

• REHABILITATION • TRAUMA • DIABETES • BIOMECHANICS • SPORTS MEDICINE

Ler

LOWER EXTREMITY REVIEW

August 16 / volume 8 / number 8

PREGNANCY AND GAIT:

*From foot pain to
fall prevention*



O&P

UNEVEN TERRAIN: TACTICS
FOR ORTHOTIC DEVICE USERS

SPORTS MEDICINE

FOOT STRIKE WHILE RUNNING
AND PATELLOFEMORAL PAIN

OSTEOARTHRITIS

FOOT ROTATION DURING GAIT
IN PATIENTS WITH KNEE OA

SURGERY

RADIOFREQUENCY-BASED
ARTHROSCOPY IN THE ANKLE



Positive Outcomes for Successful Practitioners



IT SOFTEN HEAT PATCH

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.

S WITH A H.

[10,12] manipulator
transition

ADJUSTED



IT'S TIME TO EMBRACE
THE RE-FORM.



No more sending inserts back to the manufacturer or rescheduling patients. It's the technology you expect from the leader in therapeutic footwear. Contact: (877) 728-9917 or drcomfort.com/exos2





SEE THE LIGHT.

THE LIGHTEST DIABETIC SHOES EVER.

LEARN MORE AT
www.andoyneshoes.com
1-844-637-4637

PDAC A5500 REVIEWED



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

Acor Orthopaedic
www.acor.com



Allied OSI Labs
www.osilabs.com



ComfortFit Orthotic Labs
www.comfortfitlabs.com



Eastern Podiatry Labs
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.klmilabs.com



Marathon Orthotics
www.marathonortho.com



Root Lab
www.root-lab.com



SOLO Labs
www.sololabs.com



STJ Orthotic Services
www.stjorthotic.com



SureFit Lab
www.surefitlab.com



15

ELITE DISTRIBUTORS

joining together to support

ONE

BRACE

You don't get to be the best player on the field without the support of a fabulous team.

The Richie Brace is the gold standard of the orthotics industry. It happened because a superior quality product is supported by an extraordinary team. Fifteen of the top orthotics companies in the country share and support the Richie Brace for one reason: they recognize the best product to provide for their customers. Fifteen elite distributors supporting one product...unprecedented for a good reason. Thank you!

THE *Richie*
BRACE
RESTORING MOBILITY®

For more information visit
richiebrace.com



Lower Extremity Review ler

August 2016 features

24 ORTHOTIC DEVICES FOR THE WIN Management of Achilles tendinopathy in runners

Evidence suggests orthotic intervention may reduce Achilles tendon load in healthy runners as well as symptoms in runners with Achilles tendinopathy, but the mechanism is unclear.

By Howard Kashefsky, DPM

27 Uneven terrain: Tactics for orthotic device users

Helping patients manage an orthotic device can be challenging, but doing so in the face of uneven terrain is a balancing act between stability, mobility, and strength. Device adjustments and rehabilitation protocols can help avoid asymmetries and reduce the risk of falling.

By Shalmali Pal

37 Foot strike while running and patellofemoral pain

Recent research supports the idea that increased patellofemoral stress is a contributing factor in runners with patellofemoral pain, and that gait retraining to promote a forefoot strike pattern is associated with reductions in patellofemoral stress and self-reported pain.

By Jenevieve L. Roper, PhD; Deborah L. Doerfler, PT, DPT, PhD; Christine M. Mermier, PhD; and Janet S. Dufek, PhD

43 Foot rotation during gait in patients with knee OA

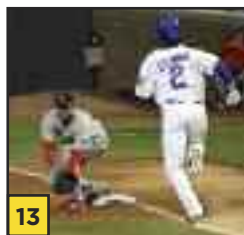
Rotating the foot in or out during gait is associated with significant decreases in frontal plane knee load during early or late stance, respectively, and can be effective for reducing pain and potentially slowing the progression of disease in patients with knee osteoarthritis.

By Kevin Alan Valenzuela, ABD, CSCS; and Hunter Jared Bennett, PhD

49 Radiofrequency-based arthroscopy in the ankle

The results of a retrospective chart review suggest that the use of plasma-mediated bipolar radiofrequency-based arthroscopic micro-debridement is associated with notable decreases in self-reported ankle pain in patients who have tried conservative treatments without success.

By Renato Giorgini, DPM, FACFAS; Stephanie Giles, DPM; Omer Aci, DPM; and Christopher Japour, DPM, MS



VOLUME 8 NUMBER 8 LERMAGAZINE.COM



16 COVER STORY PREGNANCY AND GAIT: From foot pain to fall prevention

Researchers are investigating how changes during pregnancy may affect the lower extremities in the long term, as well as ways to treat and prevent these issues.

By Lori Roniger

IN THE MOMENT

sports medicine / 13

Striking out hamstring strain: Protocol helps protect baseball players

Achilles tendon size, stiffness differ based on runners' shoe preference

Athletes with low neurocognitive scores exhibit high-risk landing biomechanics

plus...

OUT ON A LIMB / 11

Falling in with feedback

Visual feedback-based gait retraining is gaining multidisciplinary momentum, most recently with regard to diabetic foot care.

By Jordana Bieze Foster

NEW PRODUCTS / 58

The latest in lower extremity devices and technologies

MARKET MECHANICS / 61

News from lower extremity companies and organizations

By Emily Delzell

Don't let skin, braces and prosthetic liners get 'funky' this summer!

FungaSoap® washes away bacteria and fungus naturally, gently

Summertime temperatures and humidity will cause sweating and related skin problems among many of your patients. Their prosthetic liners and braces will stink. Their skin will be damp, creating the perfect breeding ground for fungus and bacteria to thrive.

That's why, in addition to leading podiatrists, O & P experts are also now encouraging their patients to wash their liners, braces, skin and residual limbs with FungaSoap®.

FungaSoap® cleans with the natural power of Tea Tree Oil — known for centuries for its antimicrobial, antifungal, antiseptic activity. In trials, it provided just the right amount of cleansing strength, without harsh chemicals. It works.

See for yourself! Get a FREE trial size bottle of FungaSoap® and help your patients stay comfortable and free from funk this summer.



Get these other helpful products from PediFix®, too!



Visco-GEL® Finger & Toe Caps
Protect Digits



Silicone Sheets Absorb Friction
& Shear Between Skin &
Prosthetics, Protect 'Hot Spots'



PediPlast® Custom-Made
Cushioning Devices in Just 5
Minutes — For Any Body Part



Visco-GEL® Foot Products
Cushion & Protect to Relieve
Pain Instantly

**See 200+ foot, ankle and skin
care products in our new catalog!
Get your copy today.**

PediFix® Medical Footcare

Effective. Economical. Easy.

To order, get a free sample, or more information...

Call: 1-800-424-5561

FAX: 845-277-2851

E-mail: info@pedifix.com

Visit: www.pedifix.com

Return this Coupon to:

Dept. LER816, 281 Fields Lane, Brewster, NY 10509

Contact your favorite PediFix distributor

Yes! Please send me: ☐ Free Catalog ☐ 1 Free FungaSoap® Sample
☐ 10 FungaSoap® Trial Size Bottles, 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. LER816, 281 Fields Lane, Brewster, NY 10509

Fax to: 845-277-2851 Please provide all information requested and allow 3 weeks for delivery

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

Editorial advisors

Craig R. Bottoni, MD, Jonathan L. Chang, MD,
Sarah Curran, PhD, FCPodMed, Stefania Fatone, PhD, BPO,
Timothy E. Hewett, PhD, Robert S. Lin, CPO,
Jeffrey A. Ross, DPM, MD, Paul R. Scherer, DPM,
Erin D. Ward, DPM, Bruce E. Williams, DPM

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. Copyright©2016 Lower Extremity Review, LLC. All rights reserved. The publication may not be reproduced in any fashion, including electronically, in part or whole, without written consent. LER is a registered trademark of Lower Extremity Review, LLC. 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

23,380 likes



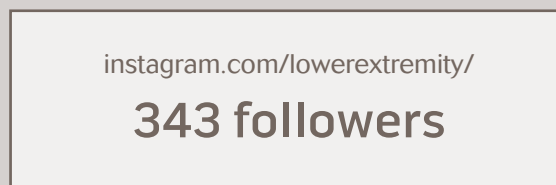
[@lowerextremity](https://twitter.com/lowerextremity)

2,909 followers



youtube.com/user/LowerExtremityReview

142,000 video views



instagram.com/lowerextremity/

343 followers



pinterest.com/lowerextremity/

294 followers

INTRODUCING:

ACOR® PRIME

FREE SHIPPING
both ways!

Satisfaction
Guaranteed!

Average lead time is
7-10 business days!*

Standard mods included at no additional charge!

Accommodative Orthotics



CORT-96

Materials:
P-Cell® +
Microcel Puff®

\$70
for 3
pairs

Functional Orthotics



SPRT-CO3

Materials:
X-Static®/NeoSponge™ +
Copoly + Microcel Puff® Post + Cordura + DuraSOLE

\$85
per
pair

Free Mods (included in price):

- Heel Lift
- Wedges
- High Heel Cup
- High Flanges (Medial/Lateral)

- Met Pad
- Met Bar
- Neuroma Pads
- Scaphoid Pad
- Horseshoe Pads

- Dancer Pad
- Toe Crest
- Depressions
- Saddle Accommodations

AFO Gauntlets

- Standard Features:
- Volara®-padded collar
- Polypropylene inner shell
- PORON® padding throughout
- Leather lining
- Seamless footbed area
- P-Cell® + PORON® orthotic
- 18 colors of Leather available!



\$270.00
each - Classic



CGC-001

- Now Made in the USA!
- Choice of Closures
- 7-10 Day Turnaround Time
- FREE STS sock included with each outbound shipment

Richie Brace®

\$295.00
each - Classic

***Average lead**
time is 15
business
days!*



- FREE STS sock included with each outbound shipment



One of the interesting things about *LER*'s multidisciplinary perspective is being able to follow a new idea as it is examined and embraced by one specialty after another, each with its own therapeutic goals and challenges. The use of visual feedback for gait retraining is a recent example of a therapeutic innovation that seems to be gathering multidisciplinary momentum.

This type of intervention typically involves a patient walking or running on a treadmill while looking at a computer screen that displays a graphic representation of a variable of interest (eg, muscle activation) and a target range for that variable. Graphics are created during gait based on measurements taken by instruments within the treadmill or external to it (eg, an accelerometer). The patient is then instructed to alter his or her gait in ways that will keep the graphics within the target range.

Published studies on visual feedback-based gait interventions started appearing in the medical literature in the 2000s, which probably means they were being used clinically for a few years before that. Early studies involved electromyographic feedback to improve ankle function in stroke patients with hemiparetic gait, peak positive acceleration feedback to reduce loading in runners, and dynamic knee alignment feedback to reduce knee adduction moment in patients with knee osteoarthritis.

Now it seems the visual feedback gait retraining trend has caught the attention of clinicians who treat foot conditions in patients with diabetes. Last month at the annual meeting of the American Podiatric Medical Association, a poster described preliminary research from Rosalind Franklin University in Chicago using peak

out on a limb: Falling in with feedback

tibial acceleration feedback to reduce tibial accelerations and ground reaction forces during walking and jogging. Although the data presented involved healthy volunteers, the goal of the project is to apply the same techniques to reduce loading in patients with diabetes and diabetic neuropathy.

It's hard to think of a patient population that could benefit more. Exercise has multiple benefits for patients with diabetes—from insulin regulation to weight management to cardiovascular health—but the loads and shear forces involved, especially for overweight patients and those with neuropathy, can put diabetic feet at risk for ulceration. Research suggests that exercise is not contraindicated in patients with diabetes, even those with neuropathy, but experts agree that caution and monitoring are warranted (see "Exercise and neuropathy: Not mutually exclusive," July 2011, page 22). Any intervention that can provide the benefits of exercise while reducing the risks is one that deserves serious consideration.

Visual feedback-based gait retraining is gaining multidisciplinary momentum, most recently with regard to diabetic foot care.

One of the most attractive things about visual feedback-based gait retraining is that patients aren't meant to be attached to instruments forever. Studies have shown patients can retain their new gait patterns even as the feedback is gradually diminished over time, and eventually don't need the feedback at all. One would think this would be particularly true in patients with diabetes who are losing body mass and gaining fitness throughout the process.

It's an exciting trend with potential benefits for so many different patient populations. I can't wait to see where it will pop up next.

Jordana Bieze Foster, *Editor*

PROCARE

Pro Night Splint

A gentle stretch to help relieve symptoms of Plantar Fasciitis

The Pro Night splint provides a gentle stretch to help alleviate the pain and discomfort associated with plantar fasciitis and Achilles tendonitis.

- A soft, padded thermoplastic dorsal shell helps hold the foot in a neutral, 90° position providing a moderate stretch and optimal comfort.
- Designed to provide a low profile, comfortable fit that's easy to apply with soft strap closures around the foot and calf.
- Open heel design allows for minimal ambulation as needed.
- Two sizes fit right or left.

Contact your DJO Global sales representative to learn more about the Pro Night Splint or call

800-793-6065



pro01431-1-12



MOTION IS MEDICINE

Striking out hamstring strain

Protocol helps protect baseball players

By Katie Bell

A hamstring injury intervention program is effective for reducing the rate of hamstring injuries and reinjuries in professional baseball players, according to ongoing research from the University of Delaware presented in July at the annual meeting of the American Orthopaedic Society for Sports Medicine.

Although more general injury prevention programs have been associated with reduced rates of hamstring injury, the authors thought a more baseball-specific protocol would have additional benefits.

"We attempted to make the dynamic movement patterns relevant to the sport of baseball to enhance player adoption and compliance," said lead author Holly Silvers-Granelli, MPT, a PhD candidate in the Department of Biomechanics and Movement Science at the University of Delaware in Newark. "We designed a neuromuscular program that



had an emphasis on eccentric hamstring strengthening and a posterior chain musculature, in addition to lateral hip strengthening. We also included movements to encourage dynamic stability with respect to the lumbar spine and pelvis during dynamic hip flexion and extension."

In the prospective study, 213 major and minor league baseball players completed a questionnaire detailing their hamstring injury history. One major and minor league organization served as the intervention cohort, with 40 players and 173 players, respectively. The hamstring injury prevention program was distributed and explained to the team physician, athletic trainer, and strength and conditioning coach. Individual program compliance, injury incidence, and time lost due to

Continued on page 14

Achilles tendon size, stiffness differ based on runners' shoe preference

The Achilles tendons of experienced minimalist runners differ from the tendons of those who wear traditional running shoes with regard to size, stiffness, and stress, according to research from the University of Connecticut in Storrs that may have implications for runners transitioning to minimalist shoes.

Investigators used diagnostic ultrasound and isokinetic dynamometry to assess the Achilles tendons of 31 well-trained runners, 17 of whom regularly wore traditional cushioned running shoes and 14 of whom regularly wore minimalist shoes.

Values for cross-sectional area, stiffness, and modulus (a measure of the ability to resist elastic deformation) were greater

in the minimalist group than the cushioned-shoe group. Minimalist runners also experienced more stress during contraction of the plantar flexor muscles.

The findings, which were published in July by the *Journal of Sport Rehabilitation*, suggest the Achilles tendon undergoes mechanical adaptations in minimalist runners in response to increased tendon loading, and underscore the need for a gradual transition to minimalist running to avoid Achilles tendon injury. [ler](#)

—Jordana Bieze Foster

Source:

Histen K, Arntsen J, L'Hereux L, et al. Achilles tendon properties in minimalist and traditionally shod runners. *J Sport Rehabil* 2016 Jul 21 [Epub ahead of print]

Athletes with low neurocognitive scores exhibit high-risk landing biomechanics

Athletes with low neurocognitive scores are more likely than their higher-scoring counterparts to demonstrate landing mechanics associated with anterior cruciate injury (ACL) risk, according to research from the University of Florida in Gainesville.

Investigators assessed the landing mechanics of 37 healthy, nonconcussed recreational athletes who also took the computer-based Concussion Resolution Index (CRI) neurocognitive test; the 17 who scored lowest on the CRI (average 41st percentile) were compared with the 20 higher-scoring athletes (average 78th percentile). Lower scores were associated with significantly greater vertical ground reaction force, peak anterior tibial shear force, knee abduction

moment, and knee abduction angle during landing, as well as significantly less trunk flexion.

The findings, which were published in late July by the *American Journal of Sports Medicine* (AJSM), are consistent with those of a 2007 AJSM study in which baseline neurocognitive scores were significantly lower in college athletes who went on to suffer ACL injuries than in those who didn't. [ler](#)

—Jordana Bieze Foster

Sources:

Herman DC, Barth JT. Drop-jump landing varies with baseline neurocognition. *Am J Sports Med* 2016 Jul 29. [Epub ahead of print]

Swanik CB, Covassin T, Stearne DJ, Schatz P. The relationship between neurocognitive function and noncontact anterior cruciate ligament injuries. *Am J Sports Med* 2007;35(6):943-948.

Continued from page 13

injury, both acute and recurrent, were collected on a weekly basis for one season.

At the end of the season, results were compared with control data in Major League Baseball's HITS (Health and Injury Tracking System) database, with 1160 players and 5685 players in the major and minor league control groups, respectively.

At the major league level, there were two hamstring injuries in the intervention group and 79 in the control group, representing a 25% lower rate of injury associated with the prevention protocol. At the minor league level, there were seven hamstring injuries in the intervention group versus 297 in the control group, resulting in a 40% lower rate of injury.

Average time lost due to injury for the major league players

was 65.3% lower for the intervention group (nine days) than the control group (25.9 days). For the minor league players, average time lost due to injury in the intervention and control groups were 11.63 days versus 21.3 days, respectively, resulting in a 45.3% lower time lost rate associated with the intervention.

Timothy Tyler, MS, PT, ATC, research consultant at the Nicholas Institute of Sport Medicine and Athletic Trauma in New York City, noted the study findings are consistent with those of preventive eccentric exercise programs done in other sports (see "An eccentric approach to hamstring training," February 2015, page 31).

"Nordic hamstring eccentric exercise have been shown to be excellent in preventing first-time hamstring strains in soccer play-


ers," Tyler said. "The current study showed the same in major and minor league baseball."

In the baseball study, as expected, participants' compliance with the prevention program was much higher in those who did not suffer a hamstring injury (an average of 25.3 uses) than in those who did (13.53 uses).

"The notion of program adoption and compliance continues to be a challenge to injury reduction and prevention researchers globally," Silvers-Granelli said. "We continue to investigate how compliance can be improved, and how program adoption may positively impact overall player and team performance."

In a previous study, published in 2015 by the *American Journal of Sports Medicine*, Silvers-Granelli and colleagues

found a 46.1% lower rate of hamstring injuries in male soccer players assigned to participate in the FIFA 11+ warm-up program than in players who didn't.

"We designed the FIFA 11+ to be a soccer-specific intervention that addressed all trunk and lower extremity injuries in youth and collegiate soccer players," Silvers-Granelli said. "This program would not be completely relevant to baseball players, particularly at the professional level." 

Sources:

Silvers H, Zachazewski J, Li B, et al. Hamstring injuries in major and minor league baseball: are they preventable? Presented at the 2016 American Orthopaedic Society for Sports Medicine annual meeting, Denver, CO, July 2016.
Silvers-Granelli H, Mandelbaum B, Adeniji O, et al. The efficacy of the FIFA 11+ program in the collegiate male soccer player (USA). *Am J Sports Med* 2015;43(11):2628-2637.

AirShift™ OA Knee Brace

Pain relief is just a few pumps away

From the company that brought you the **ASO®** ankle stabilizer and **DynaTrack™** patella stabilizer, **Med Spec** is proud to introduce the new **AirShift™** OA knee brace. The **AirShift** uses the power of air to comfortably relieve pain due to unicompartamental osteoarthritis or to assist healing of cartilage repairs. The durable air bladder system allows patients and practitioners to easily adjust the level of unloading. In addition, the **AirShift's** wraparound closure design allows for ease of application and an optimum fit.

Please visit us at:

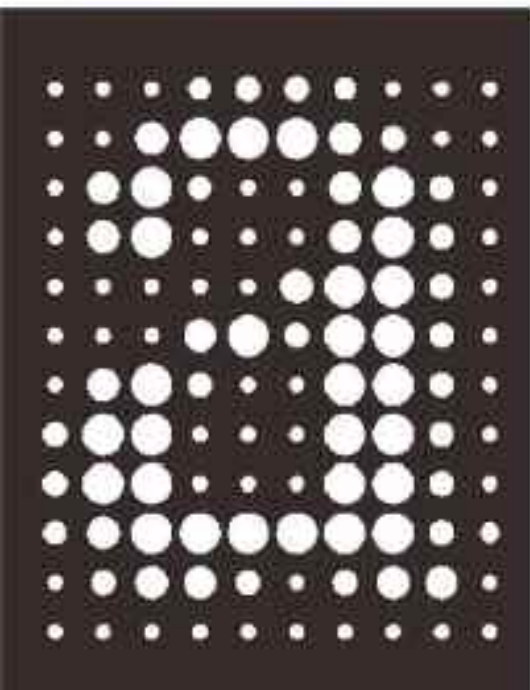
AOPA - booth 1500



Medical Specialties, Inc.
4600-K Lebanon Rd. Charlotte, NC 28227
p: 800-582-4040 f: 704-573-4047
email: request@medspec.com www.medspec.com

A chimpanzee is dressed in a grey cardigan, a white shirt, and an orange bow tie. It is sitting on a wooden stool and holding a long wooden pointer stick, pointing it at a chalkboard. The chalkboard is mounted on a wooden stand and has the text "Digitizer + Lab Services = FREE Scanner" written on it in white chalk. The background is a plain, light-colored wall.

Digitizer +
Lab Services =
FREE Scanner



No monkey business

The perfect fit for your
busy office

sales@amfit.com

800.356.foot x 266

@amfitinc



amfit.com

PREGNANCY AND GAIT:

From foot pain to fall prevention

Researchers are investigating how changes during pregnancy may affect the lower extremities in the long term, as well as ways to treat and prevent these issues.

By Lori Roniger



Istockphoto.com #10047272

Women's bodies obviously undergo a lot of changes during pregnancy, including musculoskeletal alterations that affect gait and the lower extremities. Researchers have examined these changes, such as a widened and slowed gait, and interventions that can help improve balance and reduce the risk of falls during pregnancy. However, more recent studies have also considered how lower extremity musculoskeletal changes during pregnancy may continue to affect women after pregnancy.

Lower Extremity Review talked to researchers studying these issues and healthcare practitioners who treat them about these findings and their implications for treatment and prevention.

Lifelong effects

Neil A. Segal, MD, a professor and director of clinical research in rehabilitation medicine at the University of Kansas Medical Center in Kansas City, is known for his research on knee osteoarthritis (OA), but in recent years has been delving into musculoskeletal issues related to pregnancy and any postpartum issues that remain. He noted that women are more likely than men to experience certain musculoskeletal issues—including anterior cruciate ligament injury, ankle sprain, and knee OA¹—and is exploring possible relationships between these gender-specific trends and those seen during and after pregnancy.

"I just want to know if pregnancy has a permanent effect," Segal said.

He co-edited a book published in 2015 on musculoskeletal health in pregnancy and postpartum, which includes a chapter he coauthored on musculoskeletal anatomic, gait, and balance changes in pregnancy.² In that chapter, the authors wrote that, while musculoskeletal disorders are common during pregnancy and the postpartum period, these clinically significant changes are poorly understood, and opportunities for prevention, diagnosis, and treatment are often missed, which can lead to undesirable longstanding health effects.

"Pain is not only an issue of maternal comfort but also can contribute to future health risks," they wrote.²

Changes in foot size and shape

Separately, Segal became curious when he would hear women talk about needing a larger shoe size during or after pregnancies. However, he didn't see anything in the medical literature on that topic.

He conducted an unpublished survey of 111 women at a pedestrian mall, which found that the women were more likely to have had an increase in shoe size after age 18 years if they had at least one full-term pregnancy (33%) and an even greater likelihood with two pregnancies (68%), compared with 13% of women who said they had never been pregnant.



A follow-up study

he and his colleagues published in 2013 compared the feet of 49 women during the first trimester of pregnancy and at 19 weeks postpartum.³ They found lasting changes, including a significant decrease in arch height and rigidity, along with concomitant increases in foot length and arch drop, with the most significant changes occurring during a woman's first pregnancy.

"A possible mechanism for the changes in arch height and rigidity observed with pregnancy may relate to the combination of increased magnitude and anterior displacement of body mass in the context of a hormonal milieu known to increase collagen extensibility during pregnancy," the authors wrote.³

The authors concluded these changes could contribute to the increased risk of musculoskeletal disorders in women. And Segal wondered if interventions could be designed to prevent such changes from occurring.

He has since conducted studies (not yet published), in which he randomized pregnant women without severe foot problems to wearing custom insoles that supported their arches in their normal shoes. The authors looked at whether the leg rotates in and how forces affect the knee joint.

“Does the foot change what happens at the knee? Does pregnancy make the knee looser?” Segal said.

Foot changes and pain

Jean McCrory, PhD, associate professor of exercise physiology at West Virginia University in Morgantown, noted that the structural changes to the foot experienced by pregnant women are similar to those reported in the literature for obese individuals⁴⁻⁶ and even in members of the military who carry heavy loads.⁷

McCrory has been examining in thus-far unpublished research whether such changes—including lengthening, widening, or arch height asymmetry—have any relationship to foot pain, posterior pelvic pain, or other types of pain.

She and her colleague Kathryn Harrison, MS, a PhD student at Virginia Commonwealth University in Richmond, were unable to confirm any such relationships in pregnant women who were pain free at the time of enrollment. Next, they’ll be recruiting pregnant women who are experiencing pain.

McCrory said she’d like to see if having women wear orthotic devices or supportive shoes during pregnancy would be helpful for avoiding foot pain during or after pregnancy.

Preliminary results presented in 2015 by researchers from the University of Granada at the International Conference of the IEEE Engineering in Medicine and Biology Society in Milan, Italy, indicated a relationship between plantar pressure changes during pregnancy and back pain onset.⁸ Fifteen pregnant women wore instrumented insoles at weeks 12, 20, and 32 of their pregnancy. The investigators found the center of pressure in both feet was slightly displaced toward the heel at weeks 20 and 32, which coincided with participants’ self-reported onset of back pain.

Sudheer Reddy, MD, an orthopedic surgeon who specializes in foot and ankle



Istockphoto.com #27465781

conditions at Frederick Memorial Hospital in Maryland, said he’ll often see patients with complaints related to the overall physiological changes of pregnancy, which can include ligamentous laxity that affects not only the pelvis, but also the feet.

“The arch drops and becomes flatter,” Reddy said. “The foot becomes wider. They don’t fit into their shoes. Sometimes that doesn’t change after they deliver.”

He noted gaining weight during pregnancy places added stress on the foot, and women often need bigger and more supportive shoes. His patients complain of foot pain, sometimes along their instep, which can occur with routine activities in regular shoes.

“Initially, I always look at their shoes,” Reddy said.

He recommends that patients buy supportive shoes and sometimes suggests brands that come in multiple widths. If patients need additional support, he may recommend a commercially available foot orthosis. He tries to avoid custom orthotic devices because they’re not always covered by insurance and the condition of feet can continue to change after pregnancy, sometimes reverting to its prepregnancy state.

Ami Sheth, DPM, a podiatrist in Los Gatos, CA, also emphasizes the importance of footwear to her pregnant patients.

“Don’t compromise on your shoe gear,” Sheth said.

She’ll see pregnant women come into her office wearing flip-flops or whatever they can get onto their feet. Many have swelling or flare-ups of previous foot conditions such as plantar fasciitis, and are not wearing supportive shoes. She said heel pain and arch pain in particular are frequent issues, because, as a woman’s base of support during gait widens during pregnancy, she tends to pronate, increasing medial plantar pressures. Sheth will recommend that patients wear more supportive shoes, such as hiking sandals, or even a flip-flop with a built-in arch, and sometimes an over-the-counter orthotic device.

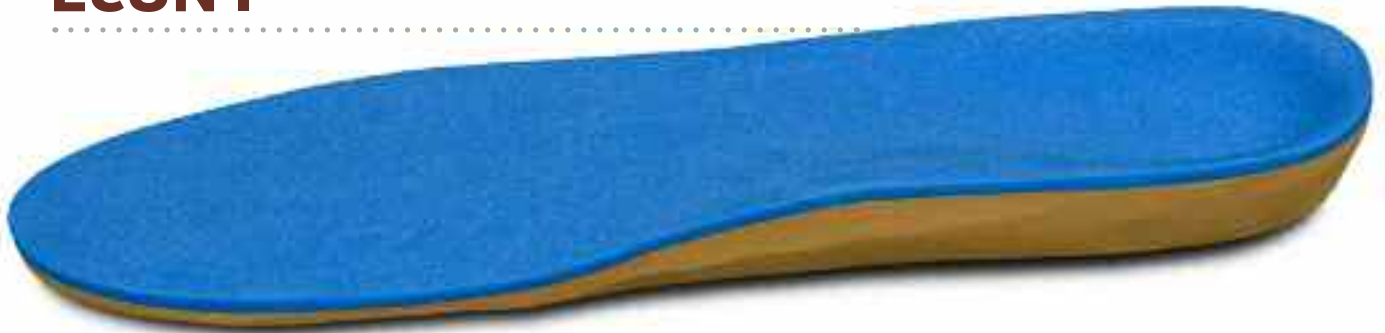
“You have to meet them wherever they’re at and get them through it,” she said.

Continued on page 20

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

Personal perspective

I am a medical journalist and the mother of two children, but until writing this article I hadn't heard about the effects the musculoskeletal and hormonal changes of pregnancy can have on the lower extremities both during and long after pregnancy.

I've always been physically active, running track throughout high school, though an anterior cruciate ligament (ACL) tear I got while skiing when I was in college, plus its consequent repair, slowed me down. However, fairly early on when I was pregnant with my first child, my feet hurt. I needed to take advantage of early aircraft boarding for people with physical disabilities. And during the third trimester, after I had gained about 50 pounds, I had to skip doing some errands if I couldn't find a parking spot nearby (as I didn't have a disabled placard) as, at one point, I could hardly walk.

Before the pregnancy, I was already wearing fairly comfortable shoes. Although I managed to get back in shape after pregnancy, with the help of bike commuting and an early morning boot camp, my feet have never fully recovered and have felt rather sore during and after activity, even after I had lost all of the pregnancy weight and then some.

It wasn't until perhaps two years after my daughter was born that I was referred to a podiatrist who diagnosed me with plantar fasciitis, prescribed custom foot orthoses, and gave me some footwear recommendations. Nonetheless, I still can't do everything I want on my feet, finding it hard to take care of my kids, now aged 10 and 6 years, on a weekend day as well as, say, exercise or go for a hike. And I can scarcely do anything around the house unless I'm wearing footwear with arch support.

As someone who used to love the feel of being barefoot but can no longer do so for long, I wonder if some of the interventions that researchers are now studying could have helped me.

Pregnancy and falls

McCrory has been conducting research for years on gait and falls in pregnant women.⁹⁻¹¹ A significant problem during pregnancy, falls were found to occur in about one-third of pregnancies in a population-based cohort study of 3997 women.¹²

Based on the issues related to falls in the study, the authors said tips that may help decrease falls include: avoiding slippery floors; when walking on stairs, holding onto the railing and not carrying items or children; wearing shoes that are flat, rubber-soled, and not loose; and trying not to hurry. The researchers also advised being careful when carrying children, walking on unlevel surfaces such as grass, or performing any activity involving an obstructed view.

"One of the things that my OB said, and that I echo to pregnant women that I see, is that it's OK to move slower," Sheth said.

One of McCrory's previous studies¹³ found sedentary women were much more likely to fall than women who exercised.

However, the women in the study who exercised were engaged in a variety of activities, including yoga, swimming, and walking, and that sometimes varied by trimester, so there was no way to determine if results varied by exercise type, McCrory said.

Using data from her previous study, she has more recently reported that pregnant women who didn't fall may have had greater ankle stiffness compared with pregnant women who fell and controls.^{14,15} This stiffness may have helped limit center of pressure excursion, which in her study population tended to decrease as pregnancy advanced—a development that appears to contribute to risk of falling.

"The center of pressure was much smaller in the third trimester and in fallers," McCrory said. "My theory is that if you're very stiff, you're not adapting to your pregnancy and not as familiar with the movement of your body. If you slip or trip or the floor moves under you, you don't know how to react to it."

Some intriguing research published in recent years by investigators from the Gaziosmanpasa University School of Medicine in Tokat, Turkey, found women in their third trimester of pregnancy had significantly worse dynamic postural equilibrium than women who weren't pregnant.¹⁶ Fall risk test scores were significantly higher among third-trimester women compared with women in earlier stages of pregnancy or women who weren't pregnant. The researchers suggested postural stability tests may be useful for detecting pregnant women with a high fall risk.

The same research group conducted another study that found wearing a maternity support belt, which is sometimes used to manage pelvic joint laxity, could help improve balance and prevent falls in pregnant women, especially during the third trimester.¹⁷ During each trimester, women who wore a maternity support belt were found to have significantly better anterior-posterior stability index and fall risk test scores than those who didn't wear the device.

"The increase in stiffness of the joints by having the belt around the pelvis may change the stability findings," explained Jill Boissonnault, PhD, PT, WCS, associate professor of physical therapy at George Washington University in Washington, DC.

Getting the word out

Despite the significant problem of falls during pregnancy, pregnant women may not be getting adequate information about fall prevention, according to a study from the University of Massachusetts Lowell in which postpartum women were asked about falls they experienced and fall prevention counseling they received while pregnant.¹⁸



istockphoto.com #32931782

Continued on page 22

Online Ordering and Live Chat Now Available!



Made in USA

#1 In-Office Foot Pad Dispensing Program in the Country

**The Largest Selection of Bulk Treatment Room
Foot Pads and Padding Supplies Anywhere!**

BEST PRICES AND 100% GUARANTEE!

Some of Our Newest and Hottest Products

Wrap Straps



**All Gel Ball of Foot
with Spreader**



Shower Easy Shower Protector



Triple Crest



**J-Tape
Porous Tape That Sticks!**



**1 Toe Crest Pad
(spreader with loop)**



Carbon Stabilizer Plates

Stiffen the sole of the shoe and limit dorsiflexion—for fractures, hallux limitus, hallux rigidus.



**Adjustable
Heel Lifts**



Memory Molds



Arch Steppers



Easy sizing:
1 size men's and 1 size women's

Always Innovating for Over 14 Years!

866-366-8723

www.drjillsfootpads.com

Dr. Jill's Foot Pads, Inc.

**Foot Pads • Padding Supplies
Lifts • Wedges • Insoles
Semi – Custom Orthotics**

"The findings highlight the need for consumer education and the development of fall prevention programs, as 35% of the women reported falling during pregnancy, with only 7% reporting they received fall prevention counseling," the authors wrote.¹⁸

The results also indicated most women were open to using as a fall prevention strategy some form of exercise modified for pregnancy and individual fitness levels, such as yoga or Pilates.

Reddy likes to recommend aquatic therapy classes to his pregnant patients. He said the classes can help stabilize their center of mass, while strengthening the core muscles and taking pressure off the joints.

"Part of my teaching includes following the ACOG guidelines for exercise, and the only place that that gets into balance and falls is related to sports and high-risk activities that pregnant women are counseled to avoid," Boissonault said of the American College of Obstetricians and Gynecologists guidelines that were updated in 2015.¹⁹

The guidelines recommend 20 to 30 minutes of exercise on most days, with avoidance of contact sports like soccer and activities with a high risk of falling, like downhill skiing. Other activities were recommended, including walking, swimming, or modified yoga or Pilates.

Postpartum priorities

After pregnancy, Reddy will evaluate whether specific issues remain to be worked on. For example, posterior tibial tendinitis can become a problem in some women several years after pregnancy.

"If left untreated, it can lead to further problems," he said.

Sheth said she also often sees posterior tibial tendinitis after pregnancy, as well as plantar fasciitis. Achilles tendinitis is another frequent complaint she sees in postpartum women, as well as in grandparents who may be unaccustomed to the frequent bending down that comes with a newborn.

Proper foot care after giving birth is important, too, especially since new moms can be on their feet a lot at home, Sheth said.

"As soon as they have the baby, I put them in orthotics in sneakers at home," she said.


After pregnancy can be a better time for more aggressive physical therapy, conditioning, or strengthening programs that weren't possible during pregnancy, Reddy said.

However, Sheth noted new parents may not prioritize their own health.

"People are ignoring themselves because they have better things to do," she said.

She'll sometimes brainstorm with patients about how to fit stretching into their regular routine—while they're nursing the baby, for example.

Preventive care can also be helpful in clients Sheth sees before they're pregnant, allowing for discussion of the advantages of moving slowly to maintain stability, as well as interventions like stretching, strengthening, supportive shoes, walking, and prenatal yoga before the pregnancy-related changes set in.

"They have an easier time because they already have the tools," she said. 

Lori Roniger is a freelance writer based in San Francisco, CA.

References are available at lermagazine.com.



adjustability

TO ACHIEVE THE PERFECT FIT

New to the US market in 2016, Revere Comfort Shoes are designed and developed in Australia, offering beautifully crafted sandals, all with removable footbeds to fit custom orthotics.

Designed in collaboration with leading foot health experts, Revere provides maximum adjustability to support many foot types. As no two feet are the same, every sandal includes the added benefit of our innovative strap extensions, to further enhance the ability to personalize the fit of our sandals, whilst not taking away from the stylish look of our upper designs. Revere sandals are available in sizes 5 to 12.

Comfort never looked so good.





0.59"



Revere strap extensions provide an additional 0.59" to personalize the width fitting across our entire sandal range.

To find out more about Revere shoes and our in-clinic fitting kit please email: sales@revereshoes.com



REMOVABLE COMFORT FOOTBED.

ASK ABOUT

OUR IN-CLINIC FITTING KIT







Control



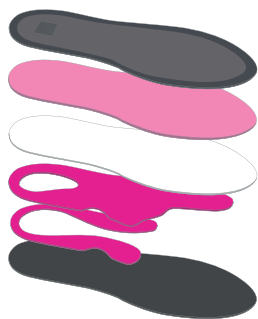
Control Slim



support



pain-relief



Introducing medi's new prefabricated insoles for active people suffering from hallux rigidus and related conditions.

The new medi Control and Control Slim insoles provide stabilization of the painful metatarsophalangeal joint of the big toe through a controlled rolling movement.

ORTHOTIC DEVICES FOR THE WIN



Management of Achilles tendinopathy in runners

By Howard Kashefsky, DPM

Achilles tendinopathy is a common lower extremity injury in athletes as well as nonathletes. The Achilles tendon is often a site of injury in runners and is the second most common running-related musculoskeletal injury, after medial tibial stress syndrome, with an incidence of 9.1% to 10.9%.¹ The lifetime risk in former elite male distance runners is a whopping 52%.²

Factors that may contribute to Achilles tendinopathy include overuse, systemic disease, older age, sex, body composition, and biomechanics.³ Elevated biomechanical load has been shown to cause both microscopic and macroscopic failures.^{4,6}

The Achilles tendon is the strongest and largest tendon in the body.⁷ This tendon connects the gastrocnemius and soleus muscles to the posterior aspect of the calcaneus. The group of muscles is collectively called the triceps surae, which serves as the primary plantar flexor of the foot and ankle, but also flexes the knee. Insertional fibers of the Achilles tendon are in continuity with the plantar aponeurosis. The Achilles tendon does not have a true synovial sheath, but rather a single layer of paratenon. The paratenon is responsible for a significant portion of the blood supply to the Achilles tendon, most of which enters anteriorly; studies have identified a hypovascular area of the Achilles tendon 2 cm to 6 cm proximal to its insertion on the calcaneus, which appears to be an area at risk for complete rupture.^{8,9}

Achilles tendinopathy can be progressive and can be characterized using terminology that reflects the condition's stage. In the acute phase, Achilles tendinitis refers to inflammatory changes at the tendon level, which may include the paratenon that surrounds the tendon.¹ Achilles tendinosis depicts a more chronic and degenerative process. Achilles tendinopathy is our preferred term for Achilles tendon pain.

The two most common sites of injury in runners include midportion Achilles tendinopathy (2-6 cm proximal to the calcaneal insertion) and insertional Achilles tendinopathy (injury localized to the insertion of the Achilles tendon at the calcaneus).¹⁰ Less commonly, injuries may occur at the myotendinous junction.

Diagnosis

Differential diagnoses that should be considered in cases of suspected Achilles tendinopathy include posterior ankle impingement; retrocalcaneal bursitis; symptomatic Haglund deformity; bone stress injury (BSI) of the distal tibia, fibula, or calcaneus; peroneal tendinopathy; and hindfoot arthrosis.¹¹

In my opinion, one cannot overstate the importance of a good physical exam. In cases of Achilles tendinopathy, the exam includes

finding the exact location of the pain and rating its severity using a scoring system with which the patient's progress can be tracked. It is helpful to compare limbs and look for a relative temperature increase, thickening, or overlying erythema in the painful limb. The posterior calcaneus should be evaluated for a prominence of the posterior aspect that may suggest the presence of Haglund deformity or a large posterior spur.

Testing of muscle strength and ankle range of motion (ROM) are also helpful. Dorsiflexion ROM assessment should be done with the knee in full extension and in 90° of flexion to determine differences in ROM (the Silfverskiöld test); less ROM in full knee extension suggests gastrocnemius tightness or contracture that may increase tension on the Achilles tendon.¹² Evaluation of strength should include a series of single-leg calf raises and evaluating for pain, between-limb differences in heel height, and fatigue during this maneuver.¹¹

If a patient's history or the presence of a palpable gap in the tendon raises concern for an Achilles tendon rupture, Thompson's test should be performed.¹³ The patient lies prone and the examiner squeezes the triceps surae distal to the knee in both limbs. Passive foot plantar flexion in both limbs suggests the painful Achilles tendon is contiguous with the calcaneus and unlikely to have a full-thickness tear. If there is no foot plantar flexion with calf squeeze on the affected side, there should be concern for Achilles rupture. Extensor lag and a palpable gap are also signs of rupture.

The calcaneal squeeze test is helpful to exclude a calcaneal BSI. The clinician presses both medially and laterally on the calcaneus and evaluates for pain localized to the calcaneus.¹¹ Weightbearing radiographs (lateral and axial views of the heel) may be helpful to evaluate for Haglund deformity, calcific tendinopathy, or if the diagnosis is unclear. Magnetic resonance imaging (MRI) is appropriate if there is concern for a significant rupture of the Achilles tendon or to evaluate for a BSI.¹¹ Ultrasonography is a useful modality that can help verify Achilles tendon injury.¹⁴

I also cannot understate the importance of a thorough history in the athletic patient. Thoughtful questions regarding training patterns may uncover the cause of the injury and assist in managing recovery and prevention of recurrence.

Treatment

In the acute phase, initial management includes rest, activity modification, a trial of heel lifts, and stretching the triceps surae. If the patient has significant weightbearing pain, a brief period of immobilization in a boot can help to alleviate this, but lengthy periods of immobilization

Sponsored by an educational grant from medi USA.

should be avoided due to the risk of muscle atrophy and deep vein thrombosis. Local modalities—including ice, massage, and ultrasound—may reduce pain.¹⁵⁻¹⁷ Iontophoresis may also be considered to reduce inflammation associated with acute presentations.¹⁸ A short course of nonsteroidal anti-inflammatory drugs (NSAIDs) is commonly prescribed, though the degree of true inflammation is questionable in more chronic conditions. Topical nitroglycerin does not have clear evidence to support its use.¹⁹

After achieving pain control, treatment should focus on strengthening the Achilles tendon and triceps surae. Alfredson and colleagues demonstrated the efficacy of an eccentric loading protocol for addressing pain and strength in patients with Achilles tendinopathy.²⁰ In this landmark study, 15 recreational athletes with unilateral midportion Achilles tendinopathy completed a 12-week session of a single-leg eccentric heel-drop program with progressive weight loading.

Individuals who completed this protocol (three sets of 15 repetitions, with both knees bent and straight, twice per day) had normalization of strength and reduction of pain, and all returned to running during the 12 weeks. A larger study using Alfredson's protocol in athletes with a five-year follow-up reported that most individuals experienced gains in function, though nearly half pursued other therapies, and most reported mild pain.²¹ A modified version of Alfredson's protocol with eccentric-load calf raises that do not include a heel drop has been proposed for insertional Achilles tendinopathy.^{11,22}

Additionally, rehabilitation exercises that address the full kinetic chain are important, given the evidence suggesting that biomechanical factors—including reduced activity of the tibialis anterior, rectus femoris, gluteus medius, and gluteus maximus muscles—may contribute to Achilles tendinopathy.^{23,24} Foot intrinsic strengthening and restoring proprioception is important for this condition, as with any foot and ankle disorder.

Treatment for chronic refractory Achilles tendinopathy may include injection of platelet-rich plasma (PRP) at the affected site. In published case series, PRP injection has been associated with symptom improvement in patients with noninsertional Achilles tendinopathy.^{25,26} However, in a randomized controlled trial, PRP was no more effective than saline for supplementing the effects of eccentric exercise in patients with chronic midportion Achilles tendinopathy.^{27,28}

Orthotic intervention

There is evidence that orthotic intervention may reduce Achilles tendon load in healthy runners²⁹ as well as symptoms in runners with Achilles tendinopathy.³⁰⁻³² Mayer et al documented significant reductions in pain symptoms in runners with Achilles tendinopathy following an intervention with semirigid orthoses.³¹ Donoghue et al evaluated the effectiveness of custom foot orthoses in runners with chronic Achilles tendon pathology.³² An improvement of 92% was noted in pain symptoms with the use of the orthoses.

A more recent study³³ found that custom orthoses were no more

effective than sham orthoses for people with midportion Achilles tendinopathy. However, the study participants were not athletes, and the orthoses were customized based on foot posture index alone, which could have affected the findings.

I have utilized foot orthoses clinically in runners with Achilles tendinopathy, in combination with other conservative therapies, and have consistently seen improvement. But more research is clearly needed to determine the mechanism of action, which will more accurately guide orthotic treatment.



Istockphoto.com #10397031

Traditionally, the mechanism by which foot orthoses were believed to alleviate Achilles tendon pain involved reducing rearfoot eversion and vertically aligning the calcaneus, thereby reducing the shear stress experienced by the Achilles tendon.³⁴ However, there is also evidence to suggest the mechanism of action may be multifactorial.^{35,36}

A deep heel cup with extrinsic varus or valgus posting will control any subtalar eversion or inversion while ambulating.³⁷ The full-contact orthosis shell is important for full functionality of the rearfoot posting and controlling midtarsal joint articulation. Proper casting is also critical. When suspension casting with plaster or a similar material, one must load the midtarsal joints to a pronated position while keeping the subtalar joint neutral.^{38,39}

The effect of running shoe design on Achilles loading has been controversial. As often is the case, conflicting information has been published. In a study of 12 male runners, Sinclair et al found that Achilles tendon forces during running were higher for minimalist footwear than conventional or maximalist footwear, and suggested that running in minimalist shoes

may increase the risk of Achilles injury.⁴⁰ Conversely, Wearing reported that, in 12 recreationally active men, peak acoustic velocity (a measure of tensile load) during walking was higher when participants wore running shoes with a 10-mm offset than when they were barefoot.⁴¹ Although walking and running are different activities, one would expect the loading patterns to be similar. However, in this study the techniques used to measure load varied between conditions, and the study sample was small. More research needs to be done.

Surgery

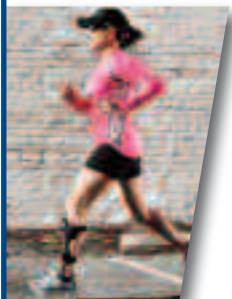
If conservative care fails, one may consider surgery. Operative management of this condition may include debridement of degenerative areas of the tendon and repair of remaining healthy tendon. In cases of recalcitrant insertional Achilles tendinopathy, removal of an associated Haglund deformity and retrocalcaneal bursectomy can be beneficial. In individuals aged 50 years and older or with severe tendon degeneration, augmenting the repair with ipsilateral flexor hallucis longus transfer may provide additional benefit.^{42,43}

Howard Kashefsky, DPM, is the director of podiatry services at UNC Healthcare at the University of North Carolina at Chapel Hill.

References are available at lermagazine.com.

Sponsored by an educational grant from medi USA.

Whatever your 100% looks like...



GIVE IT!

allard^{USA}

allardusa.com

info@allardusa.com
Toll Free 888-678-6548

Uneven terrain: Tactics for orthotic device users

Helping patients manage an orthotic device can be challenging, but doing so in the face of uneven terrain is a balancing act between stability, mobility, and strength. Device adjustments and rehabilitation protocols can help patients avoid asymmetries and reduce the risk of falling.

By Shalmali Pal

The term “uneven terrain” may bring to mind the most dramatic circumstances—a steep ramp in an indoor parking garage, a narrow spiral staircase, a dirt path littered with rocks, twigs, and other debris. But uneven terrain can also apply to changes in indoor flooring—such as from tile to wood, or from a low-pile carpet to a plusher one—or to other flooring fixtures, such as doorway thresholds.

All of these examples of uneven ground can sometimes trip up an able-bodied person, so what happens when an ankle foot orthosis (AFO) or other orthotic device is introduced?

“I have patients who wear an AFO for drop foot, and their biggest complaint is walking over the door saddle, in and out of the bathroom,” said Rob Conenello, DPM, referring to the wooden or metal strip that connects a bathroom floor to the floor outside. Conenello is immediate past president of the American Academy of Podiatric Sports Medicine, and a podiatrist with Orangetown Podiatry in New York. “That little bit of lift between the carpet of the hallway and the tile in the bathroom can sometimes “catch” the bottom of the AFO.”

In other words, managing an orthotic device can prove challenging; managing it in the face of uneven terrain is a balancing act between stability, mobility, and strength.

“Any adaptive device is going to throw the gait off,” commented Ken Lamm, PT, of Ken Lamm Physical Therapy in Tucson, AZ. “To walk on uneven ground...[we help] an individual regain neuromuscular, musculoskeletal, coordination, joint mobility, stability, and balance so that the patient feels safe during ambulation.”

Any time there is a change in the constraints imposed on gait, the neuromuscular system must adapt, agreed Shane R. Wurdeman, PhD, MSPO, CP, a prosthetist and research scientist at the Hanger Clinic at Houston Medical Center in Texas.

“Using a lower extremity device presents one change to the constraints, but uneven terrain, and the transition between various surface types, presents an additional challenge,” Wurdeman said.

Transitioning to or from surfaces that aren't smooth can be harder than stairs or ramps, particularly for orthotic device wearers, in part because the risks are less apparent.



Photo courtesy of Arizona AFO.

Laying the ground work

To get a better idea of how devices perform on uneven surfaces, it's important to understand the general biomechanics involved. When it comes to walking up or down hills, the ankle and knee are key anatomic components, according to one study that looked at the rollover characteristics of able-bodied volunteers walking on ramped surfaces.¹

The participants walked at a self-selected speed on a level surface, a 5° ramp, and a 10° ramp. The authors reported that the ankle appeared to be the main adaptive joint when the participants walked up inclined surfaces, while the knee was more important for overall adaptation in downhill walking.

Then there's the matter of stair negotiation, which was assessed by another group in 30 healthy individuals walking on a three-step staircase.² The participants climbed at normal, slow, and fast self-selected speeds while the researchers looked at the associations between speed and lower extremity mechanics.

Peak hip flexion and extension moments increased with increasing speed, while peak knee flexion moment did not vary consistently with speed. Peak muscle activations varied consistently

relative to the sagittal plane kinetics. The findings suggest the hip is primarily responsible for modulating stair climbing speed, the authors concluded.

So, what happens when devices such as AFOs or other braces are introduced? One study reported that unilateral dynamic AFO users experienced less ankle motion and power generation, lower knee extensor moments, and greater hip flexion and power generation than able-bodied controls during uphill walking.³ The AFO users also exhibited asymmetries at the ankle and knee, with decreased



Photo courtesy of Ottobock.

ankle motion and power and lower knee extensor moments for the AFO limb than the unaffected limb. Still, the two groups walked at equivalent self-selected velocities and stride lengths, the authors noted.

That study also compared three different AFO stiffnesses—the prescribed stiffness, 20% less stiff than prescribed, and 20% stiffer than prescribed—to determine if changing that variable might assist with uphill walking. Increasing joint stiffness was associated with increased knee flexion, but otherwise the variations in AFO stiffness had little effect on gait.

Another study evaluated the effects of a unilateral solid AFO, hinged AFO, and no AFO (shoe only) on the kinematics, kinetics, and temporal-spatial gait characteristics of 19 healthy adults while negotiating stairs.⁴ Wearing either orthosis was associated with slower stair locomotion than the shoe-only condition, but the hinged AFO condition was similar to the shoe-only condition with regard to sagittal knee and ankle angles, moments, and powers during the pull-up phase of stair ascent and the controlled lowering phase of stair descent. Compared with the hinged AFO, the solid AFO was associated with less ankle dorsiflexion, plantar flexion power, knee flexion, and knee extensor moment during pull-up in ascent and controlled lowering in descent.

The loss of dorsiflexion is particularly problematic, Lamm noted.

"If a person can't fully dorsiflex [the ankle], they'll wind up scraping the bottom of the foot or device on the ground, especially when walking up an incline. But you need adequate plantar flexion going down [an incline]," he said. "Either way, if you can't lift or place the foot properly, that increases the risk of falling."

Transitioning to or from surfaces that aren't smooth can prove even more troublesome than ramp or stair negotiation, especially for orthotic device wearers, partly because the risks are less apparent, Wurdeman said.

Changing surfaces can lead to changes in shear forces and impact forces, Wurdeman noted. For instance, the asphalt parking lot outside the shopping mall, which isn't likely to be slippery, might have a lower shear force than the smooth, polished stone flooring inside the mall.

"Where we see the most falls is when people transition from a surface with a high shear force to one with a low shear force," Wurdeman said. "That fall risk becomes more pronounced when portions of the lower limb are constricted [with an orthotic device]."

Hands-on solutions

Adjusting orthotic devices to improve wearability and comfort is common practice, but device adjustments can also assist with gait, especially on uneven or nonlevel surfaces.



Photo courtesy of Surestep.

NEW!

shark-o™

Charcot Orthosis



Custom to Cast or Scan from all industry standard file formats. Features: Liner made from 1/4" aliplast foam. Outer shell constructed of polypropylene for maximum control of the foot and ankle complex. Molded copolymer anterior internal shell to limit shear forces and lock the leg in securely. Tri-laminated foot bed consisting of two densities EVA and one layer of P-Cell® to help protect the foot during treatment.

INDICATIONS

Used for the prevention and management of pressure ulcers caused by ischemia, direct trauma and/or repetitive stress often found in persons with:

- Diabetes Mellitus
- Charcot deformity
- Decreased sensation and/or paralysis
- Foot fractures

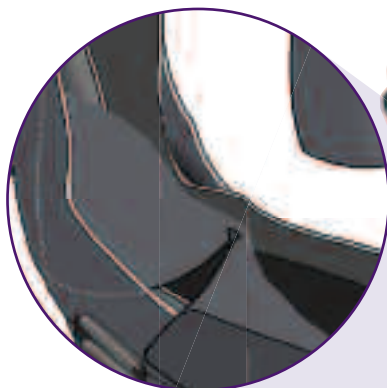
The "shark-o style" CROW Orthosis is a viable design that makes fitting and follow-up of the Charcot foot easier and more effective. Its design features reduce orthosis weight and pressure to the plantar foot surface as compared to the traditional CROW.



Patent pending design allows adjustable volume changes of the calf while leaving the foot at a set volume. This is achieved by **overlapping** the foot section, locking it in place while at the same time smoothly **underlapping** the calf area allowing the anterior shell to slide easily under the posterior.



This transition is made possible by the notched wedge shaped trim cutout at the ankle/instep. The patient can easily adjust for daily calf volume (edema) changes with simple strap adjustments.



ORTHOMERICA®
877-737-8444 | www.orthomerica.com

Justin Blair
THE PROFESSIONAL SOURCE

Justin Blair & Company | Chicago, IL 60623
www.justinblair.com | (800) 565-0664

ThermoCork®

A TRUSTED AND TIME TESTED BRAND



SUPERIOR PRODUCT FOR A SUPERIOR OUTCOME

Our Genuine ThermoCork is a heat formable cork composite that provides strength, flexibility and self adhesion when heated. Great for shock absorption, even under severe stress.

ThermoCork produced in 1/8", 3/16", 1/4" & 3/8" sheets.
Contact us today to receive a free sample

Genuine ThermoCork is available through your preferred distributor of choice.

Ask for our 2016 M Guide to learn about all the materials offered by Justin Blair's Material Division

FABRICATING CAPABILITIES



Doing business, made easy!

Justin Blair
ThermoCork®

ThermoCork® is a registered trademark of Justin Blair & Company, LLC



Photo courtesy of Allard USA.

Dynamic AFOs, which promote dynamic dorsiflexion and eversion of the ankle joint during the swing phase of gait, can be helpful when negotiating uneven terrain because the device helps to lift the foot up, avoiding the type of "catch" he mentioned earlier, Conenello said.

But a dynamic assist AFO is not suited for everyone, he warned.

"Let's go back to drop foot. If the person has no ability whatsoever to lift that foot, then they are going to need a very rigid brace. They aren't able to use any of their musculature, so they have to be in a fixed position," Conenello said. "That's very different than someone who has some muscle activity left, so you can give them a dynamic fit."

Conenello also looks at the closure of the device—"Is the closure snug? Are additional straps needed to hold the device in place better?"—as an area that may be adjusted to improve fit and, in theory, help the patient manage with the device overall, and particularly when faced with uneven terrain.

Uneven terrain can increase load on the affected side, which may be mitigated with the addition of elastic materials and bumpers to act as dampeners, Wurdeman said. But those adjustments can also have other effects.

"Use of these materials may improve [management] of uneven terrain, but it creates a softer, less supportive brace," he said. "Ultimately, this trade-off needs to be considered in conjunction with the ability of the patient to relearn to walk under the constraints of a more rigid, supportive device."

Conenello also said practitioners need to bear in mind that the orthotic device itself may not necessarily be a problem, but the change in footwear such devices often require can significantly alter gait.

If a patient who is used to wearing a low-profile, slip-on shoe has to change to a bulkier one with laces that need to accommodate the brace, or a much stiffer sole, that can cause unexpected changes in gait, especially on uneven terrain.

"Sometimes, it's not the brace that feels awkward, but the shoe that feels clunky and changes the gait," Conenello said.

Julia Wilkinson, PT, also of Ken Lamm Physical Therapy, has herself experienced footwear-related hazards on uneven terrain, though she was not wearing an orthotic device at the time.

"I had a bad fall once [wearing] a clog-style shoe that didn't give. It had a really firm bottom, and I stepped down a little step, and I [fell] on to the floor. I got rid of those shoes!" Wilkinson said. "I think you can apply that to AFOs and braces [paired with stiffer shoes] because you don't have the 'give' that you need to recover your balance."

Conenello also noted that, either for aesthetic or comfort reasons, patients aren't always willing to don the shoes that are best suited biomechanically for an orthotic device. He said he recommends patients start by wearing the device and the recommended shoe for an hour a day, and then increase by an hour each day until a certain level of comfort is achieved.

Another area that may need attention is the contralateral limb; leg-length discrepancies resulting from unilateral orthotic device use can exacerbate the challenges of uneven terrain and contribute to some of the gait asymmetries reported in the literature.³

"You don't want them to suddenly have one limb that is higher than the other," Conenello pointed out. "You have to manage the other side so that coming down a stairway doesn't feel like they are falling down a hill because they are unbalanced."

Conenello said techniques he's used to even out the limb lengths have included an off-the-shelf insole in the shoe on the unaffected side.

Wurdeman said he's not opposed to using a shoe lift to equalize leg length, but believes a properly fitted orthotic device on the affected leg should be a boon for the unaffected side in terms of gait symmetry and stability.

"Implementation of the orthosis should help the sound side," he noted. "If you put an orthosis on the affected side, it allows the person to carry more weight, and prevents transmission of impact forces to the unaffected side."

Such elevated forces on the unaffected side can be seen when the patient develops a limp, or what Wurdeman called "compensatory movements for uneven terrain that may not be safe, but do help the patient move quickly."

"A limp is typically a quick shift off the affected side; [the person is] coming off that leg quicker and shifting weight. It's the difference between just dropping on to the other leg versus smoothly gliding on to it," he explained. "So that's where the orthotic device can help; it can reduce the pain so that they can stay on that affected side longer and not develop that limp."

Improving between-limb symmetry in terms of muscle strength can also help address limb-length discrepancies related to orthotic devices; Wilkinson suggested this be done prior to any device or footwear adjustments.



Photo courtesy of Richie Brace.

The Noodle TA AFO

Advanced Carbon Fiber Brace

Available:
Off-the-Shelf
Build-to-Order
Custom-from-Cast

← Choice of Strut
Lateral or Medial



Handcrafted
in the USA



30 Day Unconditional Guarantee!

If for any reason during the initial 30 day trial period the practitioner or wearer is not completely satisfied with The Noodle TAAFO it may be returned for a refund.

FUNCTION - STYLE - VALUE



CARBON FIBER SPECIALISTS

800-919-3668

WWW.KINETICRESEARCH.COM

Continued on page 34



— An OHI Company —

THE GO INN



the arizonamezzo

The patented Arizona Mezzo™ is the 'happy medium' between a UCBL and the Arizona Brace®. Its low-profile design and soft leather lining mean easy shoe fit, exceptional comfort and greater patient compliance.
www.azafo.net

US PATENT # 9283104A

VISIT OHI AT THE AOPA
NATIONAL ASSEMBLY
BOOTH 818

ohi

CALL FOR **ARIZONA MEZZO** AND **MBB STARTER KITS**
800.288.7027 OR VISIT **ARIZONAAFO.COM**

LD STANDARD IN OVATION

MOORE BALANCE BRACE

The only balance brace clinically proven to reduce postural sway and increase postural stability.*

**Study: An Immediate Effect of Custom-Made Ankle Foot Orthoses on Postural Stability in Older Adults
- Clinical Biomechanics December 2014*



— The OHI Family of Brands —





Photo courtesy of Thuasne.

"You don't want to automatically throw a heel lift in to address that difference," she cautioned. "Work with the muscles to achieve equalization first, and then see if there's an adjustment that can be made in terms of adding to the device or the shoes."

Mobility and stability

The experts agreed that patients shouldn't be left on their own when learning how to walk again with an orthotic device, and that the rehabilitation process can help prevent future issues with uneven terrain.

"I think it helps patients invest in their recovery," Conenello said. "Strengthening and balance exercises ultimately translate to better ability to negotiate changes in terrain."

Any rehab program will start with a gait assessment, and practitioners may have to think outside the box if they are going to teach a patient to regain mastery over uneven terrain.

"Clinicians need to understand that, to truly help a patient walk, we need to see them walk in different environments, not just the hard tile floor of the clinic. I am seeing many clinics now that have uneven terrain put into rooms in their facility—a strip of shag carpet or even a gravel pit," Wurdeman said.

Because some patients will feel the need to "perform" during a formal gait assessment, Lamm will often watch a patient as he or she walks into the clinic from the parking lot.

"I'll see how they are walking when they don't know they are being observed," he said. "If they are scuffing the foot, or if they aren't picking the foot up and coming down flat-footed versus a normal step, we would notice that."

Wilkinson said she asked one of her patients to meet her outside the clinic to work on walking a set of steps. But even an assessment on level ground—looking at stride length, step frequency, limping, leaning to the side, arm swing, posture—can reveal a lot about how someone is managing with an orthotic device, she noted.

With regard to physical therapy for uneven terrain, Lamm and Wilkinson outlined several key aspects they focus on, starting with addressing the iliotibial (IT) band. IT band tightness may preclude the straight gliding of the knee forward during the swing phase of the gait pattern so that the affected leg may swing slightly out to the side, Lamm said.

WHY NOT PROVIDE THE BEST?

Step-Smart® Brace

Your patient's favorite brace for drop foot.

*Custom Step-Smart is also available.
Send casts to Insightful Products.*



L1971
L2210X2
PDAC Approved



(207) 885-0414 • www.step-smart.com/LER

This can be a problem if a person is trying to climb stairs; rather than stepping up and straight ahead, she may swing out and wind up dragging herself up the stairs, Wilkinson explained.

"It's related to the AFO because if they are swinging the leg out to the side, the insertion of the IT band ends up over the lateral shin muscles, and the IT band is so taut that when you try to stretch it, it may get irritated," Lamm said.

His group works on strengthening to avoid this situation, specifically a side-stepping exercise to strengthen the affected hip and lateral leg muscles. Wilkinson emphasized the importance of hip flexor flexibility for the swing phase of walking—tight hip flexors may lead to a limp or problems with toe-off—as well as strengthening the core, knees, and ankles.



Photo courtesy of Kinetic Research.

Both said building endurance is also paramount. A patient in an orthotic device may be able to get by with an awkward gait for 12 feet, but what happens if he must walk 200 feet?


"The trip from the parking lot into a store may well be a hundred feet," Lamm noted. "So addressing the fatigue factor is crucial."

Their preferred tools include resistance bands and isometric exercises. The latter are particularly effective because there's no joint agitation and they are able to "super-strengthen," Lamm said.

If a patient is unable to control the foot, that also will up the fatigue factor. Lamm explained that if a patient is unable to circumduct the ankle smoothly, and instead makes a "cogwheel" motion with their foot, "that makes it more likely that when they've taken ten steps on a twenty-foot walk, their muscles are fatigued already and they can't coordinate them."

Fatigue and limited ankle eversion both contribute to the risk of falling, especially on uneven terrain, Lamm noted, but resistance exercises and therapy bands can increase strength and endurance. Exercises that emphasize repetitive eversion also can help strengthen the ankle, Wilkinson noted.

For Wurdeman, neuromuscular coordination is key for making sure patients can effectively respond to any terrain they come across.

"Training the person to appropriately respond to changes in the various constraints imposed on the neuromuscular system while trying to accomplish different tasks gives them a bountiful movement repertoire for any situation," he said. "Safe and effective ambulation is not about avoidance, but rather about quick and proper responses." 

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

References are available at lermagazine.com.

bigger is better!

Trilam

- SPS - \$83.41
- Cascade - \$96.83
- 30" x 31" x 1/2"

• Ped-lite
41" x 41" x 3/8"

\$25.00

why pay a distributor mark-up?

If you are purchasing your material from SPS or Cascade, you are paying far too much!

Call to see how much we can save you on all your material needs.

SHOES • INSERTS • FABRICATION MATERIAL

Ped-lite LLC
Diabetic Shoes and Inserts

www.pedlite.com • 219.756.0901



COVER MATERIALS AS **INDIVIDUAL** AS YOUR INSOLES

We transform your insoles into absolutely unique products, thus guaranteeing a high company value recognition! Experience the whole range of top cover materials to give your orthotics a total **NEW LOOK**. Simply choose between patterns from our existing designs or send yours. We can also include your company logo or other logos of your choice.*

Foot strike while running and patellofemoral pain

Recent research supports the idea that increased patellofemoral stress is a contributing factor in runners with patellofemoral pain, and that gait retraining to promote a forefoot strike pattern is associated with reductions in patellofemoral stress and self-reported pain.

By Jenevieve L. Roper, PhD; Deborah L. Doerfler, PT, DPT, PhD; Christine M. Mermier, PhD; and Janet S. Dufek, PhD

Running is a popular mode of exercise, with more than 17 million people participating in running events each year¹ and even more participating recreationally. This number is significantly higher compared with the 1990s (4.6 million) and is likely due at least in part to numerous studies reporting significant health benefits from cardiovascular exercise.²⁻⁴

Alongside the increasing popularity of running events, clinicians have observed an increase in the number of associated running injuries. The most commonly reported running-related injury is patellofemoral pain (PFP),⁵ commonly called anterior knee pain. The cause of PFP appears to be multifactorial;⁶⁻⁸ however, it appears patellofemoral stress may play a key role in the severity and occurrence of PFP.⁹

Increased patellofemoral stress is believed to lead to pain due to greater patellofemoral joint contact force between the patella and femur.¹⁰ It is affected by several factors, including quadriceps force,^{11,12} knee abduction angle,^{13,14} and hip internal or external rotation angle.¹⁵ Additionally, stride characteristics during gait are known to contribute to PFP;¹⁶ therefore, alterations in specific characteristics are likely to affect the severity of PFP. Reducing step length by at least 10% was associated with a significant decrease in patellofemoral joint stress per step in healthy female runners,¹⁷ supporting the idea that altering running mechanics can help reduce joint specific forces.

Much of the research regarding PFP and gait retraining has focused on hip weakness and altered hip mechanics. Studies suggest individuals with PFP demonstrated greater peak hip adduction and hip internal rotation range of motion than healthy individuals,^{18,19} and therefore researchers have focused on hip mechanics for gait retraining.^{18,20} Studies have found a reduction in knee pain, but researchers did not measure patellofemoral stress. Therefore, it's possible that patellofemoral stress did not change, which could have left runners susceptible to recurring PFP.

Recreational runners with patellofemoral pain who transition to a forefoot strike pattern should be cognizant of a potential increase in ankle or Achilles injury risk.

Istockphoto.com #49375282



Foot strike patterns

The influence of foot strike patterns on PFP and patellofemoral stress has only recently been studied.^{14,21} The majority of runners naturally use a rearfoot strike (RFS) pattern.²² Studies suggest these runners are up to 3.4 times more likely to sustain an injury compared with runners who use a forefoot strike (FFS) pattern.^{23,24} Therefore, identifying runners with PFP who are also rearfoot strikers may be a key component in PFP management.

Several measures can be used to determine foot strike, including location of the center of pressure at initial contact,²⁵ foot strike angle,²⁶ and measurement of heel and metatarsal acceleration peaks.²⁷ Classically, foot strike pattern is classified as RFS, midfoot strike (MFS), or FFS. However, because MFS and FFS patterns have similar gait characteristics, they are often grouped together and collectively termed FFS. We have adopted that convention in this article.

Kinematically, there are several differences between FFS and RFS running. The greatest difference is seen at the ankle, where there is plantar flexion at initial contact with a FFS pattern compared with dorsiflexion at initial contact with a RFS pattern.^{14,28-30} Research to date on foot strike pattern and knee range of motion (ROM) has been equivocal. Some investigators have found sagittal plane knee

ROM differs significantly between foot strike patterns,²⁹ while others have found no significant difference.³⁰ Only recently has it been determined that there is a significant difference in knee abduction^{14,31} and knee flexion³¹ between RFS and FFS.

Researchers have demonstrated a significant difference between foot strike patterns for several key kinetic variables. Loading rate, or the rate at which forces are applied to the body, has been shown to be significantly lower in FFS runners than RFS runners,^{14,32,33} and studies have found associations between elevated loading rates and injury risk in runners.³⁴ Additionally, RFS patterns are associated with greater shock attenuation than FFS patterns³⁵—an indication that the magnitude of shock absorbed by the foot is higher for rearfoot strikers than forefoot strikers; the lower magnitudes of shock associated with FFS running may be due to this strike pattern's shorter stride length.^{36,37} When measuring impact peaks in the different directions (anterior-posterior, mediolateral, and vertical), it was determined that FFS running has a lower vertical impact peak than RFS running, but greater anterior-posterior and mediolateral impact peaks,³⁸ suggesting the loading rate in the vertical direction is reduced at the expense of increasing loading rate in the other two directions.

Patellofemoral contact force and patellofemoral stress also have been found to be significantly reduced with FFS running.^{14,21} Kulmala et al found that patellofemoral contact force and patellofemoral stress were significantly lower in 19 female forefoot strikers than in 19 female rearfoot strikers.¹⁴ Vannata et al reported that, in 16 habitual rearfoot strike runners, peak patellofemoral joint stress and stress-time integral over the stance phase of gait decreased significantly when those runners used a FFS pattern.²¹ However, both studies involved healthy participants, not runners with PFP.

We felt it would be clinically useful to retrain runners with PFP to transition from a RFS pattern to a FFS pattern, as this could potentially reduce patellofemoral stress and other biomechanical variables that could contribute to or exacerbate PFP. We found the most convenient way to retrain runners was to use a mirror for visual feedback during the retraining period, as most recreational runners would not have access to expensive real-time feedback equipment often used in gait labs.

Our research

To better understand if a FFS pattern was better than a RFS pattern for runners with PFP, we performed a study to examine the effects of changing foot strike pattern on knee abduction angles at initial contact, patellofemoral contact force, and patellofemoral stress, in addition to pain severity and occurrence.³¹ A physical therapist screened male and female recreational runners (habitual rearfoot strikers) for PFP. They assigned 16 to either an experimental group, which completed eight gait retraining sessions over two weeks, or a control group, which completed normal running sessions during the same time period. All the runners wore the same neutral conventional running shoe for an initial baseline running trial, a post-retraining running trial, and one-month follow-up trial. At the end of the training period all runners consistently used a FFS pattern. Biomechanical variables were recorded during the overground portion of the running trial.

We found that retraining from RFS running to FFS running was associated with a significant reduction in running-related knee pain reported by the participants from pre-retraining to the one-month

Continued on page 40

MISSION POSSIBLE:

Flip-Flops for Mike Kinney

Mike Kinney, Footmaxx Territory Manager, is more than just a great guy - he's a great case study in what Footmaxx custom milled orthotic flip-flops can do. With every pair, our certified pedorthists work with our highly-trained lab technicians to design a pair of custom milled orthotic flip-flops just for your patient. For Mike, **Footmaxx custom milled orthotic flip-flops are the first and only flip-flops he can wear comfortably and safely.**

BAVA
By Footmaxx



2 Different Sized Feet



Left: Size 13 / Right: Size 12

Leg Length Inequality



1.5 cm Lift



Without Custom Milled Orthotic Flip-Flops



With Custom Milled Orthotic Flip-Flops



Footmaxx

Footmaxx.com

©2016 Footmaxx

follow-up ($p = .02$). Additionally, there was a significant increase in knee flexion at initial contact ($p = .01$), knee abduction at initial contact ($p = .02$), and ankle flexion at initial contact ($p < .001$), as well as a significant increase in ankle range of motion throughout ground contact ($p < .001$) from pre-retraining to one-month follow-up. We also found a significant reduction in patellofemoral contact force ($p = .02$) and patellofemoral stress ($p = .02$), which are previously reported to be factors in PFP.⁹

Based on our findings, we concluded that retraining from RFS to FFS significantly reduced PFP and therefore, could be an effective self-management strategy for recreational runners experiencing PFP.

Previous gait retraining studies in runners with PFP did not change foot strike pattern, but instead focused on gluteal and hip mechanics.^{18,21,39-41} However, a subsequent systematic review and meta-analysis found a discrepancy between prospective and cross-sectional studies regarding the role of hip strength and mechanics in PFP.⁴² Although all studies reported retraining was associated with a reduction in self-reported knee pain, it is possible the reported pain reduction was a result of changes in knee mechanics—not hip mechanics—driven by retraining.

At initial contact, there is typically an impact transient present with RFS running, which is absent during FFS running. The absence of the impact transient in FFS running likely reduces the amount of patellofemoral contact force and patellofemoral stress that is seen at initial contact, as well as the loading rate,³⁴ which has been associated with injury risk. Additionally, forefoot striking is associated with greater stride frequency than rearfoot striking as well as a shorter stride length, which reduces shock attenuation.^{36,37}

One observation we noted in our study was an increase in Achilles tendon force in the intervention group as a result of retraining, though it was not statistically significant. Previous studies have found greater Achilles tendon force with FFS.¹⁴ Despite the lack of significance in our study it should be mentioned, as this is an indicator of increased mechanical work at the ankle, which could make runners susceptible to ankle injuries. Therefore, a slow transition from RFS to FFS is recommended to reduce that risk. However, if a runner has a history of Achilles tendon injury or other ankle injuries, transitioning to a FFS pattern may exacerbate the symptoms, lead to reinjury, or both, and is therefore not recommended.

Additionally, we measured running economy during the study. We hypothesized that transitioning to a new gait pattern could potentially increase metabolic cost during running, as runners learn to make technical and physiological adaptations to the novel pattern. A reduction in running economy could potentially impact performance in running events. However, our results (unpublished data, 2015) determined that there was no significant change in running economy as a result of retraining from a RFS pattern to a FFS pattern.

Collectively, our results suggest recreational runners affected by PFP should transition to a FFS pattern, but should be cognizant of a potential increase in ankle injury risk. Also, during the transition, runners may experience a reduction in performance resulting from decreased training and running economy. However, this reduction is likely temporary and will resolve as runners adjust to the modified gait pattern and return to their normal training regimen.

We also note the effects of footwear on our results. Because runners were habitually shod, we opted to use a neutral running shoe, which may not have the same effects on patellofemoral joint

contact force and patellofemoral joint stress as a FFS pattern while barefoot. However, previous research has found the only kinematic or kinetic variable affected by footwear in FFS runners was stride length, which was shorter for barefoot running than shod running.⁴³ Although that study did not include runners with PFP and did not assess patellofemoral joint contact force or patellofemoral joint stress, its findings suggest the effect of footwear on FFS mechanics is minimal. We acknowledge there may be a small effect, and that using minimalist shoes may produce the greatest benefits similar to barefoot FFS running. Further research is needed to determine the true difference between shod FFS and barefoot FFS running, particularly with respect to patellofemoral joint contact force and patellofemoral joint stress in runners with PFP.

Unresolved questions


Although our study has provided evidence that a FFS pattern is beneficial for runners affected by PFP, some questions still need to be answered. Our study included only one month of follow-up; therefore, we are unaware if any injuries, especially at the ankle, may have occurred as runners continued to use a FFS pattern. Furthermore, because we did not measure performance, we cannot be certain whether performance will be impacted as a result of retraining.

Also, our study population consisted of recreational runners. Therefore, we are unsure whether the same results would be seen in more competitive runners with higher levels of training. Caution should be used when trying to apply our results to other running populations.

Conclusion

Although some investigations have suggested hip weakness is a likely contributor to PFP, more recent studies^{42,44} indicate the role of hip strength is still unclear. Recent research supports the idea that increased patellofemoral stress is a factor in PFP, and that gait retraining to promote a FFS pattern is associated with reductions in patellofemoral stress and self-reported pain.

Further studies are needed to determine whether injuries occur with use of a FFS pattern for more than one month after retraining. Furthermore, studies have yet to assess whether running performance is affected as a result of retraining, which could be a major determining factor in whether runners decide to change foot strike pattern.

Although we are still trying to understand the cause—or causes—of PFP, the data do suggest that patellofemoral stress plays a major role. More research is needed to develop clinical tests clinicians can use to screen for increased patellofemoral stress, which may help with early identification of this pathology and potentially reduce the occurrence and severity of the pain experienced by runners. 

Jenevieve L. Roper, PhD, is an assistant professor of kinesiology at California State University, San Bernardino. Deborah L. Doerfler, PT, DPT, PhD, is an assistant professor of physical therapy at the University of New Mexico Health Sciences Center in Albuquerque. Christine M. Mermier, PhD, is an assistant professor of exercise science at the University of New Mexico in Albuquerque. Janet S. Dufek, PhD, is a professor in the Department of Kinesiology and Nutrition Sciences at the University of Nevada, Las Vegas.

References are available at lermagazine.com.

STILL LOOKING FOR A **FIT?**

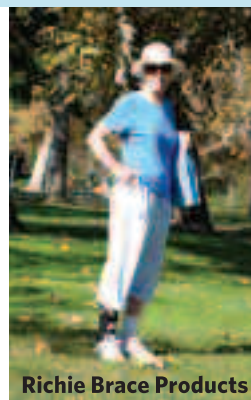
ComfortFit is Unmatched in Quality, Price and Service



Night Splints and Walkers



Stabilizer Brace



Richie Brace Products



Medicare-Approved
Diabetic Shoes and Inserts



iTOM-CAT Scanning Technology



Comprehensive Line
of Custom Foot Orthotics



Prefabricated Orthotics
for All Ages

FLAT-RATE PRICING on all custom foot orthotics,
including all additions/modifications and free shipping

7- TO 10-DAY TURNAROUND time on all orthotic orders

COMFORTFIT'S STUDENT MENTORING PROGRAM
with our Medical Director, Dr. Barbara Campbell



APMSA COMPANY OF THE YEAR

E-SERVICE ON OUR WEBSITE with three years of order status information,
online ordering capability, and product information, including coding,
tutorials, and instructional videos

COMFORTFIT OFFERS custom foot orthotics for all activities
and foot conditions, prefabs for adults and children,
the full line of Richie Brace products, night splints and walkers,
ComfortFit Stabilizer Brace, Medicare-approved diabetic shoes
and inserts, ComfortFit's New Deluxe Pneumatic Walker
and our new iTOM-CAT in-office iPad Air 2 based scanning system.

EMAIL contact@comfortfitlabs.com

VISIT www.comfortfitlabs.com

CALL 1-888-523-1600





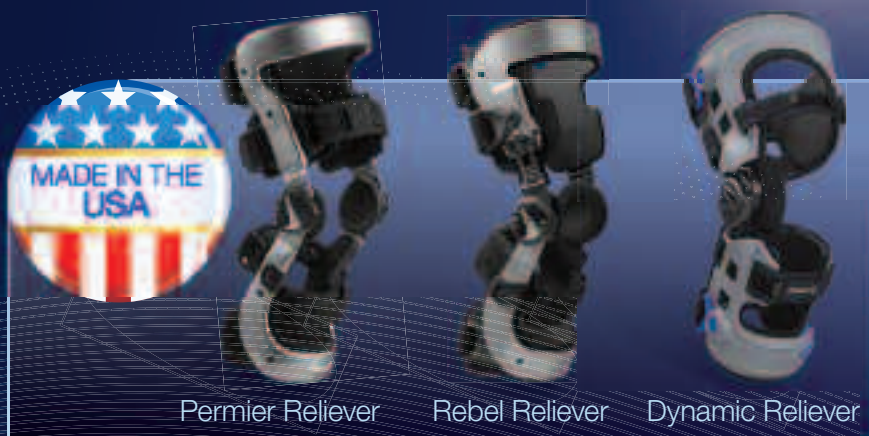
ONLY TOWNSEND

Name any other brace manufacturer in the world that routinely makes OA knee braces for patient's like this?

Genuine custom OA knee braces, individually created by skilled craftsman, here in our hometown of Bakersfield, California. A blend of art, science and good old American know how. You can count on each brace to fit, correct and suspend -- enhancing mobility and quality of life for your patients.

Townsend is also the only USA manufacturer that "custom assembles" off-the-shelf OA knee braces to fit disproportional legs. When you provide three leg measurements, our fab team will mix and match part sizes at no additional charge. So you can still achieve an intimate fit and excellent outcome when the insurer denies coverage for a custom knee brace.

For additional information, speak to your Townsend representative or visit our web site.





Istockphoto.com #49890834

Foot rotation during gait in patients with knee OA

Rotating the foot in or out during gait is associated with significant decreases in frontal plane knee load during early or late stance, respectively, and can be effective for reducing pain and potentially slowing the progression of disease in patients with knee osteoarthritis.

By Kevin Alan Valenzuela, ABD, CSCS; and Hunter Jared Bennett, PhD

Knee osteoarthritis (OA) has become an increasingly common musculoskeletal diagnosis in the US. Projections suggest that by the year 2030, approximately 25% of the US population will have knee OA.¹ As knee OA progresses to the end stage of the continuum, a total knee replacement is often the final treatment option. However, nonsurgical means of slowing the progression of knee OA can help to prolong or avoid the costly, invasive, and painful surgery.

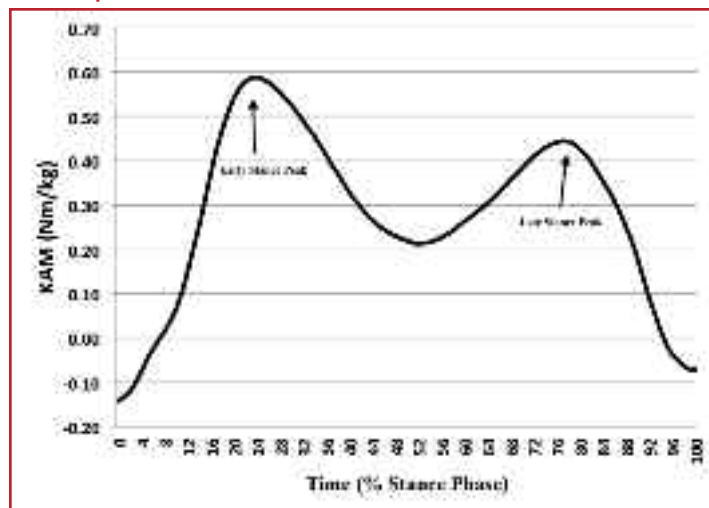
Determinants of knee OA

It's been suggested that knee OA occurs as a result of many years of applied force, or loading, to the knee joint. This can happen through uneven force distribution within the joint compartments or movement at the joint to which the individual is unaccustomed; either can lead to excessive cartilage degeneration.²

The medial tibiofemoral compartment tends to be the most common site for OA occurrence, with an incidence ratio of 5:1 relative to the lateral compartment.³ Medial knee OA is often linked to two biomechanical factors: an elevated external knee adduction moment (or internal knee abduction moment; KAM) during the stance phase of gait (Figure 1), and the occurrence of frontal plane shear force medial to the knee joint center during stance phase (Figure 2).^{4,5} Both variables affect loading on individual compartments of the knee joint.

The KAM has been prospectively linked to development and progression of medial compartment knee OA.⁶ As the KAM value increases, loading on the medial compartment of the knee joint increases,² increasing wear on the cartilage. Research has shown individuals with medial knee OA have higher KAM values late in the gait cycle than asymptomatic healthy controls.⁶ In vitro studies have found knee joint cartilage deteriorates at a faster rate under shear stress than under pure compressive loading, and this shear stress is also linked to development and progression of knee OA.⁶ Medially directed shear force causes wear on the medial compartment, making it an important component to control or minimize in patients with evidence of medial knee OA.

A toeing-out intervention predominantly affects knee loads late in the stance phase of gait, while a toeing-in gait intervention typically affects knee loads in early stance.

Figure 1.**Stance phase external knee adduction moment over time**

Foot rotation interventions

Interventions, many of which are noninvasive, have been shown to slow the progression of knee OA based on the aforementioned variables. Several laboratory-based investigations have examined foot rotation, tibial inclination angles, lateral trunk sway, and altered step widths as potential ways to slow the progression of knee OA by addressing associated biomechanical variables.^{7,8}

Foot rotation interventions are some of the more commonly studied and used methods of attempting to slow knee OA progression. One reason is the natural occurrence for people in general of foot rotation during gait. Foot rotation is seen as a natural compensatory mechanism to help alleviate pain and slow disease progression. Individuals with medial knee OA have been shown to rotate their feet externally during gait as a means of unloading the affected compartment,⁹ which has led to investigations of both external and internal foot rotation interventions. This rotation may offload the medial compartment by reducing KAM¹⁰ and lateral-medial shear force.²

As activities increase in complexity and physical demand (stair climbing vs walking, for example), associated joint moments and forces tend to increase, potentially leading to further cartilage degeneration in patients with knee OA.

With the onset of painful knee OA, individuals may bypass certain activities as a means of avoiding pain. This can adversely affect quality of life in these individuals; those who enjoyed hiking with loved ones miss those experiences, for example, while others may choose to restrict their living space if negotiating stairs is too painful to access floors of their home. Similar experiences may occur in individuals who do not have pain; if they have been advised that certain movements put their cartilage at risk, they may proactively compensate to avoid the potential future pain.

Reduced activity levels can have additional consequences, such as weight gain, increased cholesterol, and other adverse physiological effects. Issues such as weight gain can make OA worse, as it places increased force onto already damaged cartilage, likely speeding up the wearing away of remaining tissue.

Ultimately, the best clinical option is an intervention that allows for continued activity (and thus maintenance or improvement of quality of life, depending on the presence of pain or discomfort)

while reducing wear on the cartilage. This strategy can delay an end-stage knee OA diagnosis and the need for a total knee replacement.

Mechanics of foot rotation

Loading of the medial or lateral tibiofemoral compartments of the knee joint is a product of both the frontal plane position of the knee joint in relation to the center of pressure of the foot, the varus/valgus or abduction/adduction orientation of the knee, and the weight/force applied to the knee joint. Research has found increased frontal plane knee loads in individuals with medial knee OA are associated with greater varus/adduction of the knee during walking, and not greater external forces.¹¹ Researchers have investigated the effects of gait modifications such as changes in the foot rotation angle on frontal plane knee loads.¹² Changing foot rotation angle can align the knee center in a more neutral position, reducing the frontal plane moment arm,⁸ which should in turn reduce abnormal knee loads. Foot rotation gait modifications also have been associated with reduced pain in people with medial knee OA.^{2,6,13,14}

Two different foot rotation gait strategies exist to combat abnormal knee loading: increasing either the toe-out angle or toe-in angle. Both foot rotation modifications are made in relation to the forward progression of the body. While both foot rotation strategies can reduce frontal plane knee loads, each strategy affects knee loading at a different time point during the stance phase of gait. Toeing-out predominantly affects knee loads in late stance,^{2,12,13,15} while toeing-in affects knee loads during early stance.^{8,16,17} Because it is not possible to combine both gait strategies during stance phase, it is important to examine the effects of each strategy independently and discern which is most effective for a given patient or population.

Changing foot rotation angle can align the knee center in a more neutral position, reducing the frontal plane moment arm, which should reduce abnormal knee loads.

Toeing-out

An increased toe-out gait is commonly seen in the knee OA population,¹⁵ possibly as an adaptation to medial knee loading. Experimentally, increased toeing-out has been associated with reduced knee loading in the latter half of stance during level walking,^{2,6,13,16} running,¹⁸ and stair ascent¹³ in both healthy and knee OA populations. Within the current literature, toe-out gait modification studies have assessed foot progression angles of 10°, 20°, 30°, and 40° in both healthy individuals and those with knee OA. In general, the reductions in late stance knee loads seen during level walking increase progressively with increasing toe-out angles.¹⁶

Similar effects are associated with self-selected toe-out gait in patients with knee OA. Increasing foot angles beyond a self-selected degree of toe-out further reduces frontal plane knee loading and

Continued on page 46



**"I ONLY WANT
THE BEST."**

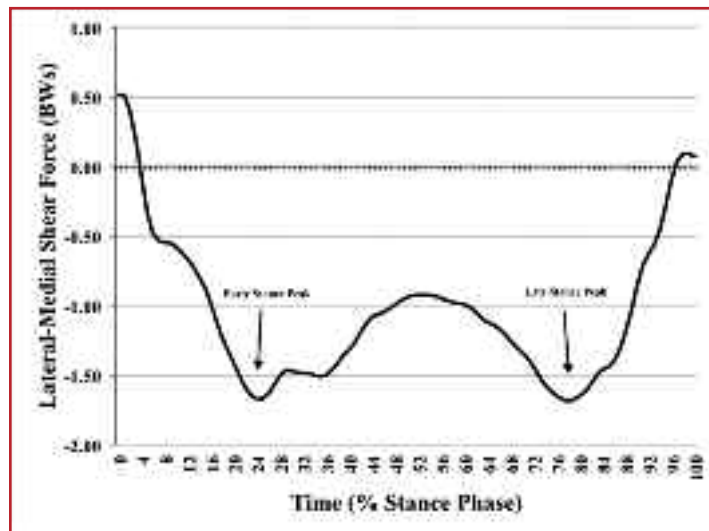
Dirk Nowitzki
13-time NBA All-Star
Bauerfeind Ambassador



TRY OUT
GenuTrain® S Pro
L1832/L1833

GenuTrain®
The Original Knee Support.

For a sample request, please email:
sample@bauerfeindusa.com

Figure 2. Stance phase frontal plane shear force over time

lateral-medial shear force.^{6,13} There is likely a point of diminishing returns, however. Certain toe-out angles would seem to be impractical (90°, for example) and unlikely to be maintainable for any significant time. The idea is to find the maximum benefit, which the individual who already rotates their foot may or may not have found, depending on their chosen level of rotation.

Additional reported advantages of toe-out gait include reducing the summed overall stance phase frontal plane knee loading by 5%,¹⁶ and late-stance medial-lateral shear force by 27%.² During level running in healthy individuals, increasing toe-out foot progression angle by 14° is associated with a 6% reduction in peak frontal plane knee loading.¹⁸ Using a 20° toe-out strategy has been used successfully to reduce late stance frontal plane knee loads during stair ascent,¹³ but had no effect during stair descent.

Although toe-out has been quite successful in reducing knee loads during late stance, an adverse effect has been observed earlier in stance. Reductions of late stance knee loads associated with increased toe-out angle have been accompanied by increases in early stance phase frontal plane knee loading in some studies,^{13,16} though not all.¹⁹ Early stance phase knee loads are generally larger in magnitude than those associated with late stance, and have garnered much attention. Therefore, increased toe-out gait strategies may be a viable option for individuals with increased frontal plane knee loads during the latter half of stance, but should be monitored for their effects on loading during early stance.

Toeing-in

Increasing toe-in angle has been associated with significantly reduced early stance phase frontal plane knee load during level walking,^{6,8,17,20} stair ascent,²⁰ and level running tasks.¹⁸ Early stance frontal plane knee loading is an important aspect of walking gait, as it is strongly related to both the onset and progression of knee OA.²¹⁻²³

Experimental toe-in angles have ranged from 5° to 10° (relative to neutral), as well as “maximum comfortable” internal rotation. When instructed to comfortably internally rotate the foot during level running, healthy participants reduced foot rotation angles from their natural alignment of about 11° of toe-out to a more neutral foot progression angle (0°). The change in foot angle during running was associated with a 9% reduction in frontal plane knee loading.¹⁸

During level walking, toe-in interventions have been associated with reductions of early stance frontal plane knee loading from 13% up to 45%.^{6,17,20} In further support of toe-in gait, 10° toe-in angles have been associated with reductions in both the early stance knee load and the summed overall stance phase frontal plane knee load in healthy people with varus, valgus, and neutral knee alignments during both level ground and stair ascent tasks.²⁰ As medial knee OA is most prevalent in individuals with a varus knee malalignment, a toe-in gait may be a particularly important strategy for reducing early stance frontal plane knee loading in those individuals.


The effect of increased toe-in angles on late stance frontal plane knee loads is unclear. Although some studies have found no changes in late stance knee loads using toe-in gait,^{6,8,17} others found significant increases in late stance loads.^{2,16,20} Therefore, while toe-in gait can be highly effective in reducing early stance phase knee loads, the potential late-stance effect should be considered before implementing a toe-in gait strategy in individuals who may also have abnormal late stance knee loads.

An interesting result of both toe-out and toe-in gait modifications is the apparent transfer of frontal plane knee loads to the sagittal plane. Several studies have found increases in peak early stance internal knee extension loads associated with both toe-out^{19,24} and toe-in^{16,20} interventions during level walking. However, one study found that a toe-out gait was associated with lower peak knee extension moments than normal walking.¹⁶ Knee off-loading in the sagittal plane has been postulated as a mechanism to reduce compression loads and pain in individuals with knee OA;^{25,26} therefore, increases in sagittal plane loads using modified foot progression angles could increase pain in some individuals. Due to the possibility of load transfer from the frontal plane to the sagittal plane, toe-out and toe-in gait strategies should be monitored for increasing knee loads in other planes.

Clinical implications

Ultimately, in choosing whether to use foot rotation as a treatment intervention, practitioners must evaluate individual patient’s goals. As discussed, sometimes the first loading peak is reduced and sometimes the second peak is reduced, depending on the intervention chosen. Each individual’s movement profile should be evaluated whenever possible to determine which peak is likely to be most detrimental.

A thorough analysis (including motion analysis) is ideal, but in reality is not always an option for clinicians. If a high-tech movement analysis system is unavailable, it may be a matter of trial and error with the different rotational interventions to see which one decreases pain and allows for increased movement. It should be noted, however, that a decrease in pain is not always associated with a change in mechanics and therefore does not necessarily indicate a slowing of knee OA progression.

It may look and feel odd at first, but walking “like a duck” may have long-term benefits for slowing knee OA progression, and thus delaying a potential need for a total knee replacement. 

Kevin Alan Valenzuela, ABD, CSCS, is a PhD student at the University of Tennessee, Knoxville, with a background in clinical and sport biomechanics. Hunter Jared Bennett, PhD, is an assistant professor of human movement sciences at Old Dominion University in Norfolk, VA, with a background in clinical and sport biomechanics.

References are available at lermagazine.com.



Megan's a blade runner

After her accident and amputation, Megan wondered if she'd ever run again. Her prosthetist knew that once she had healed, there was a way to give her a far better outcome.

The technicians at Spinal Technology are experts in fabricating the latest prosthesis technology to help patients like Megan lead full, rich lives. In fact, we have years of experience in fabricating lower limb prosthetics, using the most advanced materials and technology available.

Megan's new blade prosthesis is custom-crafted of lightweight carbon fiber, which helps her put smiles in her miles as she trains for her next half-marathon.

Find out for yourself. Call to place an order, and we'll show you how Spinal Technology can help you achieve better prosthetic results for your patients.



Trust DARCO to Assist in the Healing Process.



WCS™ Closed-Toe



MedSurg™ with PTQ series
PegAssist™



PegAssist™ Walker

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



DARCO



Radiofrequency-based arthroscopy in the ankle

The results of a retrospective chart review suggest that the use of plasma-mediated bipolar radiofrequency-based arthroscopic microdebridement is associated with notable decreases in self-reported ankle pain in patients who have tried conservative treatments without success.

By Renato Giorgini, DPM, FACFAS; Stephanie Giles, DPM; Omer Aci, DPM; and Christopher Japour, DPM, MS

Transcutaneous procedures to remove loose bodies or section synovial folds to reduce joint pain have traditionally been performed by arthroscopists.¹ The first documented intra-articular observation of a cadaveric knee was performed using a cystoscope by Takagi in 1918.² Arthroscopy came somewhat later in 1922, when Bircher described knee meniscal injury using the Jacobian laparoscope.³ Bircher believed, based only on cadaver experiments, the knee was the only joint suitable for examination because of its size. Using an arthroscope in 1931, Burman described the appearance of almost every major joint in the body.⁴ He noted the ankle was difficult to evaluate because the joint space was too narrow and the talar dome was too convex for viewing. Takagi in 1939 was able to perform arthroscopy on smaller joints, including one flail ankle.²

There was a renewal of interest in the benefits of joint arthroscopy in the 1960s and early 1970s. Watanabe performed the first resection of meniscal tissue by arthroscopic control in 1962.⁵ Jackson and Dandy had advocated a partial meniscectomy by arthroscopic means, or, if that was not technically possible, open arthrotomy.⁶ O'Connor developed instrumentation and an arthroscopic technique for the resection of meniscal tissue.⁷ Metcalf reported more than 600 arthroscopic partial meniscectomies with uniformly good technical results.⁸ Chen was also able to perform ankle arthroscopy on 67 patients and reported 94% of arthroscopic diagnoses were confirmed by arthrotomy.⁹ Currently, with state-of-the-art instrumentation, ankle arthroscopy has been shown to be highly accurate for treating and diagnosing ankle lesions.^{10,11}

Initially, arthroscopic methods involved a transcutaneous procedure performed under direct arthroscopic visualization, with manual tools for biting and cutting tissue in larger joints such as the knee. The multiple passes were sometimes problematic because of “scuffing” of the articular surfaces, even with a smooth instrument. Hence, development of powered instrumentation was the next step to make arthroscopic surgery a viable, useful technique.¹²⁻¹⁵ The first

Recent arthroscopic advancements using radiofrequency-based ablation have made the procedure even less traumatic to the tissues surrounding the affected joint.

Istockphoto.com #93053437

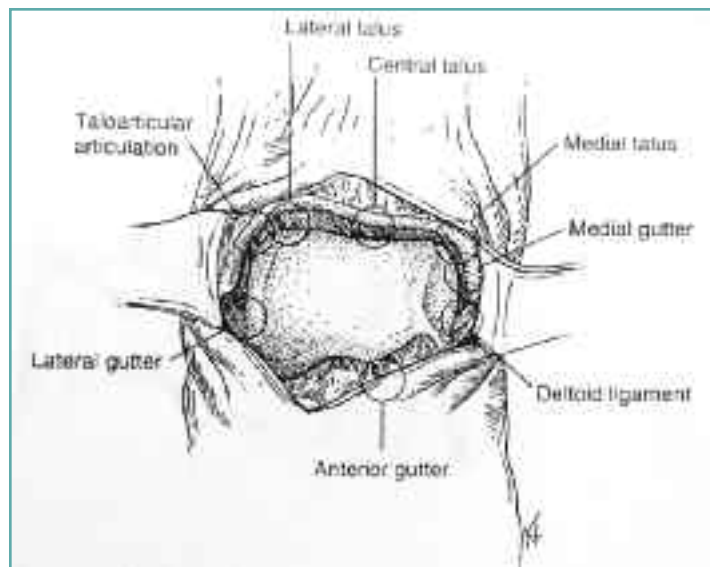


Figure 1. Ankle anatomy.

such model was a hand-operated, battery-powered, unidirectional, rotating-cutting suction device.¹⁶ The system was then modified to feature a foot-pedal control with reverse and forward cutting modes. This had a definite advantage over the single mode of rotation in that folded intra-articular tissue could be more effectively addressed from the opposite direction by reversing the rotation. This cutting burr was safe and useful. Patients were experiencing remarkable

relief from crepitus, as well as the elimination of pain and effusion,¹⁷ but the inability to cut deeply on the articular tissue was discouraging. Improved cutting was achieved in 1978 with a keyhole-shaped burr design and the subsequent development of the cutter.¹⁸

Recent arthroscopic advancements using radiofrequency ablation have made the procedure even less traumatic to surrounding tissues. The operating principle of radiofrequency-based micro-debridement technology is similar to conventional electrosurgical systems in that voltage difference is maintained between the active and return electrodes. The system uses an electrical conductive fluid, such as isotonic saline, in the physical gap between the active electrodes and the target tissue.¹⁹ When the system applies a voltage signal with a frequency of 100 kHz and sufficiently high voltage levels (between 100 V and 300 V), the conductive fluid is converted into ionized water and plasma in the small intervening gap.

The first commercial use of radiofrequency ablation technology in arthroscopic surgery was reported in 1995, and many cases have been reported since, including chondroplasties, partial meniscectomies, meniscal tears, repairs, and ligament reconstructions.²⁰ However, its use remains uncommon in smaller joints such as the ankle. A few radiofrequency ablation studies have evaluated the technique for relief of pain from plantar fasciitis/fasciosis. Results of these early studies suggest radiofrequency-based technology may be an effective treatment for fasciitis/fasciosis because it induces an angiogenic response to promote healing and reduction of pain in chronically inflamed and injured tissue.^{21,22}

We conducted a retrospective patient chart review to evaluate the effectiveness of radiofrequency ablation of dendritic synovitis used in conjunction with ankle arthroscopy for reducing chronic ankle pain.

new

attention class!

surestep courses are back in session with brand new material

Pediatric Orthotists, PTs and PTAs:

The Surestep Education team developed an entirely original, interactive continuing education course. You'll go where no Surestep presentation has gone before! New videos. New product comparisons. New case studies. Material for the course will include high tone orthotic solutions and much more. You won't want to miss it!

Check out our fall schedule at surestepacademy.com

See you at AOPA!

Our first presentation will take place at our workshop at the AOPA National Assembly in Boston, MA

Thursday, September 8th

from 1:00 p.m. - 3:00 p.m. Attendees will receive exclusive Surestep swag.

surestep

Methods

Institutional Review Board (IRB) approval was obtained before commencement of this retrospective single-center study of patients who underwent ankle arthroscopy using radiofrequency-based microdebridement between 2004 and 2012. The first author performed outpatient surgery. Patients selected for the review had not responded to six months or more of conservative treatment for their ankle pain symptoms. They were selected for the study to determine the procedure's effectiveness in terms of pain-free or less painful ambulation.

Patients included in the study were aged 16 years or older at the time of surgery and had undergone conservative therapy that included rest, stretching, strengthening exercises, nonsteroidal anti-inflammatory drugs, and steroid injections. Patients had at least six months of documented postoperative follow-up and were asked to rate their overall pain on ambulation using a visual analog scale (VAS) at each visit.²³

Exclusion criteria included diabetes, confirmed or suspected pregnancy, coagulopathy, infection, tumor, peripheral vascular disease, autoimmune disease, or other systemic disease. Also excluded were those who had previous ankle arthroscopy using a mechanical debridement device, a history of ankle infection in the six months before surgery, or ankle injections of hyaluronan. Patients who were undergoing litigation, receiving care from worker's compensation, or participating in a related study were also excluded.

The body mass index (BMI) for patients was calculated using the patient's height and mass at the time of the preoperative surgical evaluation. The BMI was used to determine obesity, overweight, and healthy weight as calculated by the National Institutes of Health.^{24,25} Patients with BMIs greater than 30 kg/m² were considered obese, those with BMIs between 25 and 29.9 kg/m² were considered overweight, and patients between 18.5 and 24.9 kg/m² were considered healthy weight.

Surgical technique

The patient was positioned supine on the operating room table, per the request of the surgeon of record. The thigh was then placed in a well-padded knee holder, and an ankle tourniquet was applied approximately 2 cm proximal to the affected ankle. Anesthesia consisted of intravenous sedation, and an ankle block was performed at the operative site using approximately 20 cc of lidocaine 1% plain. (General anesthesia alone may be used as an alternative means of sedation but was not for the reported cases.) The ankle was then prepared and draped in the usual sterile manner. Attention was directed to the affected ankle joint, which was anatomically marked and extra-articular structures identified.

Normal saline was injected at the lateral gutter of the ankle joint using a 50-ml syringe and an 18-gauge 1.5-inch needle. The joint was distended and a stab incision made over the portal of entry. The arthroscope cannula, fitted with a sharp trocar, was used to pierce the soft tissue and capsule. It was then replaced with a blunt device (an obturator) to further stretch the joint capsule and prevent injury to healthy intra-articular soft tissue. The obturator was then removed and a 2.7-mm cannula with camera and light source inserted to visualize the joint, using an anterior-central approach. While visualizing the joint, a second cannula was introduced for insertion of other instruments, such as biopsy forceps, probes, power

Continued on page 52

FOOTWEAR • ORTHOSES • BRACES

"We Want Your Most Difficult Cases"

William Lanier, CEO



SEBRING BRACE



Made in
the USA



Trusted Quality for over 25 Years



877-524-0639 • Branier.com

Table 1. Change in ankle pain from baseline to 6 months postsurgery

Patient	Gender (M/F)	Age (yrs)	Side (right/left)	Ankle pain score before surgery (0=no pain; 10=most pain)	Ankle pain score after surgery (0=no pain; 10=most pain)	Preoperative body mass index (kg/m ²)
1	F	63	L	8	3	26.29
2	F	50	L	10	0	27.79
3	F	22	L	9	4	35.19
4	F	47	R	5	0	46.59
5	M	60	L	2	0	40.60
6	M	48	L	6	3	44.30
7	F	53	R	3	1	22.80
8	F	73	R	5	0	26.40
9	M	16	R	3	0	42.60
10	F	55	L	6	1	23.52
11	M	29	R	7	2	37.70
12	F	46	L	5	0	33.60

abraders, or radiofrequency ablation wand. This method of joint visualization with accession is known as the triangulation technique.

The arthroscope was swept through the joint and a standard nine-point check was made to visually evaluate the deltoid ligament, medial gutter, medial talus, central talus, lateral talus, talofibular articulation, lateral gutter, anterior gutter, and the central tibiotalar articulation (Figure 1). At this point the joint was ready for treatment with the microtenotomy wand.

The hypertrophic synovitis, or synovial accumulation in the me-

dial and lateral gutters as well as the proximal joint space, was removed using a radiofrequency microtenotomy wand. The ankle joint was then irrigated with copious amounts of normal saline under pressure, and debris was removed with a vacuum. Once the area was clear, all lesions were lysed and abrasion chondroplasty was performed.


The difficulty of assessing the lateral gutter area with the arthroscope requires a small 3-cm incision in an "S" shape, performed at the lateral gutter using a #15 blade, to obtain visualization of the lateral ankle joint. The ankle joint was copiously irrigated with sterile saline. The skin incision was then reapproximated, first closing deep structures with 3-0 Vicryl, subcutaneous tissues with 4-0 Vicryl, and the skin with 4-0 nylon.

A conforming bandage was applied to the operative site, followed by a short-leg nonweightbearing fiberglass cast. The cast and sutures were removed seven to 10 days postoperatively, and a conforming dressing was applied. During postoperative week four, after the edema had reduced, physical therapy was initiated, consisting of whirlpool, ultrasound, and progressive resistance exercises. Therapy was performed twice each week, ideally for one month or more as needed.



Results

Twelve patients (eight women) with an average age of 46.8 years (range 16-63 years) had arthroscopic surgery (Table 1). The average patient BMI was 33.9 kg/m². Seven were obese, three overweight, and two healthy weight.

Patients presented with multiple intraoperative findings. The most common were chronic synovitis, lateral impingement syndrome, and



GAIN UNIQUE INSIGHTS ABOUT GAIT & FOOT FUNCTION USING **F-SCAN®** IN-SHOE TECHNOLOGY

- Improve athletic performance
- Assess risk of injury
- Monitor patient progress
- Pinpoint issues in gait cycle

Educate patients with visual reports

>

LEARN MORE: WWW.TEKSCAN.COM/IN-SHOE

osteochondritis dissecans of the talus. All ankles had hypertrophic synovium, and several had various subchondral osteochondral defects. The arthroscopic intraoperative findings tended to reveal pathology that was not observed clinically or radiographically. For example, many patients with chronic nonspecific ambulatory pain and negative ankle x-rays were observed to have osteochondral defects, including osteochondritis dissecans, during the arthroscopic procedure. All patients completed the physical therapy sessions, which were part of the postoperative office visits.

Six months postprocedure, pain in the overall cohort compared with baseline had improved by an average of 4.5 points on a 10-point VAS (Table 1). Pain improved by an average of four points in the obese patients, 6.6 points in the overweight patients, and three points in the healthy weight patients.

Discussion

Arthroscopy reduces sources of inflammation by removing loosened and fragmented intra-articular cartilage, bone, and soft tissue that impede ankle joint range of motion. Ultimately the goal is to allow the ankle joint to function pain free. The development of an arthroscopic mechanical debrider historically has given surgeons the option of a less-traumatic technique than the earlier standard of care, open ankle arthrotomy. Further development of arthroscopic equipment has led to development of instrumentation that is less traumatic to surrounding tissues than the mechanical debrider.

Patients in our study were arthroscopically found to have osteochondral talus defects, talus fractures, osteochondritis dissecans of the talar dome, degenerative joint disease of the lateral gutter, and medial groove erosions. These osteochondral findings were undetected by x-ray in this chart review.

Obese and overweight patients six months postoperatively had greater decreases in pain than healthy weight patients.²⁶ Degenerative joint disease is more prevalent in obese patients than those of normal weight, and is thought to be due to greater joint loading forces.²⁶ Hypothetically, obese and overweight patients have more joint pathology and inflammation, hence, when these are arthroscopically removed, pain symptoms decrease.²⁷ However, it's also possible that the healthy weight patients were more active than the others; if so, even if their pain during low-impact activity was similar to that of heavier patients, they might have had more pain overall because they were participating in more challenging activities.

Weight in obese patients increases stresses on the ankle joint during weightbearing, putting extra pressure on the surrounding bone and soft tissue. Excessive impact loading on ankle bone from obesity, blunt trauma, and microtrauma pressure is thought to cause an indirect inflammatory osteoarthritic response.²⁸ High internal stress also can create microfractures of the bone trabeculae, weakening the superstructure, as well as creates cracks and fissures of the overlying cartilage. The response to these conditions is osteochondral destruction, inflammation, and pain.²⁹ This extra pressure potentially exacerbates the inflammatory process, causing a painful ankle and affecting arthroscopic treatment outcomes.

Cellular trauma is associated with the release of interleukin 1 (IL-1), which stimulates fibroblast synovitis. The fibroblastic synovitis then proliferates and secretes metalloproteases, prostaglandins, and cytokines—all markers of inflammation.^{30,31} These inflammatory effects are modified by receptor antagonist IL-1RA, of which two structural variants exist.³² The first type is produced by macrophages,

Continued on page 55

FOOTWEAR • ORTHOSES • BRACES

"We Want Your Most Difficult Cases"

William Lanier, CEO



CUSTOM ORTHOSES



FREE
Impression Box
FREE Shipping



Made in
the USA



Trusted Quality for over 25 Years



877-524-0639 • Branier.com

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!



and the second type is produced by keratinocytes or other epithelial cells. Both types reproduce simultaneously. In addition, transforming growth factor beta (TGF- β) has been shown to modify IL-1.³²

In describing lateral impingement syndrome pain, Fallat et al suggested the hypertrophic synovium is compressed by the talus and fibula, causing increased irritation and inflammatory processes, affecting synovial tissue growth.¹² The result is chronic lateral ankle pain. Guhl suggested excessive stress on bone or trauma causes an intra-articular hematoma that is reabsorbed slowly, ultimately by macrophages, and results in a reactive synovitis.²⁹ Meniscoid bodies are composed of capsule, ligament, and synovial tissue and are indicators of advanced stage of ankle joint destruction.³³ Both osteoarthritis (OA) and rheumatoid arthritis (RA) are joint destructive processes commonly involving the bone and the soft tissue including ligaments and cartilage, though OA and RA differ in mechanisms.³⁴


Just as important as the procedure is postoperative physical therapy, which can include continuous passive range of motion (CPM), supervised exercise, and therapeutic modalities.

O'Driscoll and colleagues found that CPM effectively accelerates clearance of joint hemarthrosis; in contrast, hemarthrosis slowly cleared from immobilized joints was associated with synovial hypertrophy, intra-articular adhesions, and joint stiffness. It is believed that synovial hyperplasia results in the production of proteolytic enzymes and cartilage destruction.³⁵ Evidence suggests CPM therapy promotes reorientation of blood vessels to a normal state and increases tendon sheath repair.³⁶

Saxena and colleagues reported that the most efficacious method of promoting an expedient and functional recovery after foot surgery is through physical therapy instructional exercises.³⁷ Modalities such as heat, ultrasound, and paraffin wax often have temporary analgesic effects with increased range of motion. This increase in activity and exercise can help to improve extrinsic muscle strength and prevent muscle atrophy.^{38,39}

Conclusion

The results of this retrospective chart review suggest plasma-mediated bipolar radiofrequency-based arthroscopic microdebridement can successfully treat painful ankle joints when conservative treatments fail. Obese and overweight patients had larger reductions in pain level compared with healthy weight patients given the same surgical and postoperative protocol, presumably because more arthritic pathology was removed.

This study was limited because of the small number of cohort patients reviewed. A foot and ankle scoring system also could have been used to measure activities of daily living in addition to a pain VAS. 

Renato Giorgini, DPM, FACFAS, is podiatry residency director; Stephanie Giles, DPM, is a podiatry resident; and Omer Aci, DPM, is a podiatry attending at Good Samaritan Hospital Medical Center in West Islip, NY. Christopher Japour, DPM, MS, is section chief and residency director in the Department of Surgery/Podiatry Section at the VA Illiana Health System in Danville, IL.

Authors' note: Dr. Giorgini passed away in 2015. He saw that his patients benefited from radiofrequency-based arthroscopic microdebridement and would have been pleased by the publication of this manuscript.

References are available at lermagazine.com.

FOOTWEAR • ORTHOSES • BRACES

"We Want Your Most Difficult Cases"

William Lanier, CEO



CUSTOM FOOTWEAR



Trusted Quality for over 25 Years



877-524-0639 • Branier.com

You provide braces to help him up;
we provide the support to lift him up.



*If you have patients with Charcot-Marie-Tooth,
the CMTA gives them the support they & their loved ones deserve.*



One Disease, One Mission, One Family...We Are The CMTA

cmtausa.org • 800-606-2682

ad index

Acor	10	Justin Blair	30	Ped Lite	35
800/237-2267	acor.com	800/566-0664	justinblairco.com	219/756-0901	pedlite.com
Allard	26	Kinetic Research	31	Pedifix	8
888/678-6848	allardusa.com	800/919-3668	kineticresearch.com	800/424-5561	pedifix.com
Amfit	15	Levy & Rappel	19	Revere	22
800/356-3668	amfit.com	800/564-LEVY (5389)	levyandrappel.com	208/720-2100	revereshoes.com
Apex	Back Cover	Lower Limb	47	Richie Brace	6
800/526-2739	apexfoot.com	800/253-7868	spinaltech.com	877/359-0009	richiebrace.com
Anodyne Shoes	4, 5	Medi USA	23	Streifeneder USA	36
844/637-4637	anodyneshoes.com	800/633-6334	igliusa.com	800/378-2480	streifeneder-usa.com
Arizona AFO	32, 33	Med Spec	14	Surestep	50
877/780-8382	arizonaafo.com	800/582-4040	medspec.com	877/462-0711	surestep.net
Bauerfeind	45	Ortho-Rite	inside back cover	Tekscan	52
800/423-3405	bauerfeindusa.com	800/472-6682	ortho-rite.com	800/248-3669	tekscan.com
Branier	51, 53, 55	Orthomerica	29	Townsend	42
877/524-0639	branier.com	800/446-6770	orthomerica.com	800/432-3466	townsenddesign.com
ComfortFit	41				
888/523-1600	comfortfitlabs.com				
Darco	48				
800/999-8866	darcointernational.com				
DJO Global	12				
800/336-6569	djoglobal.com				
Dr. Comfort	2,3				
877/728-3450	drcomfort.com				
Dr. Jill's Foot Pads	21				
866/366-8723	drjillsfootpads.com				
Ferris Mfg.	54				
800/765-9636	polymem.com				
Footmaxx	39				
800/779-3668	footmaxx.com				
G-W Heel Lift	57				
800/235-4387	gwheelift.com				
Insightful Products	34				
207/885-0414	insightfulproducts.com				

Help Your Patients

ENJOY
life
AGAIN!

A Short Leg Caused By:
Hip or Knee Replacement,
Fracture of Lower Extremity,
Or Other Lower Extremity Issues,
Can Diminish Their Quality of Life.
Our Products Can Help Them:
Rehab Better,
Walk better,
And Feel Better.



www.gwheelift.com

Heel Lift, Inc. 1.800.235.4387

ler new p



Clima-Flex
OA Knee Brace



Peg Assist
Walker Insole



OP-Tek Flex
Materials



iTOM-CAT
Scanning System

DJO Global has launched the Clima-Flex OA Knee Brace from DonJoy. The Clima-Flex OA Knee Brace is designed to offer a new level of comfortable cooling relief through compression and offloading for patients with mild to moderate knee osteoarthritis (OA) pain. Clima-Flex OA features new DonJoy C-6 cooling material technology, which is designed to deliver breathable, moisture-wicking comfort that's soft to the touch, temperature controlled, and antimicrobial. Keyless offloading via a dual-action dial empowers patients with on-the-fly adjustment for convenient, comforting relief from OA knee pain.

DJO Global
800/336-6569
djoglobal.com

Darco International announces another addition to its popular Peg Assist Offloading Insole line of products, the new Peg Assist Walker Insole. The easy to use, off-the-shelf product quickly turns most standard walking boots into a more effective offloading device for patients who have had foot surgery or have other wound-healing needs. Each insole base has a 15-mm combination of Plastazote and Multi-Foam, topped with 3 mm of Poron. Designed to help reduce plantar pressures at wound sites by up to 60%, the insole system offers an alternative for patients who cannot tolerate a total contact cast.

Darco International
800/999-8866
darcointernational.com

Curbell Plastics announces the availability of OP-Tek Flex materials—soft, flexible sheet materials designed to maximize patient comfort when used for prosthetic inner liners and orthotic inner boots. Curbell is the exclusive distributor for the OP-Tek Flex family of products, including OP-Tek Flex in black or natural, OP-Tek Flex Comfort, and OP-Tek BiLam. OP-Tek Flex Comfort is silicone free and internally lubricated so it has a smooth feel and is easy to don and doff. The OP-Tek Flex BiLam offers both comfort and cosmetic appeal since it helps hide the trim line and windows of carbon-fiber socket frames.

Curbell Plastics
888/CURBELL (287-2355)
curbellplastics.com

SOLO Laboratories is proud to release the iTOM-CAT, a new innovation in 3D scanning technology. Portability and ease of transport make this iPad-based scanner system a convenient option for clinicians who work out of multiple locations or who visit patients at home. Orders are easily submitted electronically, which eliminates inbound shipping costs, and template options further simplify ordering. The system is uniquely equipped with SOLO's order form, which will help guide the practitioner when prescribing the company's devices, and SOLO will waive the handling fee for all iTOM-CAT orders.

SOLO Laboratories
800/765-6522
sololabs.com

products



**Diabetic A5513
Custom Insert**

Allied OSI Labs adds the Diabetic A5513 Custom Insert to its growing catalog of foot and ankle products. The Diabetic A5513 Custom Insert is designed to help prevent foot wounds that can lead to amputation in patients with diabetes. The Diabetic A5513 Custom Insert is full-length with a 3.16" Plastazote topcover, a 35-durometer EVA (ethylene vinyl acetate) shell, and a 10-mm heel cup. Accommodations such as toe prostheses, metatarsal raises, and cut-outs are also available. The Diabetic A5513 Custom Inserts can be purchased in sets of three—the number Medicare will reimburse for each year—for \$96.

Allied OSI Labs
800/444-3632
alliedosilabs.com



**Turbomed FS3000
External AFO**

Turbomed Orthotics offers the FS3000 external foot drop brace. The FS3000 brace is a custom-built modular AFO (ankle foot orthosis) made from highly durable thermoplastic. The device attaches to the outside of a patient's footwear and is easily interchangeable between shoes. The unique design of the FS3000 brace acts as an exoskeleton to the impaired limb, helping to improve the patient's function without discomfort or rubbing. The FS3000 brace does not prevent ankle plantar flexion or limit dorsiflexion, making it easier for patients to walk and run on slopes, stairs, and uneven surfaces.

Turbomed Orthotics
888/778-8726
turbomedorthotics.com



**Earthwalk Sterling
Collection Orthoses**

The Sterling Collection from Earthwalk Orthotics combines alchemy and biomechanics, incorporating the healing properties of silver in the design to maximize performance. Every design feature was carefully selected for its unique contribution to the finished device. The resulting high-performance, prescription orthotic device is thin, durable, featherweight, and designed to wick moisture away from the body. The Sterling Collection orthotic therapy products can be produced with unlimited accommodations, and can be customized with a personalized logo. Earthwalk Orthotics promises a three-day turnaround.

Earthwalk Orthotics
888/492-8393
earthwalkorthotics.com



**DVS-Dynamic
Vacuum System**

Ottobock has released the DVS-Dynamic Vacuum, a socket technology solution for transtibial amputees. Integrating innovative design with simplicity, the DVS system reduces the movement between the limb and socket that is associated with limb volume fluctuations. The vacuum generated during walking is maintained in both swing and stance phases, which reduces pistoning and enhances fit and control throughout gait, setting it apart from passive systems in which a vacuum is generated only in the swing phase. The easy-to-use device helps simplify the fitting process for both the patient and prosthetist.

Ottobock
800/328-4058
professionals.ottobock.com

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

ler new products



**AF7 Ankle
Bracing Sleeve**

Sports medicine and performance brand OS1st has released the AF7 Ankle Bracing Sleeve. Like all the company's technical bracing sleeves, the slip-on AF7 Ankle Bracing Sleeve features Compression Zone Technology for graduated medical-grade support. It also introduces K-Zone Technology, a stabilizing system that eliminates the need for plastic, metal, or immobilization. The woven ankle stabilizer zone fuses into a lateral gel stabilizer bar that provides inversion resistance. The resulting seamless, strapless bracing effect offers a supportive flexible rigidity that replicates various clinical taping techniques.

ING Source
877/647-0386
ingsource.com



**Restiffic
RLS Therapy**

New from medi USA is Restiffic, a drug-free treatment for restless leg syndrome (RLS). Restiffic is a foot wrap that provides gentle, relaxing pressure on the abductor hallucis and flexor hallucis brevis muscles, which helps reduce uncontrollable impulses to move the legs and allows the wearer to relax and sleep. Clinical trials showed 90% of patients said their RLS symptoms were "much improved" or "very much improved" after six weeks of using Restiffic. The compact, lightweight product is designed for easy application and removal, and hook-and-loop straps allow for adjustment of the degree of compression.

medi USA
855/700-6875
restiffic.com



**Comfort Air
Stabilizer Gauntlet**

New from CyberKinetics is the Comfort Air Stabilizer Gauntlet, with special breathability features to maximize patient comfort and improve compliance without sacrificing support, control, or function. The defining characteristic of the Comfort Air Stabilizer Gauntlet is the perforated full grain leather on both the outer and inner shells; the perforations facilitate air cooling of the foot and ankle, improving the breathability of the device for enhanced comfort. In fact, even the padded cell foam orthotic device within the gauntlet is perforated for total breathable comfort on the plantar surface of the foot.

CyberKinetics
855/692-8444
cyberkinetics.us.com



**Quadrastep Now
In New Sizes**

Nolaro24 proudly introduces two new sizes of its Quadrastep System custom-to-foot-type prefabricated foot orthosis line. The product line now fits up to men's size 14 in C Quad orthoses for neutral feet and D Quad orthoses for moderate pes planus foot types. The Quadrastep System simplifies the 24 foot-type medical model into six sub-classifications, or Quads, corresponding to foot-type groups based on structure and function. This allows the prefabricated orthoses based on the Quadrastep System to be biomechanically customized for each patient, at a much lower cost than typical custom foot orthoses.

Nolaro24
877/792-4669
nolaro24.com

Spenco execs buy footwear, Silicore rights after Implus buys insole, 2nd Skin lines

Waco, TX-based Spenco Medical Corporation in July announced that four of its executives have purchased the company's footwear and Silicore assets in the wake of the sale of its insole and 2nd Skin first aid lines to Durham, NC-based Implus.


Spenco reps will provide customer service for all Spenco products at least until the end of August, said Jeff Antonioli, current VP of sales and marketing and one of the new owners of the footwear and Silicore business.

The other new owners are Brad Granger, current VP of business development; David

McKown, current CFO; and Nancy Muhlman, current VP of operations.

Since launching the footwear division six years ago, sales of Spenco shoes, sandals, and slides have delivered double-digit increases every year, said Antonioli.

All footwear will continue to incorporate Spenco's Total Support foot bed design and a cushioned heel, deep heel cupping, orthotic arch support, metatarsal dome, and a cushioned forefoot.

The Silicore line includes foot pillows and other therapeutic padding products. 


Fidia Pharma's gel gives lasting OA pain relief

Parsippany, NJ-based Fidia Pharma USA's injectable viscoelastic gel significantly improves knee osteoarthritis (OA) pain for up to a year in patients younger than 40 years, according to data presented July 7 at the annual meeting of the American Orthopaedic Society for Sports Medicine (AOSSM) in Colorado Springs, CO.

Italian investigators presented data from a multicenter, open-label phase III study that involved giving 50 patients two intra-articular injections (3 mL of Hymovis one week apart. Researchers assessed knee pain using several tools, including the OMERACT-

OARSI (Outcome Measures in Rheumatology-Osteoarthritis Research Society International) responder criteria, at the beginning of the study, immediately after the injections, and at six months, and conducted a year of follow-up assessment.


All measures showed significant improvement from baseline that was maintained for 52 weeks, and 88% of patients improved enough to be classified as responders by OMERACT-OARSI criteria.

The *European Review for Medical and Pharmacological Sciences* first published the results in March. 

FDA OKs Erchonia laser for toe fungus

McKinney, TX-based Erchonia reported in July that the Food and Drug Administration (FDA) has given 510(k) marketing clearance to its low-level laser for onychomycosis.


The study on which the FDA

clearance is based found four weeks of once-weekly treatment with the Lunula Laser produced 3 mm of clear nail growth in 67% of patients infected with onychomycosis. 

Acor offers Prime ordering system

Cleveland, OH-based Acor Orthopaedic recently launched Acor Prime, a simplified system for ordering its products that includes free shipping both ways and a free STS sock with each

gauntlet or Richie brace order.

Free modifications included with orders of orthoses include heel lifts, wedges, high heel cups, high flanges, and metatarsal pads and bars. 

Össur posts OARSI knee OA subgroup recs, #MyWinningMoment contest champ pics

Össur reported on July 22 that, after a two-day consensus symposium sponsored by the Foothill Ranch, CA-based company, an expert panel has published clinical treatment protocols for three subgroups of patients with knee osteoarthritis (OA).


The Osteoarthritis Research Society International (OARSI) convened the panel of 27 OA experts from the US and Canada in February to develop protocols in three knee OA populations: those younger than 65 years; active, demanding patients who, regardless of age, are capable of performing moderate-to-vigorous activities or were competitive athletes; and patients older than 65 years seeking to maintain or regain former activity levels.

The new OARSI guidelines, which have not been published in a peer-reviewed journal but are available at <http://bit.ly/>

29zxsqz, include recommendations for biomechanical interventions, such as unloader braces, to reduce pain and improve function.

Össur also announced in July that Federica Maspero, a bilateral amputee from Como, Italy, won its first online contest celebrating amputee mobility.

She took the #MyWinningMoment contest's grand prize, a three-night trip for two people to Reykjavik, Iceland, home of Össur's international headquarters. Her submission showed her and her husband in full wedding regalia on a running track.


Össur has launched a second contest, and people with lower limb loss—now including children—can enter through August 31 by sharing a photo or video that captures their stories at mywinningmoment.com. Parents or legal guardians must submit children's entries. 

FDA approves Dysport for kids with CP

Basking Ridge, NJ-based Ipsen Biopharmaceuticals announced August 1 that the Food and Drug Administration (FDA) had given the nod to its abobotulinum-toxinA injection for treatment of pediatric lower limb spasticity in children aged 2 years and older. It's the first FDA-approved botulinum toxin for treatment of pediatric lower limb spasticity, according to a company release.

The approval comes after an Ipsen-sponsored pivotal trial in cerebral palsy patients (aged 2 to 17 years) with lower limb

spasticity causing dynamic equinus foot deformity. The trial, published in February in *Pediatrics*, showed that, compared with placebo, treatment with Dysport produced significant improvements in ankle plantar flexor muscle tone and Physician's Global Assessment response to treatment score four weeks and three months after injection.


Most study patients were eligible for re-injection between 16 and 22 weeks, though some had more durable responses. 

APTA releases exercise recs for obese kids

The American Physical Therapy Association's (APTA) scientific journal, *Physical Therapy*, in June published guidelines for providing safe and effective exercise interventions for children with obesity.

The new recommendations,

provided by the Belgian Physical Therapy Association (AXXON), are intended for physical therapists who treat children and adolescents in private practice or home care settings.

The full text is available at ptjournal.apta.org. 

Continued on page 62

Surgeon, patient advocate Ray Pellicore dies

Orthopedic surgeon Raymond Pellicore, MD, died July 17 at age 97. His philosophy and compassionate approach to the treatment of people with limb loss and orthopedic problems lives on in the archives of the Digital Resource Foundation for Orthotics and Prosthetics (DRFOP), according to a release from DRFOP, a nonprofit based in Gainesville, FL. Its mission is to develop worldwide computer-based information resources and communication links for worldwide O&P community.

Pellicore was a Member Emeritus of the American Academy of Orthopaedic Surgeons and the American Board for Certification (ABC). Following graduation from the Loyola School of Medicine in Illinois, he

served in the US Navy from 1943-1946. He was clinic chief at the University of Illinois Amputee Program in Chicago (1957-1984), and was instrumental in developing the concept of interdisciplinary team management.

Pellicore and colleagues at UCLA Child Amputee Prosthetics Project (CAPP), New York University, and Mary Free Bed Hospital in Grand Rapids, MI, were leaders in care of juvenile amputees that evolved into the Association of Children's Prosthetic-Orthotic Clinics (ACPOC). Research from the thousands of patients cared for by these clinics led to consensus on the International Classification of Congenital Deficiencies accepted worldwide. [ler](#)

E&C passes sports medicine clarity act

The US House Energy and Commerce Committee on July 13 unanimously passed the Sports Medicine Licensure Clarity Act (H.R. 921), according to the Carrollton, TX-based National Athletic Trainers' Association, which has worked to get Congress to take action on this legislation.

During the organization's annual Capitol Hill Day in June, more than 400 athletic trainers

from 48 states met with members of Congress and requested support for passage of the bill, which clarifies medical liability rules for athletic trainers and other medical professionals to ensure they are properly covered by their malpractice insurance while traveling with athletic teams in another state.

For more information visit nata.org. [ler](#)

Zion predicts \$1B gain in insole market

Deerfield Beach, FL-based Zion Market Research predicted in a report issued July 27 that the global foot orthotic insoles market, valued at \$2.637 billion in 2015, will reach \$3.678 billion by 2021, growing at a CAGR (compound annual growth rate) of around 5.6% between 2016 and 2021.

North America holds more than a 43% share of the global market and is set to dominate the world marketplace within the forecast period, according to Zion, which attributes the projected growth to increasing health awareness coupled with technological advances. [ler](#)

OHI VP finishes second Ironman race

Josh White, DPM, cofounder of Milford, CT-based SafeStep and VP of its parent company, OHI, headquartered in Ronkonkoma, NY, on July 24 finished his second Ironman competition.

White competed in the 140.6-mile race at the 18th annual Ironman Lake Placid in New York, riding the same road bike he used in his first Ironman race in 1994. [ler](#)

Topical Gear device may lower risks to ACL

Data presented in July show Austin, TX-based Topical Gear's wearable neuromuscular (WNM) device may help reduce anterior cruciate ligament (ACL) injury risk in young female soccer players.

Investigators from the University of Denver recruited 79 elite youth and collegiate female soccer athletes (aged 12-25 years) to train with or without Topical's ACL Tube, which applies bilateral pressure to the medial quadriceps and hamstrings, for seven to nine weeks of pre-season training.

Compared with the control group, training with the WNM

device significantly lowered peak medial and vertical ground reaction forces; medial-lateral and net center of pressure (COP) velocities; and COP displacements; device wearers also had significantly longer landing phase durations.

The device was associated with significantly improved speed, power, and endurance compared with controls. No athletes sustained an ACL injury during training or during the season.

Researchers presented the results at the American Orthopaedic Society for Sports Medicine (AOSSM) annual meeting in Colorado Springs, CO. [ler](#)

Dralla Foundation awards 2016 grants

The Rockaway, NJ-based Dralla Foundation in July released the names of its 2016 grant recipients. The awards fund events for children and adults with physical challenges.

This year's recipients are the Adaptive Sports Foundation, Catalyst Sports, the Charcot-Marie-Tooth Association, Kinetic Kids, Stride Adaptive Sports, and

World T.E.A.M. Sports.

The events are already under way and will run through March 2017. The next grant cycle begins in December, when Dralla will begin accepting grant applications.

Go to dralla.org for more on the foundation's grant program and supported organizations. [ler](#)

Amputee Coalition taps Lundquist as CCO

The Manassas, VA-based Amputee Coalition announced in July that Karen Lundquist will join their leadership team as communications officer (CCO).

Lundquist will be responsible for translating the organization's 2020 strategic goals into focused programs that include external and internal communications, brand and reputation

management, and oversight of publications, media relations, and social media.

Since 2000, Lundquist has been regional director of communications at Austin, TX-based Ottobock USA, where she made a significant impact on the organization's communications, according to an Amputee Coalition release. [ler](#)

Ottobock AFO reduces knee OA pain

A study published July 8 in the *Archives of Orthopaedic and Trauma Surgery* found an ankle foot orthosis (AFO) made by Duderstadt, Germany-based Ottobock significantly reduced pain and stiffness and improved physical function in patients with knee osteoarthritis (OA).

Investigators from Ottobock,

the University of Göttingen, and other German centers found the AFO improved Western Ontario and McMasters Universities Arthritis Index (WOMAC) total and subscores, visual analog pain, activity restriction, and complication rate in 23 patients with mild to moderate unicompartmental knee OA. [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.

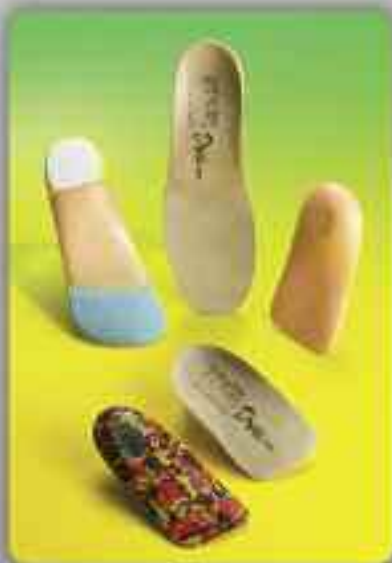
Call Us

*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



2016 Collection

To view the complete
Apex® Footwear Collection visit apexfoot.com
or to order by phone call 800-745-9801

WELCOME TO THE 'NEW' APEX

The same industry-leading construction,
finest materials and exceptional comfort that
you and your patients have come to expect.

A fresh and exhilarating focus on style that
everyone will love.

A commitment to service excellence
unparalleled in our industry.

Look And Feel Your Best From Heel to Toe!™

The OHI Family of Brands

