel pain sufferers than standard flat flip flops. These results make Vionic® the first and only sandal brand proven to effectively alleviate heel pain.

PODIATRIST DESIGNED

TRUSTED SINCE ORTHOTIC TECHNOLOGY 1979

IMPROVE OUTCOMES WITH OUR COMPREHENSIVE RETAIL OPPORTUNITIES.

Contact us to learn about our comprehensive in-store retail opportunities and our slatwall display program.
Contact: Deena Rudden at: **415-755-2783** or email: **drudden@vionicgroup.com**
www.VionicShoes.com

To read the full study, visit: **www.vionicshoes.com/heel-pain-relief-study**
*Based on a peer-reviewed clinical study partially funded by Vionic on patients experiencing moderate, non-traumatic heel pain.

POWERED BY VASYLI® MEDICAL

Istockphoto.com #48511688

Dynamic load analysis for injury prevention

Identifying loading patterns associated with Jones fractures and other common sports-related injuries can assist with the development of custom modifications to footwear, insoles, and training programs to help reduce injury rates and enhance athletic careers.

By Yannick Goeb, Nate Wilcox-Fogel, and Kenneth J. Hunt, MD

Foot and ankle injuries are common in the athletic population, particularly in athletes participating in field and court sports. In fact, an internal review of National Collegiate Athletic Association athletes in Stanford University's carefully kept injury database indicates that more than one quarter (27%) of injuries in athletes are to the foot, ankle, or both.[1] These injuries can often impact performance, result in missed time from participation, and in some cases require surgery or other interventions to return the athlete to their sport.

Much has been published in the scientific literature about "static" mechanical risk factors for foot and ankle injuries.[2-4] These are factors such as foot alignment, stiffness, and plantar pressures, which are generally measured on examination or x-rays, with the athlete standing still or taking a single step. Until recently, very little was known about "dynamic" mechanical risk factors for injuries to the foot and ankle during sports activities. These factors must be measured while the athlete is participating in an athletic activity such as running, jumping, or changing direction (ie, cutting).

Identification of dynamic risk factors in athletes can be a challenge since many loading assessment techniques are too cumbersome or inaccurate to give meaningful data. For example, pressure mats are commonly used to measure static pressures or pressures associated with a single step in the middle of a gait or activity protocol. The problem is that it is difficult to know whether this one step—especially if the study participant knows which step will be measured—is representative of the participant's gait or movement patterns, which can be variable. In addition, while assessment during walking or running is more difficult than a static assessment, it is even more difficult to obtain data on cutting, landing, and other sport-specific activities.

Advances in insole-based plantar pressure measurement technology allow for calibrated and accurate quantification of dynamic loads at specific sites in the foot during athletic activities.[5] We are able to apply this technology to the athletic population, in the hope of identifying risk factors for foot injuries and introducing preventive

> An important goal of characterizing dynamic loading in athletes is to identify patterns that are modifiable using noninvasive measures such as orthotic devices or footwear.

Continued from page 49

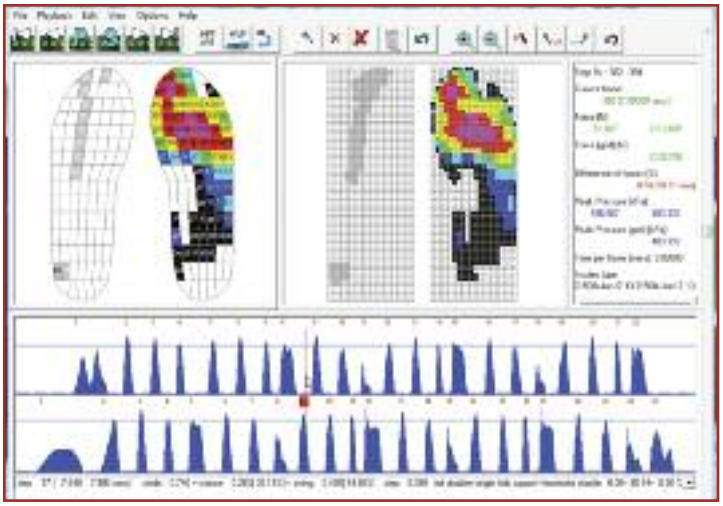


Figure 1. Novel Emed software interface. Steps are shown as pressure peaks in the lower panel (blue peaks). Sensor elements in the insole are represented by colored rectangles in the interface (upper left panel). Image courtesy of Novel.

measures to correct or accommodate for excessive mechanical loading.

The best way to identify these risk factors is to prospectively screen a group of athletes and follow them to see which sustain injuries, but that is an expensive and logistically prohibitive undertaking for most researchers. An alternative approach is to assess athletes who have already been successfully treated for the injury.

The Jones fracture

Fractures of the base of the fifth metatarsal (also called the Jones fracture for Sir Robert Jones, the British orthopedic surgeon who first described the injury)[6] are relatively common in field and court athletes. Several high-profile athletes have experienced this injury, and it is not always inconsequential. Jones fractures are broadly accepted to occur because of a buildup of stress at this location in the bone (the fifth metatarsal is on the lateral side of the foot). Forces from the strong peroneus brevis tendon that attaches the fifth metatarsal, along with impact forces during running and cutting, cause the stress buildup.[7]

It's well known that one risk factor for Jones fracture is a cavovarus foot with a high arch, in which the heel bone sits slightly inward from its normal position, exposing the fifth metatarsal to higher loads.[8] A cavovarus foot alone is unlikely to cause enough stress buildup to cause a Jones fracture in an inactive person but, in athletes, this part of the foot experiences tremendous force. Often the fracture is associated with a seemingly minor impact or inversion injury, the bone having been weakened by many preceding impact forces.

Due to rates of slow healing, nonhealing, and refracture after healing, the majority of Jones fractures in athletes are treated surgically. Surgery involves placing a screw into the fifth metatarsal bone, crossing and compressing the fracture, and stabilizing the bones. Healing rates are high, and recovery generally happens quickly.[9]

To determine whether athletes with a history of Jones fracture experience increased loads at the fifth metatarsal during athletic activity, thus increasing their risk of stress buildup, we recruited 16

healthy elite athletes (two women) to participate in a study. Half had a history of Jones fracture that had healed uneventfully after surgery, and the other half were controls matched for the same age, sport, and position.

Using a calibrated wireless insole system, we analyzed dynamic loading patterns during sports activities. Each insole has 99 sensors, each sampling at 99 Hz. This provides a lot of information about each step, as illustrated in Figure 1. All athletes performed a series of athletic movements that simulate typical training and competition activities, including walking, running, cutting, and jumping. Previous studies have demonstrated that specific cutting motions such as a crossover pivot may be more relevant for lateral forefoot loading than side cutting.[10] Our testing included both side cutting and crossover cutting. We extracted dynamic loading data using the insole software system and compared loading at the fifth metatarsal during each activity between athletes with a history of Jones fracture and controls.

The resulting data showed that athletes with a history of Jones fracture experience significantly higher loads at the base of the fifth metatarsal during athletic activities than control athletes. Interestingly, these differences were evident in walking, running, jumping, and cutting activities, which are among the most common movement patterns in competitive athletes. It's possible these increased loads during walking and running lead to chronic overloading of the lateral forefoot and contribute to the development of fracture.

Previous studies using other methods of assessing plantar pressure loading have found a decrease in lateral foot loading in athletes with a history of Jones fracture, and no association between cavus foot structure and Jones fracture risk.[11] We believe dynamically assessing plantar pressure with insoles, rather than force platforms, provides researchers with more accurate plantar pressure data and may explain the differences seen in our study and previous studies.

We now collect plantar pressure data on all athletes at risk for Jones fractures and other overuse injuries based on their skeletal structure, alignment, and sport. A football lineman with a cavus foot, for example, has a greater risk for Jones fracture than a swimmer.

An important goal in our work characterizing dynamic loading differences in athletes is to identify loading patterns that are modifiable using noninvasive measures such as orthotic devices, mobility and flexibility training, or footwear choice. A study of nonstandardized custom insoles did not demonstrate significant reduction of fifth metatarsal loads in athletes who had suffered a Jones fracture.[12] We have now standardized our orthotic technique, and preliminary results of this new method appear to reduce loads.[13] Additional study will also help us determine whether identification of at-risk athletes, and subsequent implementation of intervention programs, will reduce injury rates. The results of these and similar studies will help inform understanding of the utility of nonoperative interventions for altering loading patterns of athletes with a particular loading imbalance.

Optimizing injury recovery

A primary goal of rehabilitation following surgical or nonsurgical treatment of any foot injury is reducing mechanical loading in the region of injury. This can be done with crutches or with devices, such as a walking boot, that are designed to reduce loads during walking.

Let's again look at Jones fractures. After the injury and/or surgery, we want to reduce loads on the lateral aspect of the foot to

Continued on page 52

Continued from page 51

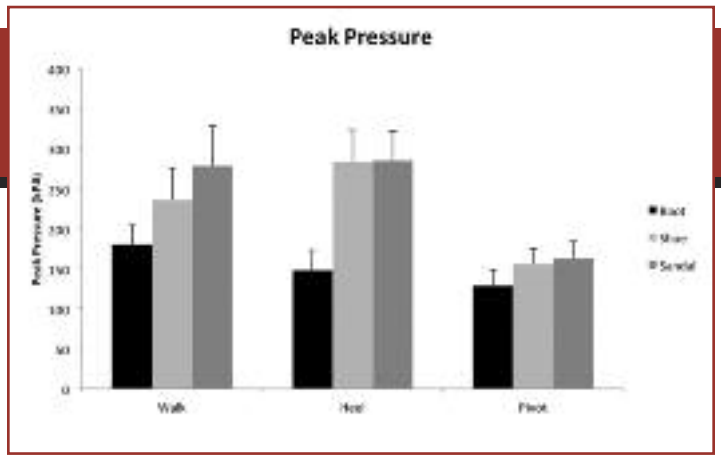


Figure 2. Graphic illustrating mean and standard errors for peak pressure (left), contact pressure (center), and impulse (right) in three footwear devices in three gait activities. Peak pressure and contact pressure in kPa, impulse in Ns.

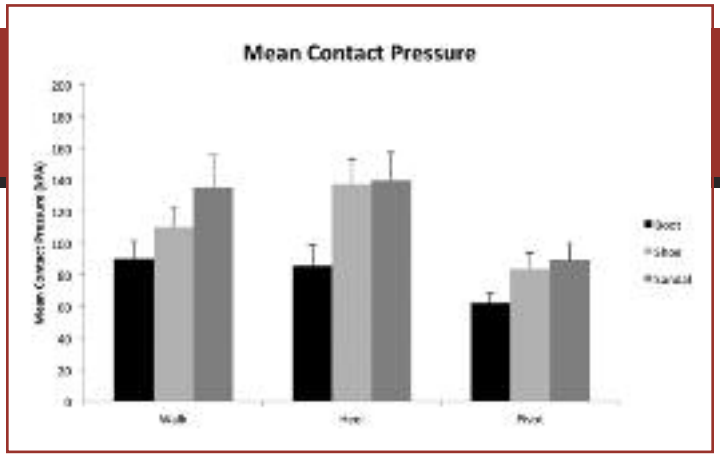
help ensure complete healing before the athlete returns to sports. Excess force after surgery can slow or even prevent healing.[14] However, we want to avoid complete immobilization, as in a cast or non-removable splint, since this can lead to muscle atrophy and deconditioning.[15]

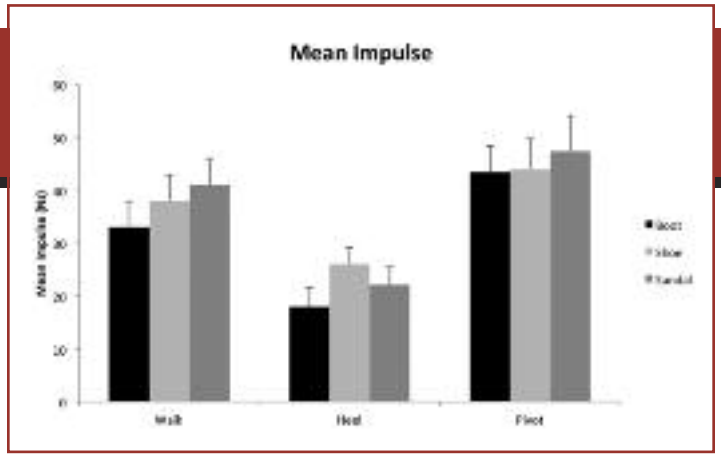
Using dynamic load-sensing insoles, we recently compared available offloading rehabilitation devices to see which would best accomplish our objective.[16] We recruited 20 active healthy young people with no recent history of foot injury. We had each study participant wear each of three commonly used rehabilitation devices—a CAM (controlled ankle movement) walker boot, a rigid postoperative sandal, and a standard athletic shoe. During heel walking, subjects walked on their heels at 1 m/s and were instructed to keep pressure off the hallux and forefoot.

Our aim was to determine which device most successfully offloaded the fifth metatarsal base during walking, heel walking, and pivoting, all common daily activities. Our results (Figure 2) show the CAM walker boot was associated with significantly lower loads at the fifth metatarsal base in several testing conditions relative to the sandal and shoe.

The CAM walker boot shower reduced contact pressure at the fifth metatarsal during walking and heel walking relative to the postoperative sandal, and during heel walking relative to the shoe. In other testing conditions, there was a trend toward reduced contact pressures in the CAM boot relative to the shoe, though these trends were not statistically significant. There was little observed difference in fifth metatarsal loads between the athletic shoe and the postoperative sandal for any of the conditions tested. This suggests a CAM walker boot is likely a better choice for rehabilitation of Jones fractures than a sandal or shoe.

There are, of course, many factors in addition to load reduction to consider when choosing rehabilitation footwear. Mobility and comfort, for example, may affect practitioners' and patients' decisions about footwear devices for the rehabilitative period.





Clinical applications

The observation that increased fifth metatarsal loads during repetitive athletic activities such as walking and running correlate with an athlete's history of fifth metatarsal stress fracture highlights the role that repetitive loading patterns may play during long periods of competition or training.

Wireless insole-based plantar pressure measurement systems allow an accurate and reproducible assessment of loading patterns and an effective means of understanding an athlete's loading mechanics, as well as the effectiveness of interventions. As sensor technology continues to advance, basic pressure insole systems will likely become more available for a greater number of practitioners and will undoubtedly become a more common tool for risk factor assessment.

We foresee a future in which patients are risk-stratified based on their plantar pressure distributions as compared with a large group of healthy age-matched controls. Developing a large database of patients to better understand the "normal" plantar pressure distributions in different foot structures will require ongoing testing.

Topological data analysis

The use of wireless plantar pressure insoles allows for quantification of loading patterns in elite athletes during a variety of athletic activities. The amount of data generated by even a single trial of data sampling is substantial. Our team has used innovative data analysis methods to better handle our large data sets. One such method is

Continued on page 55


A Fit For A
Queen
Queen
COBRA
From high heels to boots to flats, the Queen Cobra custom orthotic fits easily into all of your patients' high-fashion footwear.
Feet get the royal treatment with Queen Cobra's unique, thin and lightweight design – it bends to adapt to different heel heights and shoe styles while offering superior arch support and control.
Handcrafted to each individual patient's prescription, the Queen Cobra offers custom correction for regal comfort.
Footmaxx
Call Customer Service today. 1.800.779.3668
facebook.com/footmaxx
twitter.com/footmaxxinc
footmaxx.com
©2015 Footmaxx

Continued from page 53

Figure 3. Sample topological network created with 60-plus elite athletes, each represented by a node and spatially organized based on loading patterns during common athletic activities. Nodes highlighted represent athletes with a history of Jones fracture.

called "topological data analysis," or TDA, which allows for visualization of complex data sets in a spatial network of nodes organized by statistical similarity. This method has been used in oncology to study genetic similarities between tumor samples, as well as in sports analytics to better understand athletes' performance.[17]

In our use of TDA, each athlete is represented as a node in a topological network. The similarities are assessed based on each athlete's plantar pressure data, whereby athletes with similar measurements across all chosen dimensions are more closely connected to each other. We then use a software program to determine which athletes are most and least similar to each other based on clustering of specific data points in the statistical network. A sample of a TDA network from our data, highlighting athletes with a history of Jones fracture, is shown in Figure 3.

Through this athlete risk segmentation, we can identify "types" of athletes who are more or less at risk for certain injuries based on their plantar pressure data. We can also determine associations between certain loading patterns and different sports, positions, and genders, creating relationships between an athlete's dynamic loading profile and his or her injury history or risk. At this stage, we are using this method of risk stratification in a research setting only. In the future, we hope to better understand foot and ankle injury risk using TDA networks and implement topological data analysis into clinical practice.

Summary

The end goal of this collaborative work is prevention of injuries in athletes by systematically identifying risk factors for injury and instituting preventive measures. Our work thus far has allowed us to identify a pattern of increased loads at the fifth metatarsal in athletes with a history of Jones fracture and to compare the degree of offloading provided by different rehabilitative footwear options.

Additional analyses are underway with our data system to identify loading patterns associated with other common injuries. Ultimately, custom modifications to footwear, insoles, and training programs may help reduce injury rates and enhance athletic careers. ler

Yannick Goeb is a fourth- year medical student and Nate Wilcox-Fogel is a third-year medical student at the Stanford University School of Medicine in California. Kenneth J. Hunt, MD, is an associate professor and chief of Foot and Ankle Surgery at the University of Colorado School of Medicine in Aurora.

References are available at lermagazine.com.

ad index

ler new p

GlideWear Shear Protection Socks

New from Tamarack Habilitation Technologies, GlideWear Shear Protection Socks provide targeted protection from friction and shear to help prevent skin breakdown. Featuring dual-layer, low-friction fabric technology, GlideWear is engineered to provide protection where it is needed while preserving friction in surrounding areas to maximize comfort and safety. The full forefoot and transmetatarsal models are SmartKnit Seamless Socks by Knit-Rite featuring a GlideWear low-friction zone. The Heel & Ankle model helps prevent heel ulcers during extended bed-stay and the use of orthotic walkers.

Tamarack Habilitation Technologies
866/795-0057
glidewear.com

TriZone Knee Brace

DonJoy, a DJO Global company, is proud to introduce the TriZone Knee Brace. Featuring compression knit and silicone materials, TriZone is a lightweight, low-profile knee sleeve designed for performance as well as protection from knee pain. The TriZone Knee Brace combines the benefits of proprioception and compression in one fast application. Directional, wicking fibers provide compression, comfort, and cooling. This new product embodies the DJO Global mandate that if you understand the benefits of motion and take control of joint pain, you take control of your ability to stay active longer.

DJO Global
800/336-6569
djoglobal.com

Updated OPTP Catalog

OPTP (Orthopedic Physical Therapy Products) has published the 34th edition of its semi-annual professional catalog. The updated catalog now includes nearly 1000 health and wellness products, many of which are offered exclusively through OPTP, in 16 categories including taping, foam roller therapy, Pilates, balance, and foot therapy. New and exclusive items in this volume include the 18" Pro-Roller Soft, a shorter length foam roller designed for convenience and portability, and the ActivMotion Bar, an exercise bar with internal weighted ball bearings that shift during use for a more challenging workout.

OPTP
800/367-7393
optp.com

Silcare Breathe Prosthetic Liners

New Silcare Breathe prosthetic liners from Endolite feature laser drilled perforations to allow moisture and air to escape, offering improved comfort and control for amputees and reducing the risks of socket movement, loss of connection, and skin damage. The action of walking and weight bearing on the Silcare Breathe liner expels air through the pores, which helps prevent air and moisture from being trapped inside the liner. With the use of a one-way valve, this helps to generate a better vacuum and more secure fit, allowing users to comfortably wear their prosthetic devices for longer periods.

Endolite
800/548-3534
silcareliners.com

roducts

KX2 Flexible Foot Lift

For those suffering from foot drop, the KX2 Flexible Foot Lift enables a more natural walking or running step while allowing ankle mobility. The device is comfortable, easy to use, lightweight, and adjustable. The KX2 Flexible Foot Lift combines a soft ankle cuff with two spring straps that attach to a toe strap or eyelets. This foot brace raises the foot and toes, and can be easily adjusted according to the degree of lift necessary. The cuff accommodates changes in ankle size from swelling and requires no special shoes or foot inserts. The KX2 Flexible Foot Lift is made in the US and is available in two colors and five sizes.

KX2 Devices
866/605-1071
kx2devices.com

Handler 704 Sani-Grinder

Handler Manufacturing introduces the new and improved model 704 Sani-Grinder, with a 33% larger sanding drum to allow for better contouring and shaping of larger podiatric and orthotic appliances. The 704 Sani-Grinder is an affordable, self-contained device that requires no installation. A powerful two-speed Red Wing bench lathe on a 6-inch-high base provides a comprehensive sanding and grinding system with a built-in suction and containment bag. The low speed allows for shaping and reduction of plastics, foams and leather, while the high speed can be used for polishing and faster reduction of devices.

Handler Manufacturing
800/274-2635
handlermfg.com

Advanced Ortho Aero Walker

The new Aero Walker from Advanced Orthopaedics is an advanced walker boot designed to provide the necessary immobilization and compression while maintaining a comfortable user experience. This lightweight, durable walker boot features a meticulously engineered cushioned sole for greater energy absorption. A newly designed adjustable reinforced toe guard adds toe protection and promotes easy fitting. The Aero Walker also incorporates an inflatable bladder into the boot liner for more effective immobilization of the lower leg, ankle, and foot. Each device is designed to fit the left or right foot.

Advanced Orthopaedics
800/270-7074
advanced-orthopaedics.com

ToeSnug Buttress Pad

Evenup is excited to introduce its new product, the ToeSnug Buttress Pad, for treating hammertoes, hard and soft corns, metatarsalgia, and spreading and overlapping toes. For toes that are contracted and bent, the ToeSnug acts as a bumper above the toes to reduce dorsal pressure from footwear. Padding above and below the toes helps to straighten them and reduce pressure at the tip and ball of the foot. Toes that are spreading apart or leaning against each other are gently realigned with the ToeSnug. The new product comes in small, medium, and large sizes; each device fits either the left or right foot.

Evenup
800/334-1906
toesnug.com

Visit lermagazine.com/products for more products and to submit your new product listing.

ler new products

STS XXL Slipper Sock

The STS Company has developed a new size of its slipper casting sock for those individuals with very large feet who are in need of custom foot orthotic devices. The Extra-Extra Large (XXL) Slipper Sock is designed to create an accurate model of the foot for the fabrication of custom orthotic devices for patients whose shoe size is a men's 15 or larger. The addition of the new size will now provide lower extremity practitioners with a full complement of casting sock sizes to accommodate a range of patients, from children to very large adults. The new size has been assigned the product number 903-XXL.

STS Company
800/787-9097
stssox.com

Arcopedico Summer Shoes

Arcopedico USA introduces new collections for summer 2016. Alice is a loafer in solid-tone suede with a hand-stitched vamp, cushioned insole, metal-free twin arch supports, and a lightweight polyurethane outsole. The new Monterey sling back sandal features two flexible crisscrossing elastic straps across the vamp, leather heel and toe straps, and a moisture-absorbing, antibacterial insole. The metro/modern Leina walking shoe is now available in White Flare and Black Flare. The Leina is vegan and water-resistant, with a slip-resistant sole and a wide, bow-shaped elastic strap over the bridge of the foot.

Arcopedico USA
775/322-0492
arcopedicousa.com

Therafirm Ease Microfiber Tights

Ease Microfiber Tights by Therafirm, a Knit-Rite brand, are made with high stretch yarns for easy donning. The soft microfiber material, knit-in waistband, and smooth toe are designed to ensure all-day comfort; the waistband also resists rolling. The reinforced heel and toe help to maximize durability. Ease Microfiber Tights are available in long and short lengths, mild (15-20 mmHg) and moderate (20-30 mmHg) compression levels, and six fashionable everyday colors. Like all Therafirm gradient compression products, Ease Microfiber Tights are made in the US in the company's own manufacturing facilities.

Therafirm, a Knit-Rite brand
866/842-0984
therafirm.com

Magnetic Slide Release Buckles

WBC Industries introduces Magnetic Slide Release Buckles to improve donning and doffing of lower extremity devices for children and patients with dexterity issues. The buckle is easily fastened with the help of an internal magnet by bringing the two ends of the buckle close to each other. Once the ends are close together, they snap the buckle into place with a strong secure closure. Opening the buckle is also easy: just slide the two ends apart, which will break the magnetic force holding the buckle closed. The product is sold in pairs and is available in black (1" or 1.5" width) or black and silver (1" width).

WBC Industries
800/818-2932
wbcindustries.com

market mechanics

By Emily Delzell

Foot and ankle surgeons name officers and board of directors at annual meeting

The American College of Foot and Ankle Surgeons (ACFAS) on February 12 installed its 2016-2017 board of directors at the organization's 74th Annual Scientific Conference in Austin, TX.

New ACFAS President Sean T. Grambart, DPM, FACFAS, practices at the Carle Physician Group and Foundation Hospital, Department of Surgery, in Champaign, IL. He is board certified in foot surgery and reconstructive rearfoot and ankle surgery by the American Board of Foot and Ankle Surgery. He is a clinical instructor in the College of Medicine at the University of Illinois at Urbana-Champaign.

Laurence G. Rubin, DPM, FACFAS, is ACFAS president-elect. He practices at the Foot & Ankle Specialists of Virginia in Mechanicsville and is board certified in foot surgery and reconstructive rearfoot and ankle surgery by the American Board of Foot and Ankle Surgery.

Other members of the board: John S. Steinberg, DPM, FACFAS, secretary-treasurer; Richard M. Derner, DPM, FACFAS, immediate past president; directors Christopher Reeves, DPM, FACFAS; Byron L. Hutchinson, DPM, FACFAS; Scott C. Nelson, DPM, FACFAS; Randal Wraalstad, DPM, FACFAS; Aksone M. Nouvong, DPM, FACFAS; Thanh L. Dinh, DPM, FACFAS; and Eric G. Walter, DPM, FACFAS, division presidents council chair. ler

Guidelines address diabetic foot ulcer care

The American Podiatric Medical Association and the Society for Vascular Medicine in February published in the *Journal of Vascular Surgery* new recommendations for five key aspects of diabetic foot ulcer (DFU) care.

These include using custom therapeutic footwear in high-risk patients with diabetes, including those with significant neuropathy, foot deformities, or previous amputation; preventive recommendations, such as adequate glycemic control, periodic foot inspection, and patient and family education; offloading of plantar DFUs with a total contact cast or irremovable fixed ankle walking boot; probes and plain film images in new DFUs, with magnetic resonance imaging for suspected soft tissue abscess or osteomyelitis; and guidance on comprehensive wound care. ler

Spenco acquires Canadian distributor

Spenco announced in January its acquisition of a Canadian distributor, Spenco Canada. Spenco Canada, which operated independently for more than 20 years, is now under the umbrella of Spenco's North American headquarters in Waco, TX, as a wholly owned subsidiary. Spenco plans to keep its sales, customer service, and shipping teams in place and hire a new national sales and marketing manager.

Spenco products are available in 87 countries. In China, Spenco has operated for the last year under an exclusive distributor agreement with Teamwork, a sales and distribution company. Spenco's line of fashion-forward orthotic shoes, sandals, and slippers are available at Chinese retailers and select high-end shops. ler

Study supports Vionic sandal for heel pain

A contoured sandal made by San Francisco, CA-based Vionic is as effective for relieving heel pain symptoms as an in-shoe orthosis with a similar footbed and more effective than a flat sandal, according to an Australian randomized controlled trial.

Researchers from the University of Queensland randomized 150 patients with heel pain lasting at least four weeks to one of three footwear conditions: the Vionic contoured sandal; a prefabricated, full-length in-shoe orthosis with a similar contoured footbed, also made by Vionic; or a commercially available flip-flop sandal with a flat footbed. Participants were instructed to wear the assigned footwear during waking hours for 12 weeks.

Patients in the contoured sandal group were 68% more likely than those in the flat sandal group to report improved pain at 12 weeks, assessed using the Global Rating of Change tool, and 61% more likely to report improved function, assessed using the Lower Extremity Function Scale. Reported improvements were similar for the contoured sandal and in-shoe orthosis conditions.

The findings were published in December by *PLoS One*. ler

NY Orthopedic Manufacturing opens

Vadim Yatsunsky and Sergey Prokhorov, former general manager and production manager, respectively, of Brooklyn, NY-based American Orthopedic Manufacturing Corporation, have opened an orthopedic laboratory in the Bronx, NY.

NY Orthopedic Manufacturing Corporation (NY OMC) creates custom ankle foot orthoses, custom molded shoes (including athletic, casual, and dress shoes; hiking boots; work boots; and slippers), and neuropathic walkers, all made in the US. Visit the company's website at newyorkomc.com. ler

STS revamps website, adds e-ordering

Mill Valley, CA-based STS in January launched its new website at stssox.com.

The casting sock manufacturer's online site offers detailed product information, including educational videos and a chart to match each STS product to its recommended clinical applications. The site also offers customers the ability to purchase products electronically; traditional ordering methods also will continue to be honored. ler

BOC announces slate of 2016 leaders

The Owings Mills, MD-based Board of Certification/Accreditation (BOC) on January 14 announced its 2016 board of directors, chair, and executive committee.

L. Bradley "Brad" Watson, BOCO, BOCP, LPO, who practices at Clarksville Limb & Brace and Rehab in Tennessee, is chair. The executive committee members are Rod Borkowski, CDME, vice chair; Wayne R. Rosen, BOCP, BOCO, FAAOP, secretary; Shane Ryley, BOCP, BOCO, treasurer; William J. Powers, MBA, LFACHE, re-elected as member-at-large; and James L. Hewlett, BOCO, immediate past chair.

Newly elected board members are Diana Klunk, CMF; David Regier, ATC; and Wayne Rosen, BOCP, BOCO, FAAOP. ler

Continued on page 66

CSUDH unveils O&P education center

California State University, Dominguez Hills (CSUDH) on January 14 celebrated the ribbon cutting for its new Orthotics and Prosthetics Education Center in Los Alamitos.

Attendees viewed current O&P applications, such as 3D scanning, machine and plastics fabrication labs, and a high-tech mechatronics and CAD/CAM room, available to O&P master's students in the 12,000 square foot center.

CSUDH's 22-month O&P master's degree program teaches clinical and technical skills for care of patients with neuromuscular or musculoskeletal disorders or limb loss. The program graduates approximately 10% of the nation's O&P professionals, according to a university release.

The O&P program has been housed at various locations since its 1984 launch, including at the San Diego-based orthopedic company Össur. Before being installed in Los Alamitos it had been at the VA Long Beach Healthcare System hospital since 2009. ler

Össur, Ottobock fund neural device study

Duderstadt, Germany-based Ottobock and Össur, headquartered in Reykjavik, Iceland, announced in late January that the two companies have endowed a research trust with $1 million to further development of neural-controlled prosthetic devices.

The research trust has been established at the University of Iceland in Reykjavik, and within a year will award its first international grants for scientific research and innovative projects in advanced neural control of prosthetic limbs.

Details for the fund's grant application process will be announced soon, according to a joint news release from Össur and Ottobock. ler

Students invent smart mat for diabetes

Jackson State University (JSU) in Mississippi reported in December that a group of its graduate engineering students have designed a "smart mat" that gauges foot temperature in people with diabetes. Data from the mat could give caregivers and physicians early warning of infection.

The project was part of the students' senior design project in JSU's Computational Data-Enabled Sciences and Engineering program. The senior projects aim to find solutions to real problems, according to Gordon Skelton, PhD, JSU professor of electrical and computer engineering and director of the graduate program. ler

Triennial podiatry congress scheduled

The International Federation of Podiatrists and the Canadian Podiatric Medical Association have scheduled the World Congress of Podiatry for May 26-28 in Montreal, Canada. The global congress occurs once every three years and is expected to draw about 1200 attendees.

The event will feature a debate on biomechanics and orthoses moderated by François Allart, DPM, from the podiatry program of the University of Quebec at Trois-Rivières.

Go to fipworldcongress.org to get more information and, until February 29, a reduced registration rate. ler

Thuasne Group acquires Quinn Medical

The Thuasne Group announced in late January that it has acquired Quinn Medical, a specialized spinal bracing company based in San Clemente, CA. The purchase increases Thuasne's investment in the US market and diversifies the portfolio of orthopedic products available through its European subsidiaries and global network of medical device distributors.

Like Townsend Design, a Bakersfield, CA-based manufacturer and distributor of orthopedic knee and leg braces purchased by Thuasne in 2011, Quinn Medical was a family-owned company that developed a respected brand. Quinn's primary assets are its patented spinal bracing technology, US sales force, and customer relationships with physicians and medical providers.

Thierry Arduin, an Executive Vice President for Thuasne who has served as President of Townsend since 2013, will also serve as President of Quinn Medical. Rick Riley, CEO of Townsend, has been appointed to Quinn's new governing board, and will help lead the integration of Townsend and Quinn as jointly managed and marketed entities of Thuasne USA. Todd Thornton will continue as Vice President of Product Development. ler

medi USA expands national sales force

Whitsett, NC-based medi USA announced in January a national expansion of its sales force. The changes will better serve its customer base, increasing its reach and frequency to foster increased market share growth, according to a company release.

medi's 2016 internal sales structure features five sales regions, each led by a regional manager and supported by a district sales manager and product specialist. The company also will significantly increase the number of representatives across the country, while reducing the overall size of each territory, allowing the sales team to become more available to its partners.

In addition, medi has expanded its clinical services team to include a Clinical Wound Care Division and a Prosthetic Specialty Training Group, which will provide additional education, training, and services to customers and patients. ler

OTWorld will meet in Leipzig in May

The German Association of Orthopaedic Technology plans to hold the OTWorld International Trade Show and World Congress May 3-6 in Leipzig.

The event will feature about 550 exhibitors from 40 countries. Keynote speakers will lecture on the congress' core disciplines: orthotics, prosthetics, and orthopaedic footwear technology. Specific topics include phantom pain, the biomechanics of diabetic foot, cosmetic socket technology, and obesity.

International exhibitors include Basko Healthcare from the Netherlands, Freedom Innovations and Fillauer from the US, the French companies Proteor and Rodin4D, and Endolite, Blatchford & Sons, and Ortho Europe from the UK. Other countries represented include Canada, China, Iceland, Japan, Lithuania, Poland, Russia, Taiwan, and the Czech Republic.

Go to ot-world.com for more information. ler

Stop wasting time and money with plaster.

New Technology, Same Product

Get the same result from a 3-D scan

Non-Semi Full Weight Bearing 3-D Scanning

We will always accept traditional orthotic casting methods as well.

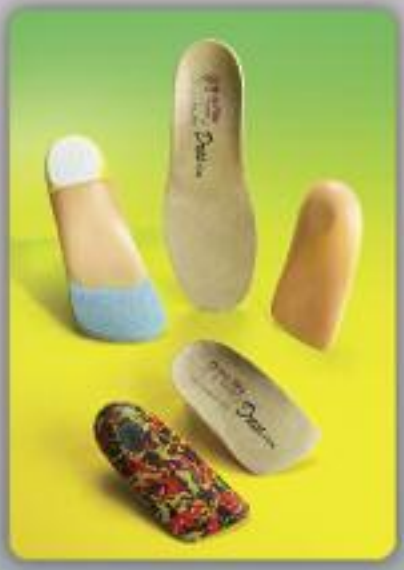
Call Us

Never hang up unhappy

800-473-6682

www.ortho-rite.com

Here are some of our orthotic products:



Ortho-Rite
INCORPORATED

65 Plain Ave.
New Rochelle, NY 10801
Fax: (914) 235-9697
info@ortho-rite.com

THE LANGER SPORTHOTICS LINE

FINE TUNING ATHLETES, ONE SPORT AT A TIME

Langer Biomechanics
An OHI Company

The Langer Sporthotics Line

ALLSPORT BASKETBALL MARATHONER SOCCER SPRINTER

For more info on the Langer Sporthotics Line, visit LangerBiomechanics.com or call:

800.645.5520

The OHI Family of Brands

APEX · AZafo Arizona · Langer Biomechanics · PedAlign · safestep · The Orthotic Group