

ler

LOWER EXTREMITY REVIEW

June 22 / volume 14 / number 6

ADAPTATIONS OF PREGNANCY

- 9 A NEW LOOK AT PROPRIOCEPTION
- 23 INCREASING CONSENSUS ON ACHILLES TERMINOLOGY
- 29 BIOLFILM: THE STRUGGLE IS REAL
- 41 DOG LEASH-RELATED INJURIES
- 51 BISPHOSPHONATES, ATYPICAL FEMUR FRACTURES, AND HRQOL
- 62 THE MANY ADVANTAGES OF BANANAS!



NOW OPEN

lerMARKETPLACE



lerMARKETPLACE

NOW IS THE TIME TO DREAM.
WELCOME THE HELP BRING
YOUR NEXT EVENT ONLINE.

Introducing lerEPO

TRUTHICS

Jambu Co.

ProtoKinetics

SENSOR medical

OrthoFeet

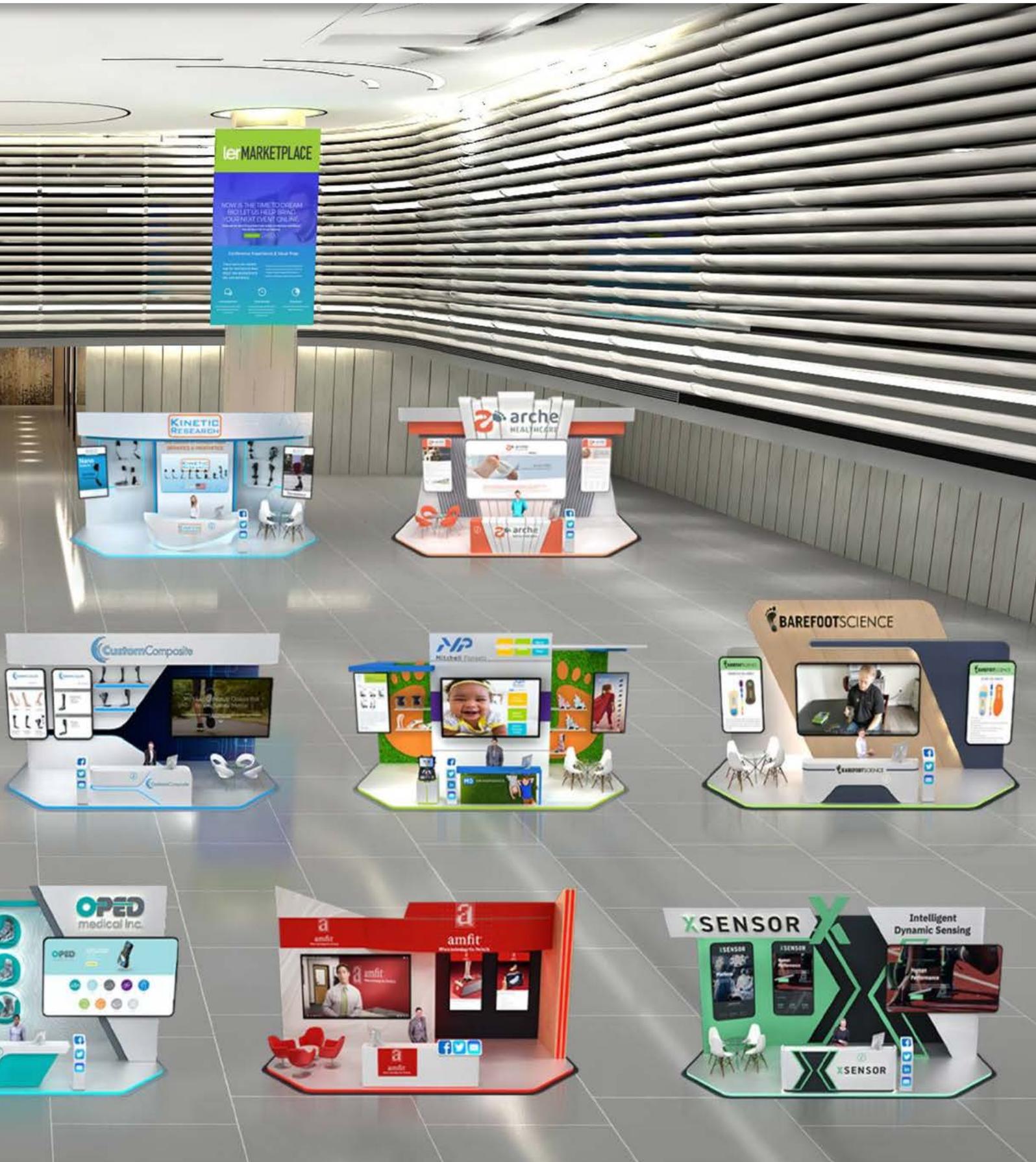
BAUERFEIND

ACOR

OPED

EVEN

Visit lerMARKETPLACE.com to learn more.
Available 24/7/365



EXPLORE MORE. ADVENTURE MORE.

The lightweight and breathable Expedition orthotic is engineered for repeated impact and shock absorption.

Start providing Footmaxx orthotics today!

1.800.779.3668



Expedition
By Footmaxx



Footmaxx™
[Footmaxx.com/get-started](https://www.footmaxx.com/get-started)

GUEST PERSPECTIVE

9 PROPRICEPTION: A NEW LOOK AT AN OLD CONCEPT

These authors present a novel framework for human proprioception assessment that is divided into 2 categories: low-level and high-level proprioceptive judgments.



By Martin E. Héroux, Annie A. Butler, Lucy S. Robertson, Georgia Fisher, and Simon C. Gandevia

COVER STORY

33 ADAPTATIONS IN THE LOWER EXTREMITY DURING PREGNANCY

Pregnancy elicits a range of adaptations throughout the body that impact nearly every aspect of a woman's life. This round-up of recent research findings focuses on how the lower extremity responds.



FEATURES

23 INCREASING CONSENSUS ON TERMINOLOGY OF ACHILLES TENDON-RELATED DISORDERS

Long-standing terminology regarding Achilles tendon-related disorders is not only often misused, it is confusing.



By Kim T. M. Opdam, Ruben Zwiers, Johannes I. Wiegerinck, C. Niek van Dijk, and Ankle Platform Study Collaborative – Science of Variation Group

AD INDEX

57 GET CONTACT INFO FOR ALL OF OUR ADVERTISERS

NEW & NOTEWORTHY

58 PRODUCTS, ASSOCIATION NEWS & MARKET UPDATES

THE LAST WORD

62 THE MULTIPLE ADVANTAGES OF BANANAS FOR THE ATHLETE

Despite its many health benefits, green bananas are NOT recommended on race day!

Designed by @YLMsportScience

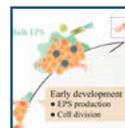
SHORTTAKES FROM THE LITERATURE

- 15 • Disuse Impacts Cardiovascular, Skeletal Muscle Health
- Self-Adhesive Tape = Short-Leg Cast for 5th Met Fracture
- Orthobiologics: Definitions, Challenges, Barriers, & Strategies
- Stem Cell Strategy for Repairing Joint Damage Shows Promise in Pig Model
- Acupuncture Appears to Reduce Fracture Risk in Osteoarthritis
- Muscle Mass & COVID Outcomes Examined in 2 Studies
- Amputation Decision Guides Available

WOUND CARE UPDATE

29 BIOFILM MANAGEMENT: THE STRUGGLE IS REAL

Frequent and thorough debridement reduces bacterial bioburden. In some cases, although the debridement adequately removes devitalized tissue, the remaining wound bacteria may become problematic.



By Windy Cole, DPM, CWSP

41 DOG LEASH-RELATED INJURIES OF THE LOWER EXTREMITY TREATED AT HOSPITAL EMERGENCY DEPARTMENTS

Trips and tangles are the most common culprits in falls related to dog-leash injuries, with the knee and ankle most commonly involved.



By Mathias B. Forrester, BS

51 BISPHOSPHONATES, ATYPICAL FEMUR FRACTURES, AND HRQL

Safety profiles for bisphosphonates, among the most often prescribed medications due to an aging population, show they are generally well-tolerated.



By Jonathon Spanyer, Lauren A. Barber, Harrison Lands, Alexander Brown, Mary Bouxsein, Marilyn Heng, and Madhusudhan Yakkanti



DIGITSOLE
PRO



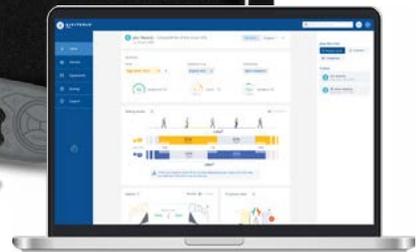
UNLOCK YOUR PATIENTS BIOMECHANICS SECRETS!

Powered by our **EXCLUSIVE AI ALGORITHM**, Digitsole Pro is your in clinic digital partner to objectively measure biomechanical data not observed by the naked eye.

- Run and walk analysis
- Remotely monitor mobility with our Digitsole smart insole
- Discover rich biomechanical data to guide clinical discussions for Plantar Fasciitis, Hallux Valgus, Achilles injuries, and more.



COMING SOON - REHAB Analysis



**SMART MOTION,
EMPOWERING YOU**

SCAN HERE TO
REGISTER FOR
OUR WEBINARS



ASK ABOUT OUR EARLY ADOPTER PROMOTION!

TO LEARN MORE AND ACCESS
A FREE DEMO GO TO

DigitsolePro.com
Contact us at: USASALES@DIGITSOLE.COM



Richard Dubin

Publisher and Chief Executive Officer

rich@lermagazine.com | 518.221.4042

STAFF

Editor

Janice T. Radak | janice@lermagazine.com

Associate Editor

Laura Fonda Hochnadel | laura@lermagazine.com

Marketing Manager

Glenn Castle | glenn@lermagazine.com

Graphic Design/Production and Website Development

Anthony Palmeri | PopStart Web Dev
webmaster@lermagazine.com

Operations Coordinator

Melissa Rosenthal-Dubin | melissa@lermagazine.com

Lower Extremity Review

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, except for 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 ©2022 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

41 State St. • Suite 604-16 • Albany, NY 12207
518.452.6898

Lower Extremity Review Mission

Showcasing evidence and expertise across multiple medical disciplines to build, preserve, and restore function of the lower extremity from pediatrics to geriatrics.

EDITORIAL PILLARS

- Biomechanics matter
- Injury prevention is possible
- Diabetic foot ulcers can be prevented
- Collaborative care leads to better outcomes

EDITORIAL ADVISORY BOARD

David G. Armstrong, DPM, MD, PhD

Professor of Surgery and Director, Southwestern Academic Limb Salvage Alliance (SALSA), Keck School of Medicine of the University of Southern California, Los Angeles, California

Windy Cole, DPM

Medical Director, Wound Care Center, University Hospitals Ahuja Medical Center

Adjunct Professor/Director Wound Care Research

Kent State University College of Podiatric Medicine
Cleveland, Ohio

Robert Conenello, DPM

Orangetown Podiatry
Clinical Director, NJ Special Olympics
NYPD Honorary Surgeon
Greater New York City Area, New York

Sarah Curran, PhD, FCPodMed

Professor, Podiatric Medicine & Rehabilitation
Cardiff Metropolitan University
Cardiff, United Kingdom

Paul DeVita, PhD

Director, Biomechanics Laboratory
Leroy T. Walker Distinguished Professor of Kinesiology
East Carolina University
Greenville, North Carolina

Stefania Fatone, PhD, BPO

Professor and Association Chair
Department of Rehabilitation Medicine
University of Washington
Seattle, Washington

Geza Kogler, PhD, CO

Program Director
MS Prosthetics and Orthotics
Kennesaw State University, Clinical Biomechanics Laboratory
Kennesaw, Georgia

Robert S. Lin, MEd, CPO, FAAOP

Managing Partner Biometrics INC.
Hartford, Connecticut

Bijan Najafi, PhD

Professor of Surgery
Director, interdisciplinary Consortium on Advanced Motion Performance (iCAMP)
Director, Clinical Research in Vascular Surgery
Baylor College of Medicine
Houston, Texas

Antonio Robustelli, MSc, SCS

Sports Performance Consultant
Applied Sport Scientist/Technologist
Strength & Conditioning Specialist
Salerno, Italy

Jarrod Shapiro, DPM

Vice Chair, Department of Podiatric Medicine, Surgery & Biomechanics
Associate Professor of Podiatric Medicine, Surgery & Biomechanics
Western University of Health Sciences
Liaison, American College of Podiatric Medicine
Pomona, California

Philip Stotter, CEP

Visionary at Stotter Technologies
Director of Sports Science
V1 Sports
Cleveland, Ohio

Bruce E. Williams, DPM

Medical Director
Go4-D
Chicago, Illinois

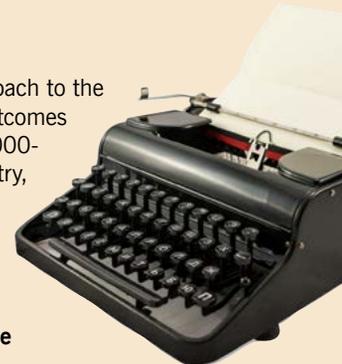
INFORMATION FOR AUTHORS

LER encourages a collaborative multidisciplinary clinical approach to the care of the lower extremity with an emphasis on functional outcomes using evidence-based medicine. We welcome manuscripts (1000-2000 words) that cross the clinical spectrum, including podiatry, orthopedics and sports medicine, physical medicine and rehabilitation, biomechanics, obesity, wound management, physical and occupational therapy, athletic training, orthotics and prosthetics, and pedorthics.

See detailed Author Guidelines at lermagazine.com – click the Editorial tab on the homepage.

ELECTRONIC SUBMISSIONS

Please attach manuscript as an MS Word file or plain text. Tables may be included in the main document, but figures should be submitted as separate jpg attachments. Send to: janice@lermagazine.com

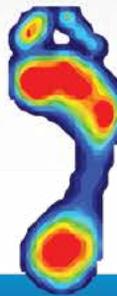


Introducing the new

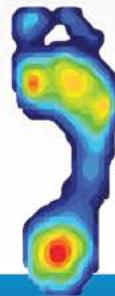
DARCO DUO



Standard Surgical Shoe



DUO™



The MedSurg Duo™ shoe combines two different densities of EVA to provide excellent pressure relief long term. The sole provides 4x better shock absorption than a standard TPR sole. The MedSurg DUO™ shoe is built to last.

DUO™ Features and Benefits

- > The Dual Density EVA sole is lightweight, more durable, and provides better shock absorption.
- > Adjustable ankle strap with ankle pad is softer, meaning more patient comfort.
- > Dual Buckle means strap and pad can be switched left or right
- > The DUO™ is compatible with the PQ - Peg Assist Offloading Insole to form the premier offloading combination on the market.
- > 5 Sizes means reduction in inventory.
- > Duo EVA sole provides up to **40%** pressure reduction over a standard post op. shoe.



Pair with the PQ Peg Assist to enhance offloading.

www.darcointernational.com
Contact your DARCO distributor today!

Guest Perspective

Proprioception: A New Look at an Old Concept

BY MARTIN E. HÉROUX, ANNIE A. BUTLER, LUCY S. ROBERTSON, GEORGIA FISHER, AND SIMON C. GANDEVIA

Proprioception, which can be defined as the awareness of the mechanical and spatial state of the body and its musculoskeletal parts, is critical to motor actions and contributes to our sense of body ownership. To date, clinical proprioceptive tests have focused on a person's ability to detect, discriminate, or match limb positions or movements, and reveal that the strength of the relationship between deficits in proprioception and physical function varies widely. Unfortunately, these tests fail to assess higher-level proprioceptive abilities. In this Perspective, we propose that to understand fully the link between proprioception and function, we need to look beyond traditional clinical tests of proprioception. Specifically, we present a novel framework for human proprioception assessment that is divided into 2 categories: low-level and high-level proprioceptive judgments. Low-level judgments are those made in a single frame of reference and are the types of judgments made in traditional proprioceptive tests (i.e., detect, discriminate, or match). High-level proprioceptive abilities involve proprioceptive judgments made in a different frame of reference. For example, when a person indicates where their hand is located in space. This framework acknowledges that proprioception is complex and multifaceted and that tests of proprioception should not be viewed as interchangeable, but rather as complimentary. Crucially, it provides structure to the way researchers and clinicians can approach proprioception and its assessment. We hope this Perspective serves as the catalyst for discussion and new lines of investigation.



The term “proprioception” was coined by Charles Sherrington in 1907 when he stated, “In muscular receptivity, we see the body itself acting as a stimulus to its own receptors—the proprioceptors.” Early controversy revolved around whether proprioceptive signals were solely of peripheral origin, or whether central signals also contributed. After spirited debates, it is now accepted that proprioceptive signals include peripheral inputs from muscle spindles, Golgi tendon organs, cutaneous, and joint receptors, along with central inputs from efferent motor commands (i.e., corollary discharges). Together, these proprioceptive signals allow us to perceive the position and movement of our body, the force and effort generated by our muscles, and the weight of objects we lift. Although perceptions of body position and movement have been grouped and referred to as kinaesthesia, proprioception encompasses all of these perceptions. Thus proprioception can be defined

as the awareness of the mechanical and spatial state of the body and its musculoskeletal parts.

Proprioception contributes to our sense of ownership of our body and its parts, as well as our sense of self. Proprioception is also critical to learn, plan, execute and correct motor actions: consider the case of Ian Waterman—his acute loss of activity in all large-diameter afferents initially rendered him paralyzed. However, in other clinical conditions in which proprioceptive deficits are less extreme, the strength of the relationship between deficits in proprioception and physical function varies widely. Importantly, this relationship is associational, not causal, with other deficits that impact function and performance on proprioceptive tests often present.

The choice of proprioceptive measure is another factor that is important to understand the link between proprioception and function. Proprioception, like other senses, requires sensory

Continued on page 11



It's Not Just Footwear It's Your Health

Find Comfort in Fully Adjustable
Therapeutic Wellness Footwear

Shop Now

www.celiaruizusa.com



Phone: 410-983-3982

E-mail: info@celiaruizusa.com

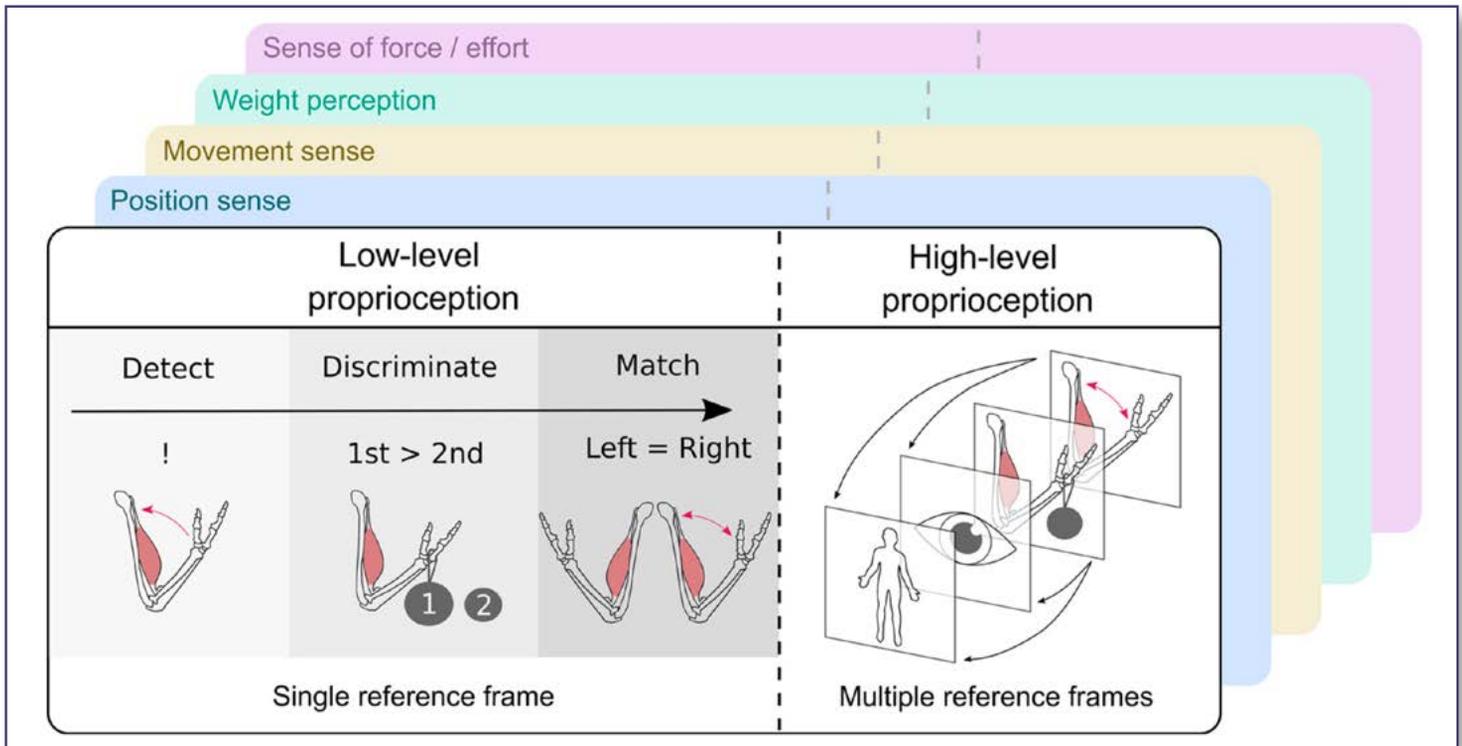


Figure. Schematic representation of the proposed framework of human proprioception assessment. The front tile depicts a generic version of the framework with examples. The framework divides proprioception and its assessment into 2 categories: low-level proprioception and high-level proprioception. To highlight the multifaceted nature of proprioceptive testing, the framework also depicts in cascading colored tiles, examples of various senses that are part of proprioception. Low-level proprioceptive judgments are those made with respect to a single frame of reference, and they can be ordered along a continuum of increasing neural complexity. First are judgments that require people to detect a proprioceptive input, e.g., “Tell me when you feel your arm starts to move.” Second are judgments that require people to discriminate between 2 proprioceptive inputs, e.g., “Lift this weight, and now this one. Which was heavier, the first or the second?” Third are judgments that require people to match a proprioceptive input, e.g., “Bend your left elbow so that it matches the angle of your right elbow.” High-level proprioceptive judgments are those made in a different frame of reference. For example, consider a person who grasps an unseen object between their thumb and index finger and must report its width by selecting from a series of visible horizontal lines of different lengths. Based on available proprioceptive inputs, the brain generates a central representation of the hand that includes the spacing between the thumb and index finger. To report the spacing between the thumb and index finger, the brain must transform this central representation of digit spacing into a line length in the external world.

signals to first be processed by dedicated brain areas before being integrated into higher-level brain functions. For other senses, clinical tests have evolved to assess both these aspects. For example, to assess hearing, an audiologist might administer a pure tone detection test or assess the ability to interpret sound and recognize speech. Similarly, to assess somatosensation, a neurologist might test 2-point tactile discrimination or assess the ability to identify objects by touch alone. But, when it comes to proprioception, clinicians and clinical researchers have generally focused on the first category of tests, those that require people to detect, discriminate, or match limb positions or movements. To understand fully the link between proprioception and function, it will be necessary to look beyond traditional tests, to those that assess higher-level proprioceptive abilities.

When healthy people are asked to detect,

discriminate, or match proprioceptive stimuli, errors tend to be relatively small, with little person-to-person variability. For example, people can discriminate between 2 arm positions where the location of their index finger differs by only 1 to 1.5 cm. However, when their arm is in a similar configuration and they are instead asked to select a line from a visible ruler to indicate the location of their index finger, people make errors of several centimeters, with differences between people as large as 15 cm. These observations are in line with the view that there are 2 distinct position senses: one that codes limb position relative to the body, and one that codes limb location relative to the external world.

But, what makes a proprioceptive ability higher-level? The answer was alluded to above with the 2 types of position sense. High-level proprioceptive abilities involve proprioceptive judgments made in a different frame of reference. For example, the brain possesses dozens

of spatial maps (e.g., retinotopic, somatotopic, egocentric, face-centered, object-centered, and world-centered), each with their own frame of reference (i.e., coordinate system). To ask a person to indicate the location of their index finger when their upper limb is hidden from view is a higher-level proprioceptive judgment because, to indicate the location of the index finger, for example by selecting a line on a visible ruler, coordinates of where the index finger is located relative to the body must be transformed into coordinates of where the index finger is located in the visible external world. This is different from when a person is asked to match the configuration of 1 of their arms because, in this situation, the brain simply matches the central representation of the 2 arms, it matches like with like. Jastrow came to a similar conclusion more than a century ago. With the help of several clever contraptions, Jastrow made thousands

Continued on page 13

Fall in Love With Your Orthotic Lab

Unrivaled custom orthotics are just the
beginning at Orthotica Labs



MAY WE TELL YOU MORE?

888.895.1305

orthotica.com/learn-more



of observations on judgments of perceived width made with the eyes, the hands, and the arms. In some trials, the “receiving sense” and the “expressing sense” were the same; for example, when a person had to report the width of a grasped block with their opposite hand. In other trials, the “receiving sense” and the “expressing sense” were different; for example, when a person had to report the width of a grasped block by selecting from a series of visible lines. Based on his observations, Jastrow eloquently concluded:

“The processes involved in the above-described experiments can be represented thus: A length presented to the receiving sense makes a certain impression on my brain-center; the problem then is to reproduce the objective stimulation which shall give me an equivalent sensation. The two operations being simultaneous, the sensations can be compared and the judgment corrected until they agree. When the receiving and expressing senses are the same, the comparison is between homogeneous sensations, involving 1 brain-center; the operation is easy and the error small. When the expressing sense differs from the receiving sense, heterogeneous sensations must be compared, involving 2 brain-centers; a difficult operation with a large error. The large error seems to be due to a looseness of association between heterogeneous space-centers; it is a path of high resistance.” (Jastrow J. *The perception of space by disparate senses. Mind os-XI. 1886;549. doi:10.1093/mind/os-XI.44.539.*)

Traditional tests of proprioception involve a single frame of reference; thus they cannot capture deficits in higher-level proprioceptive abilities. As a first step to address this shortcoming, we propose a novel framework for human proprioception assessment (Figure). The framework is divided into 2 categories: low-level proprioceptive judgments and high-level proprioceptive judgments.

Low-level proprioceptive judgments are those made in a single frame of reference and are shown along a continuum of increasing neu-

To understand fully the link between proprioception and function, it will be necessary to look beyond traditional tests, to those that assess higher-level proprioceptive abilities.

ral complexity. They are the types of judgments made in traditional proprioceptive tests, those that require a person to detect, discriminate, or match a proprioceptive stimulus.

High-level proprioceptive judgments are those made in a different frame of reference. Versions of these tests are common in laboratory-based studies, including in psychology where they are referred to as cross-modal judgments. For example, with their upper limb resting on a table and hidden from view, a person might choose from a series of visible lines of different widths to indicate the perceived width of a grasped object, or they might report the number of milliliters in a milk carton equivalent to the perceived weight of a lifted object. The challenge will be to devise high-level proprioceptive tests that are clinically viable and functionally relevant.

This framework acknowledges that proprioception is complex and multifaceted. As such, tests of proprioception should not be viewed as interchangeable, but rather as complimentary. This makes intuitive sense as different peripheral and central neural processes and brain areas contribute to different proprioceptive senses, and more complex proprioceptive tests, for example, those that require a person to recall a previous limb position or point to the location of a hidden hand, require more complex neural computations and thus recruit additional brain areas. Moreover, impaired proprioception on a bilateral matching task is not necessarily accompanied by impaired proprioception on a unilateral matching task, nor is impaired proprioception in the upper limbs necessarily accompanied

by impaired proprioception in the lower limbs. Thus, a single test of proprioception is unlikely to capture a person’s overall proprioceptive ability, a crucial point for future investigations on the link between proprioception and function.

Testing human proprioception comes with challenges. First, performance on proprioceptive and functional tests can be confounded by other deficits. For example, stroke survivors may present with cognitive, visual, motor, attention, and memory deficits, all of which can influence performance on proprioceptive and functional tests. Thus, to investigate the link between proprioception and function, these deficits should be included in causal models. Second, proprioceptive tests are tied to perceptual (i.e., conscious) judgments. Yet, these judgments do not necessarily reflect how proprioceptive signals are processed or interpreted centrally to plan, execute, or correct motor commands. Accordingly, because some proprioceptive signals are processed subconsciously to plan motor outputs, there may be a limit to what proprioceptive tests can tell us about proprioception and its causal link to function.

The proposed framework comprised of both low-level and high-level proprioception provides structure to the way researchers and clinicians could approach proprioception and its assessment. However, as with any new framework, it is necessarily tentative; it will evolve as new insights are gained, and clinicians and researchers put its logic to the test. Thus, we hope this Perspective serves as the catalyst for discussion and new lines of investigation. 

This article has been excerpted from “Proprioception: a new look at an old concept,” by the same authors, which was published February 10, 2022, in the Journal of Applied Physiology. <https://doi.org/10.1152/jappphysiol.00809.2021>. Editing has occurred and references have been removed due to space limitations. Reprinted with permission from the American Physiological Society; all rights reserved.

KILL COVID-19

with 99.96% Effectiveness

Every surface, every second, everywhere.

STARTING AT
\$895



Meet CASPR.

Continuous Air and Surface Pathogen Reduction

This No-Touch technology continuously works 24-7, with no moving parts or fan to provide an added layer of protection.

CASPR utilizes a Natural Catalytic Converter™ (NCC) to create highly effective oxidizing molecules, including hydrogen peroxide, out of ambient air. These oxidized molecules then circulate the air and land on all surfaces, destroying harmful pathogens at a cellular level.

Protect your patients,
staff and yourself.



✓ **Up to 99.96% kill rate
on all surfaces against:**

- SARS nCoV2 (COVID-19)
- Viruses
- Bacteria
- Molds
- Formaldehyde
- Odors
- VOCs

✓ **Safe for people, pets
and plants.**

AWARD-WINNING TECHNOLOGY:

2020 Transit Tech Lab Finalist: *Making transit safer, healthier and more responsive amid the COVID-19 pandemic.*

CTO-Innovation of Excellence from NASA 2019

TIPS: Top Innovations of the Year 2019

2018 SANI Award in the Outstanding Food Safety Program Innovation Category

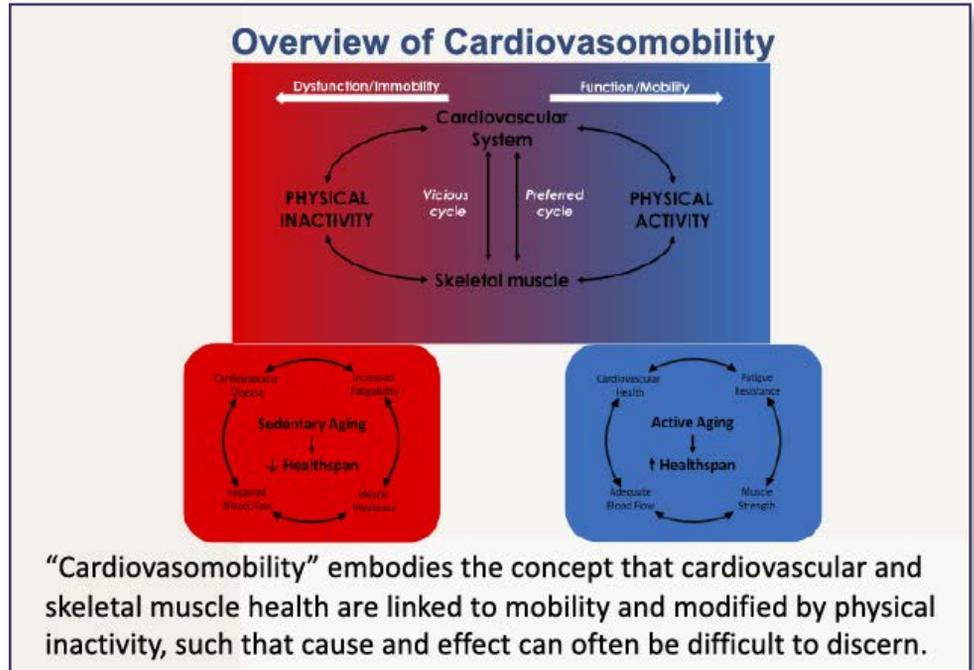


Visit viruskillertechnology.org to learn more and
purchase your CASPR today!



DISUSE IMPACTS CARDIOVASCULAR, SKELETAL MUSCLE HEALTH

Cardiovasomobility is a novel concept that encompasses the integration of cardiovascular and skeletal muscle function in health and disease with critical modification by physical activity, or lack thereof. Compelling evidence indicates that physical activity improves health while a sedentary, or inactive, lifestyle accelerates cardiovascular and skeletal muscle dysfunction and hastens disease progression. Identifying causative factors for vascular and skeletal muscle dysfunction, especially in humans, has proven difficult due to the limitations associated with cross-sectional investigations. Therefore, experimental models of physical inactivity and disuse, which mimic hospitalization, injury, and illness, provide important insight into the mechanisms and consequences of vascular and skeletal muscle dysfunction. This review provides an overview of the experimental models of disuse and inactivity and focuses on the integrated responses of the vasculature and skeletal muscle in response to disuse/inactivity. The time course and magnitude of dysfunction evoked by various models of disuse/inactivity are discussed in de-



tail, and evidence in support of the critical roles of mitochondrial function and oxidative stress are presented. Lastly, strategies aimed at preserving vascular and skeletal muscle dysfunction during disuse/inactivity are reviewed. Within the context of cardiovasomobility, experimental manipulation of physical activity provides valuable insight into the mechanisms responsible for vascular and skeletal muscle dysfunction that limit mobility, degrade quality of life, and hasten

the onset of disease. ^(ler)

Source: Trinity JD, Drummond MJ, Fermoye CC, McKenzie AI, Supiano MA, Richardson RS. Cardiovasomobility: an integrative understanding of how disuse impacts cardiovascular and skeletal muscle health. J Appl Physiol (1985). 2022;132(3):835-861. doi: 10.1152/jappphysiol.00607.2021. Reprinted with permission from the American Physiological Society. All rights reserved.

SELF-ADHESIVE TAPE = SHORT-LEG CAST FOR 5TH MET FRACTURE

Patients who used self-adhesive taping (SAT) as treatment for tuberosity fractures of the proximal 5th metatarsal fared just as well as patients who were placed in short-leg casts (SLC) for the same condition, in a recent study from Turkey. Functional outcome was assessed at the time of injury and at 2, 4, 6, and 12 weeks. While the SAT group had significantly higher Visual-Analogue-Scale Foot and Ankle (VAS-FA) scores at weeks 2 and 4, overall, there was no difference between the groups' VAS-FA scores at the time of injury, and at 6 and 12 weeks. Furthermore, there was no difference between the groups in the American Orthopedic Foot and Ankle Scores at 12 weeks. Bone union was achieved within 12 weeks for all patients. The authors concluded that



istockphoto.com #1284857539

Continued on page 16

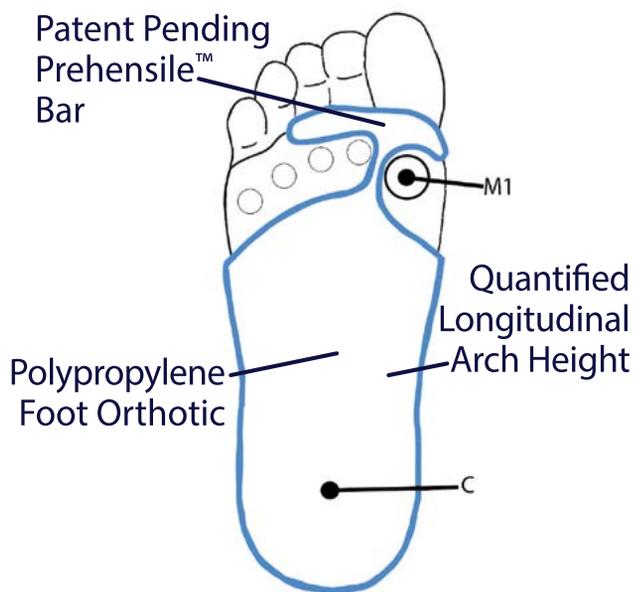
OrthoticME®

introduces

Biometric Arch Height & Prehensile™ Bar



YOU CONTROL THE DEGREE OF ARCH HEIGHT CORRECTION



- Your Scans + Our System = OrthoticME
- Met Head Relief
- We produce finished orthotics
- Give it a try! Email us at: 3D@InsightfulProducts.com



Continued from page 15

treatment with SAT had satisfactory functional results compared with traditional SLC. ^(ler)

Source: Batibay S, Bayram S, Duman S, Karaytug K, Camur S. Comparison of Self-adhesive Taping and Short-Leg Casting to Treat Tuberosity Fractures of the Proximal Fifth Metatarsal: A Prospective Study. J Amer Pod Med Assoc. 2022;112(1):20-068.

ORTHOBIOLOGICS: DEFINITIONS, CHALLENGES, BARRIERS, & STRATEGIES

Currently defined as “biological substances found naturally in the body that help injuries heal more quickly,” orthobiologics come in many flavors (see Table). With post-traumatic osteoarthritis and tendinitis dominating the orthopedic care space, use of orthobiologics is getting a lot of attention, but raising a lot of questions as well. To address those questions, the C. Wayne McIlwraith Translational Medicine Institute at Colorado State University recently convened an expert panel. Their meeting is summarized in a new report published in the *Journal of Cartilage & Joint Preservation*. ^(ler)

Table. Orthobiologic products

Source	Product
Blood derived	<ul style="list-style-type: none"> • Platelet rich plasma (PRP) • Autologous conditioned serum (ACS)
Bone Marrow derived	<ul style="list-style-type: none"> • Bone marrow aspirate concentrate (BMAC) • Bone marrow derived pluripotent mesenchymal cells
Fat derived	<ul style="list-style-type: none"> • Stromal Vascular Fraction (SVF) • Microfragmented Adipose Tissue (MFAT) • Adipose derived pluripotent mesenchymal cells
Umbilical cord derived	<ul style="list-style-type: none"> • Umbilical cord pluripotent mesenchymal cells
Amnion/placenta derived	<ul style="list-style-type: none"> • Cryopreserved amniotic fluid • Amnion membrane • Wharton's jelly
Exosomes	<ul style="list-style-type: none"> • Exosomal products

Source: Lattermann C, et al. Orthobiologics in orthopaedic applications: a report from the TMI Havemeyer Meeting in Orthobiologics. Journal of Cartilage & Joint Preservation. Published May 3, 2022. <https://doi.org/10.1016/j.jcjp.2022.100055>.

STEM CELL STRATEGY FOR REPAIRING JOINT DAMAGE SHOWS PROMISE IN PIG MODEL

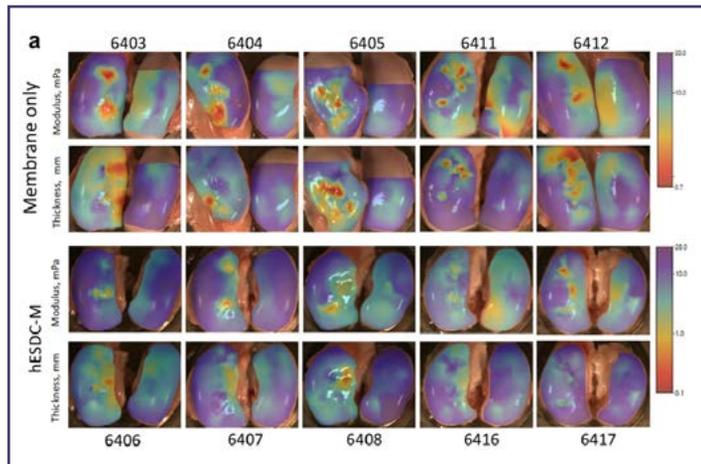


Figure. hESDC-M elicit biomechanically superior articular cartilage repair long term in porcine knees at 6 months. **a)** Heat maps depicting scanning indentation and thickness of femoral condyles generated using Mach-1 bioindenter; scale bars for instantaneous modulus (top rows) and thickness (bottom rows) are shown on the right. hESDC-M = human embryonic stem cell-membrane -bound; Membrane only = control.

A method to turn human stem cells into cartilage cells shows promise for repairing damaged joint tissue in a pig model of knee cartilage injury. The findings, funded in part by the National Institute on Aging and published in *Regenerative Medicine*, provide a potential new therapeutic strategy that may help repair damaged cartilage and prevent osteoarthritis.

In a new study, an international team of researchers refined a stem cell-based procedure that produces longer-lasting, higher-quality cartilage. The approach may also be easier to use in the clinic. To first test their theory, the researchers modified stem cells and implanted them into experimentally damaged knees in miniature pigs, which led to integration of the implanted stem cells and repair of the damaged cartilage. After 6 months, the repaired tissue had all of the physical and molecular characteristics of undamaged cartilage (figure). The tissue even got thicker and more compressible—qualities that help cartilage to cushion the joints. The study also found that the injected cells caused the pig’s own body to start making cartilage cells to further help in damage repair. The team also developed a liquid in which the injectable cells can be frozen and later revived, meaning the therapeutic cells could be transported to clinics and stored for an extended period.

While these cells did not cause an immune response in the pigs, more studies are needed to understand what might happen in humans and determine any potential adverse effects. 

Source: Petrigliano FA, et al. Long-term repair of porcine articular cartilage using cryopreservable, clinically compatible human embryonic stem cell-derived chondrocytes. *NPJ Regenerative Medicine*. 2021;77(6). doi:10.1038/s41536-021-00187-3. Use is per CC BY.

Continued on page 19

THE DIRECTION FOR SUCCESS!



A MEMBERSHIP WITH THE PEDORTHIC FOOTCARE ASSOCIATION PUTS YOU OUT AHEAD!

NEW members - benefits include:

- ▶ 1 FREE LMS product upon joining
- ▶ PFA Job Board
- ▶ Discounts on PFA store purchases
- ▶ Subscription to *Current Pedorthics*

CURRENT members – new benefits:

- ▶ 1 FREE LMS product upon renewal
- ▶ PFA Job board
- ▶ “Member helps Member”, refer a colleague and if they join receive 20% off your future renewal
- ▶ Exclusive member networking site

“PFA...THE ONLY PEDORTHIC MEMBERSHIP YOU NEED TO RUN YOUR PRACTICE EFFECTIVELY.”



PEDORTHIC FOOTCARE ASSOCIATION
www.pedorthics.org
 phone:(229) 389-3440
 email: info@pedorthics.org

Put Some Spring in Their Step

Posterior Spring AFO Stores & Releases Energy with Every Step

A Dynamic AFO with Progressive Flexibility from Heel to Toe



Ultra Light Carbon Fiber Construction

Made from Prepreg Carbon Fiber

Custom Foot Bed with Foam Padding

Or Custom Proflex® SMO
for Enhanced Ankle Control

Easily Fits in Shoe



Dynamic Energy Return

Adjustable Anterior Shell

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

Open Heel Design

Provides soft initial floor contact
preventing sudden knee flexion



Suggested L- Codes: L1945, L2755, L2820



Custom Composite Manufacturing, Inc.
www.cc-mfg.com | 866-273-2230

ACUPUNCTURE APPEARS TO REDUCE FRACTURE RISK IN OA



Osteoarthritis (OA), the most common form of arthritis, is commonly known as wear-and-tear arthritis. It is a growing epidemic as the world's population ages. In Taiwan, nearly 40% of Taiwanese individuals over age 50 have OA of the knee; that number rises to 55% in women over age 80. OA is a known risk factor for falls in older adults, making OA management a public health goal. Researchers in Taiwan wanted to better understand the association between acupuncture therapy, which has been around for centuries, and the risk of fracture in Taiwanese patients with OA.

Using a 1:1 propensity score-matched cohort design, the multi-site team used the Taiwanese National Health Insurance Research Database (which covers about 97% of the population) to identify >3,400 patients between 1997 and 2010 with newly diagnosed OA. The 2 groups (1,708 individuals each) were equally matched in baseline characteristics for age, sex, comorbidities, drugs used, and surgical episodes. More than half the study population had hypertension, 40% had hyperlipidemia, 23% had diabetes, and 17% had depression. Alcoholism, tobacco dependence, and obesity were similar among both cohorts. In the final analysis, 292 patients in the acupuncture cohort and 431 in the no-acupuncture cohort developed fractures. Fracture incidence increased with age rising from 2.11 in those age 40 to 60 years, to 3.91 in those over age 65. Patients with depression had higher risk of fractures while the acupuncture cohort overall had a lower cumulative incidence of fracture (log-rank test, $P < 0.001$).

In the acupuncture group, 87% underwent manual acupuncture, 2% electroacupuncture, and 11% used a combination of the 2 forms. The authors note the evidence for use of acupuncture as a fracture preventive is growing. In particular, they cite studies that found acupuncture increases bone mineral density and may stimulate and/or regulate pro-inflammatory and anti-inflammatory cytokines, which has the potential to improve osteoporosis and therefore fractures.

The authors concluded that acupuncture treatment relieves joint

pain and improves muscle power, which benefits musculoskeletal disorders as well as degenerative disease and may help stroke patients preserve limb function and attain better quality of life. The results of this study, they write, shows the association between using acupuncture and the reduced incidence of fracture in an aging population. ^(ler)

Source: Huang CY, Wu MY, Huang MC, et al. The association between acupuncture therapies and reduced fracture risk in patients with osteoarthritis: a nationwide retrospective matched cohort study. *J Integr Complement Med.* 2022;28(5):418-426. doi: 10.1089/jicm.2021.0287.

MUSCLE MASS & COVID OUTCOMES EXAMINED IN 2 STUDIES



Recent publications from 2 locations in Germany used different techniques to look at muscle mass and outcomes in SARS-CoV-2 patients during the height of the pandemic. Both found associations between loss of muscle mass and mortality. Both were published in the *Journal of Cachexia, Sarcopenia and Muscle*.

In the first study, Kremer et al¹ assessed muscle quantity by sonographic muscle indices as possible predictors of COVID-19 outcome. This team first examined a cohort of patients without COVID-19 to obtain median reference values for low muscle quantity by gender—using the psoas muscle area index (PMAI) as well as the thigh muscle thickness index (TMTI). Then the group looked at 2 cohorts of patients—Cohort I from the initial round of the pandemic, and Cohort II from the second wave.

The PMAI showed the most favorable characteristics to predict COVID-19 disease outcome, when compared to other muscle indices. Using sonographic morphometry in the cohort without COVID-19, gender-specific medians for PMAI (male: 291.1 mm²/m², female 260.6 mm²/m²) were identified as threshold values of low muscle quantity. Among the COVID-19 patients, 22.4% of Cohort I (13/58) and 34.5% of Cohort II (20/55) developed a critical course of disease. The mortality

Continued on page 20

rate reached 12.1% in Cohort I (7/58) and 20% in Cohort II (11/55) within 30 days of follow-up. COVID-19 patients with a PMAI below the gender-specific median showed a higher 30-day mortality in both COVID-19 cohorts (log rank, $P < 0.05$). The optimal PMAI cutoff value ($206 \text{ mm}^2/\text{m}^2$) predicted 30-day mortality of hospitalized COVID-19 patients with a sensitivity of 72% and specificity of 78.5% (receiver operating characteristic-area under the curve: 0.793, 95% confidence interval 0.671–0.914, $P = 0.008$). Multivariable log-regression analysis of PMAI, age, gender, body mass index, and comorbidities confirmed an independent association of low PMAI with 30-day mortality of COVID-19 patients ($P = 0.018$).

The authors concluded that sonographic morphometry can provide reliable muscle quantification under hygienic precautions and allows risk stratification of patients with COVID-19.

In the second publication—a systematic review and meta-analysis, Meyer et al² found significant effect for low skeletal muscle mass (LSMM) and visceral fat areas (VAT) on mortality and unfavorable outcomes in COVID-19 patients, using both univariate as well as multivariate analyses. Their review examined 6 studies to understand the association between LSMM and VATs and in-hospital mortality in COVID-19 patients using computed tomography (CT). The studies in the review included 1,059 patients (591 men, 55%) with a mean age of 60.1 years (range, 48–66).

The pooled prevalence of LSMM was 33.6%. The pooled odds ratio for the effect of LSMM on in-hospital mortality in univariate analysis was

5.84 [95% confidence interval (CI), 1.07–31.83]. It was 2.73 (95% CI, 0.54–13.70) in multivariate analysis. The pooled odds ratio of high visceral fat area on unfavorable outcome in univariate analysis was 2.65 (95% CI, 1.57–4.47).

These authors concluded that CT-defined LSMM and high VATs have a relevant effect on unfavorable outcomes and in-hospital mortality for COVID-19 patients and call for the inclusion of these measures as prognostic biomarkers in the clinical routine for these patients. They also note that body composition is an emergent field of research not just related to COVID-19. Given that all patients in critical care are at risk of muscle wasting, as are the elderly with primary sarcopenia, the authors argue that the ease of calculating LSMM and VAT from existing CT images calls for further research into these parameters. 

1. Kremer WM, Labenz C, Kuchen R, et al. Sonographic assessment of low muscle quantity identifies mortality risk during COVID-19: a prospective single-centre study. *Journal of Cachexia, Sarcopenia and Muscle*. 2022;13:169–179. <https://doi.org/10.1002/jcsm.12862>
2. Meyer H-J, Wienke A, Surov A. Computed tomography-defined body composition as prognostic markers for unfavourable outcomes and in-hospital mortality in coronavirus disease 2019. *Journal of Cachexia, Sarcopenia and Muscle*. 2022;13:159-168. <https://doi.org/10.1002/jcsm.12868>

RESOURCES TO HELP INFORM DIFFICULT DECISIONS ABOUT PARTIAL FOOT AMPUTATION



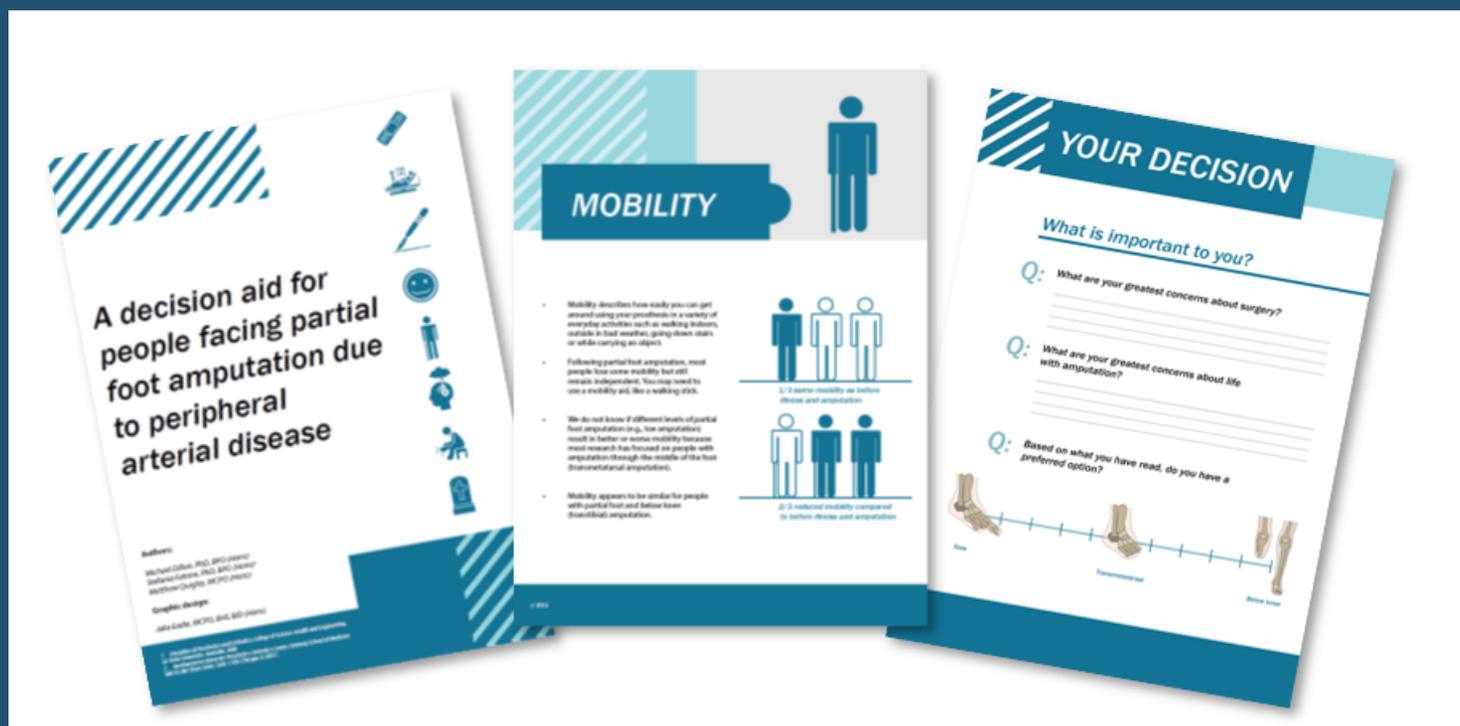
25%

In first 12 months, one quarter of all partial foot amputations are revised. Dillon et al. 2017

Amputation Decision Aids for patients with Amputation Discussion Guides for medical professionals are available for free

AMPUTATIONDECISIONAID.COM

RESOURCES TO HELP YOU HELP PATIENTS FACING DIFFICULT DECISIONS ABOUT PARTIAL FOOT AMPUTATION



- **Amputation Decision Aid**—written for people facing partial foot amputation due to peripheral arterial disease. Includes unbiased information about different options, likely outcomes, and risks of complications. Information is presented in simple terms to facilitate understanding.
- **Amputation Discussion Guide**—companion resource for healthcare professionals that includes up-to-date research evidence and example conversation starters to facilitate meaningful conversations tailored to the needs of each individual patient.
- **Training Videos**—series of 5 short, animated videos to help healthcare providers learn more about shared decision-making and how to use Amputation Decision Aid resources.

AVAILABLE FOR FREE AT AMPUTATIONDECISIONAID.COM

“Excellent as always! As prescribed, as designed, as promised. A real time saver for my clinical hours.”

– Joshua U., CPO

Discover the DAFO[®] Experience

We offer a wide variety of bracing solutions with dynamic, flexible support for your patients' unique needs.



Fast Fit[®] Chipmunk[®]



JumpStart[®] Leap Frog[®]



DAFO 3.5



DAFO 2



DAFO FlexiSport



DAFO Turbo

cascadedrafo.com



Helping kids lead healthier, happier lives[®]

1360 Sunset Avenue, Ferndale, WA 98248 | ph: 800.848.7332 | fax: 855.543.0092 | intl: +1 360 543 9306

CASCADE[®]
dafo[®]

Increasing Consensus on Terminology of Achilles Tendon–Related Disorders

BY KIM T. M. OPDAM, RUBEN ZWIERS, JOHANNES I. WIEGERINCK, C. NIEK VAN DIJK, AND ANKLE PLATFORM STUDY COLLABORATIVE – SCIENCE OF VARIATION GROUP

It has been customary practice for medical terms to be named after a person—familiar eponymous terms serve as shorthand during communication with colleagues. Specifically, as it relates to tendon–related disorders, several of these disorders can be distinguished and for each pathology different definitions and terms or eponyms arose over time. For example, the indistinct Haglund eponyms are still frequently used in Achilles tendon–related terminology. Moreover, the terminology for Achilles tendon–related disorders is inconsistent and confusing. Initially terms were used such as “cellulite peritendineuse,” “tendinitis Achillae traumatica,” “paratendinitis,” “tenosynovitis,” and “peritendinitis.” The term “achillodynia” was introduced as a descriptive term for Achilles tendon–related pain. Subsequently terms were based on histological findings and a subdivision was made into insertional and non-insertional Achilles tendon problems.

Maffulli et al observed that terminology used for tendon conditions was misused and confusing. In their opinion, definitions such as tendinitis, tendinosis, and paratendonitis can only be diagnosed after biopsy; however, they were often used in clinical practice without histopathologic examination. Due to a lack of consistence in nomenclature, Maffulli et al advocated to use the term tendinopathy to describe clinical overuse conditions characterized by pain and swelling around the tendon and impaired performance. Depending on the affected tissue, the terms tendinopathy, paratendinopathy, or pantendinopathy were proposed.

In 2011, an addition was proposed to further purify the terminology used in Achilles tendon–related disorders to effectuate uniform and clear terminology. This terminology is based on anatomic location, symptoms, clinical findings, and histopathology and consists of the following 5 terms: mid-portion Achilles tendinopathy, insertional Achilles tendinopathy, Achilles paratendinopathy, retrocalcaneal bursitis, and superficial calcaneal bursitis (see Table).

Uniform terminology provides the ability to communicate with a universal language in

daily practice amongst clinicians and researchers. Toward this end, the Ankle Platform Study Group set out to survey and evaluate the current terminology and assess the latest proposals on terminology used for Achilles tendon–related disorders.

Methods & Results

All orthopedic surgeons experienced in the field of foot and ankle surgery who are members of the Ankle Platform Study Group—Science of Variation Collaborative were invited to participate in this survey by logging on to the website www.AnklePlatform.com* (see Note at end). Fully completed responses were received from 141 of the 283 (50%) orthopedic surgeons from around the world. They were requested to fill out a survey on terminology in 6 typical cases with Achilles tendon–related disorders (see Appendix I, page 25). Participants were asked to give their preferred diagnosis for each case presented. In 5 out of 6 cases with Achilles tendon-related disorders, the majority gave an answer according to latest proposals.

The second part of the study comprised a systematic literature search of Achilles ten-

Table 1 The latest proposed terminology by van Dijk et al.

Mid-portion Achilles tendinopathy	A clinical syndrome characterized by a combination of pain, swelling and impaired performance. It includes but is not limited to, the histopathological diagnosis of tendinosis
Insertional Achilles tendinopathy	This is located at the insertion of the Achilles tendon onto the calcaneus, bone spurs and calcifications in the tendon proper at the insertion site may exist
Achilles paratendinopathy	An acute or chronic inflammation and/or degeneration of the thin membrane around the Achilles tendon. There are clear distinctions between acute paratendinopathy and chronic paratendinopathy, both in symptoms as in histopathology
Retrocalcaneal bursitis	Is an inflammation of the bursa in the recess between the anterior inferior side of the Achilles tendon and the posterosuperior aspect of the calcaneus (retrocalcaneal recess)
Superficial calcaneal bursitis	Inflammation of the bursa located between a calcaneal prominence or the Achilles tendon and the skin

*van Dijk CN, van Sterkenburg MN, Wiegerinck JI, Karlsson J, Maffulli N. Terminology for Achilles tendon related disorders. *Knee Surg Sports Traumatol Arthrosc.* 2011;19:835–841.

This article has been excerpted from “Increasing consensus on terminology of achilles tendon-related disorders,” by the authors noted above, which was published online on May 15, 2021, in the journal *Knee Surgery, Sports Traumatology, Arthroscopy*. 2021;29:2528–2534. doi.org/10.1007/s00167-021-06566-z. Editing and summarization have occurred, including the renumbering of tables, and references have been removed for brevity. Use is per CC BY 4.0.

Continued on page 25



Diabetic & Therapeutic Wellness Footwear

We have developed an innovative footwear collection, which combines functional footwear designs for various types of pathologies with clinically tested materials. Our current collection uses COOLMAX® fabric lining with Carbon threads.

COOLMAX® polyester fibers are known for their high breathability due to their hollow fiber design and aeration channels, which helps to release moisture quickly and efficiently.

By combining COOLMAX® fibers with Carbon fibers we have created a one of a kind fabric with the ability to create a dry, and airy environment while maintaining freshness.

In a test for Staphylococcus aureus and Klebsiella pneumoniae, two bacteria that can proliferate under normal conditions of humidity and temperature caused by sweating our Coolmax-Carbon fabric has demonstrated bacteriostatic properties.

Preventing bacterial reproduction, reducing odors and the risk of allergies.

Unlike other fabrics, Coolmax-Carbon fabric does not receive any chemical treatments such as microencapsulation, or ion application. These treatments degrade over time resulting in the fabric losing its properties.

Our innovative footwear collection that combines functional designs and advanced Coolmax-Carbon fabric ensures the general comfort and safety of the wearers.

Franki T



Wallaby T



Marc T



Bacteriostatic

Prevents bacterial reproduction, reducing odors and the risk of allergies.



Free of harmful chemical agents

OEKO-Tex Standard 100 certified fabric according to REACH regulations.



Biocompatibility

Tested by the ISO EN10993 approved standard, guaranteeing perfect skin compatibility.



MEDICARE APPROVED



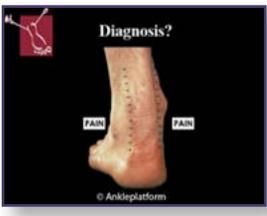
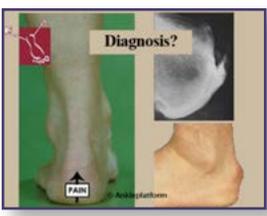
MADE IN SPAIN

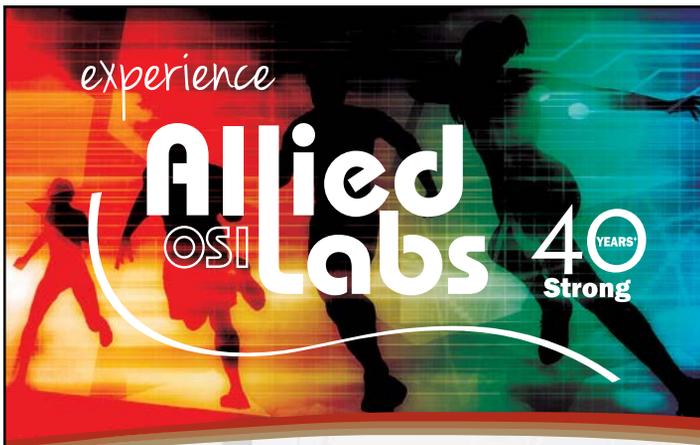
ISO 13485

BUREAU VERITAS
Certification



Appendix I. The 6 cases surgeons were asked to review.

CASE #	IMAGE AND DESCRIPTION	CASE PRESENTATION	DIAGNOSIS
Case 1	 <p>The photo on the left shows the location of the pain in a normal ankle. The photos on the right show the pathology.</p>	<ul style="list-style-type: none"> • 40-year-old male. • Pain over his right Achilles tendon, which impairs his activity. • Painful localized fusiform swelling of the Achilles tendon located 6 cm proximal to the insertion onto the calcaneus. • X-ray shows deviation of soft tissue contours. • Ultrasound showed a larger tendon than normal (in cross-sectional area and antero-posterior diameter). There were hypoechoic areas within the Achilles tendon and increased tendon vascularity (mainly in the ventral peritendinous area). 	Mid-portion Achilles tendinopathy
Case 2	 <p>The photo on the left shows the location of the pain in a normal ankle. The photos on the right show the pathology.</p>	<ul style="list-style-type: none"> • 30-year-old female. • Posterolateral heel pain on the right side (worsens with shoes with rigid posterior portion). • Visible, painful and solid swelling with discoloration of the skin located at the posterolateral calcaneus. • X-ray shows no abnormality. • Ultrasound showed fluid between the skin and the Achilles tendon. 	Superficial calcaneal bursitis
Case 3		<ul style="list-style-type: none"> • 32-year-old male. • Since 4 days edema and hyperemia around the midportion Achilles tendon on the left side. • Redness and swelling of the skin over the full length of the Achilles tendon. • On palpation there are crepitations. • X-ray shows no abnormalities. • Ultrasound showed a normal Achilles tendon with a circumferential hypoechoic halo. 	Acute Achilles paratendinopathy
Case 4	 <p>The photo on the left shows the location of the pain in a normal ankle. The photos on the right show the pathology.</p>	<ul style="list-style-type: none"> • 60-year-old male. • Stiffness and pain on the posterior aspect of the calcaneus on the left foot. • Painful Achilles tendon insertion at the mid-portion of the posterior aspect of the calcaneus with visible swelling • X-ray shows calcaneal bone spur at the insertion of the Achilles tendon. 	Insertional Achilles tendinopathy
Case 5	 <p>The photo on the left shows the location of the pain in a normal ankle. The photos on the right show the pathology.</p>	<ul style="list-style-type: none"> • 35-year-old female patient. • Painful swelling superior to the calcaneus of the left foot. • Painful soft tissue swelling, medial and lateral to the Achilles tendon at the level of the posterosuperior calcaneus. • X-ray shows bony prominence of the posterosuperior calcaneus. • Ultrasound showed fluid in the retrocalcaneal area (hyperechoic). 	Retrocalcaneal bursitis
Case 6		<ul style="list-style-type: none"> • 39-year-old male. • Since one year exercise-induced pain around the midportion Achilles tendon of the left foot. • Minimal swelling and some crepitations around the midportion Achilles tendon. • X-ray shows no abnormalities. • Ultrasound shows thickened hypoechoic paratenon and the echo-Doppler shows increased tendon vascularity (mainly in ventral peritendinous area). 	Chronic Achilles paratendinopathy



PREMIUM CUSTOM ORTHOTICS



OTC ORTHOTICS



THE RICHIE BRACE®

800.444.3632
www.alliedosilabs.com

Continued from page 25

don-related disorders in 8 foot and ankle journals in Medline, Embase (Classic) from 2000 to 2016: the *American Journal of Sports Medicine*, *British Journal of Sports Medicine*, *Knee Surgery Sports Traumatology Arthroscopy*, *Foot & Ankle International*, *Journal of Orthopedic Research*, *Acta Orthopædica*, *Journal of Foot and Ankle Research*, and *Journal of Foot and Ankle Surgery*.

All articles on Achilles tendon-related disorders, except Achilles tendon ruptures, published from 2000 until 2016 were included. Title and abstract were screened, and the used terminology was extracted. All extracted terms were counted and divided into “according to the latest proposals” and “not according to the latest proposals,” based on anatomic location, symptoms, clinical findings, and histopathology, which was published January. When multiple terms were used in 1 publication, for example mid-portion Achilles tendinopathy and insertional Achilles tendinitis, this was scored as “not according to the latest proposals.” All terms described in publication about terminology of Achilles tendon-related disorders in 2011 were used. Literature was reviewed for the terminology used in papers on Achilles tendon-related disorders and thereafter a systematic literature search was performed.

After the search, 244 articles were reviewed. The terms most used in literature from 2000 to 2016 are (chronic) Achilles tendinopathy, mid-portion Achilles tendinopathy, and (chronic) Achilles tendinosis. Also, eponyms were still frequently used. In 2000, 20% used terminology according to the latest proposals based on anatomic location, symptoms, clinical findings, and histopathology and in 2016, 93%. In 2000, 33% used terminology according to the latest proposals and in 2016, 100%. In 2000, 0% used terminology according to the latest proposals for insertional Achilles tendinopathy and retrocalcaneal bursitis and in 2016, 80%.

Discussion

The main findings of this study were that terminology for Achilles tendon-related disorders according to the latest proposals based on anatomic location, symptoms, clinical findings, and histopathology is being used by the majority of orthopedic surgeons in daily practice and is increasingly being used in the literature. However, the indistinct Haglund eponyms are still frequently used in Achilles tendon-related terminology.

The wide variety in terminology for Achilles tendon-related disorders is confusing. The term that represents the entity must be neutral yet descriptive, uniform, and clear. Therefore, descriptive terms are preferable to eponymous terms. Terminology that includes the combination of anatomic location, symptoms and clinical findings, and pathological changes for each entity has, therefore, been advocated.

Symptoms around the Achilles tendon often have a similar presentation and it is, therefore, important to define the pathology or the combination of pathologies. For example, lack of distinction between entities, such as insertional tendinopathy and chronic retrocalcaneal bursitis, is crucial to determine further treatment and it impedes the process for researchers to perform an all-encompassing systematic review.

In 5 out of 6 cases in the survey, the majority of orthopedic surgeons gave a diagnosis according to the terminology based on anatomic location, symptoms, clinical findings, and histopathology. The exception is the fifth case, where the majority choose Haglund's disease instead of retrocalcaneal bursitis. A possible reason for this is the ingrained use of the eponym Haglund. There are approximately 20,000 medical eponymous terms in use today and the literature shows that using eponymous terms is an inaccurate and unreliable method of communication. Somford et al questioned 244 orthopedic surgeons worldwide on common eponymous terms and reported a low agreement on use of eponymous terms (κ 0.11; proportion of agreement, 68%). Nevertheless, eponymous terms are often used in clinical setting and are passed on to the residents and students. Also, eponymous terms used in the published articles are often inconsistent and do not match their original definition.

Terminology in which Haglund eponyms such as Haglund's deformity, Haglund's syndrome, and Haglund's disease are all dissimilar entities that should be avoided, because there is a large variation in the presumed meaning of these eponymous terms. Haglund's syndrome was first defined as a common cause of posterior heel pain, characterized clinically by a painful soft tissue swelling at the level of the Achilles tendon insertion. Haglund's deformity was first described as a tender swelling in the region of the Achilles tendon with visible prominence of the posterolateral aspect of the calcaneus. Haglund's disease, however, refers to osteochondrosis of the accessory navicular bone.

In systematic reviews, many eponymous diagnoses have to be converted to anatomical diagnostic groupings and at all studies are excluded based on aberrant or uninterpretable definitions of an eponym or pathology, which can lead to different research results, which are often leading for the best scientific-based treatment in clinical practice.

Uniform terminology provides the ability to communicate with a universal language in daily practice amongst clinicians and researchers and will lead to the best available scientific-based treatment in clinical practice.

Conclusion

The revised terminology for Achilles tendon-related disorders is used by the majority of orthopedic surgeons and is increasingly used in the literature. However, the indistinct Haglund eponyms are still frequently used in Achilles tendon-related terminology. ^(ler)

**Note: The Ankle Platform (www.ankleplatform.com) was developed for orthopedic surgeons who have a special interest in the ankle and hindfoot. The aim is to share knowledge and techniques of the Amsterdam Foot & Ankle School and to improve skills on ankle and hindfoot pathology. The techniques are developed by Dutch Orthopedic surgeon Niek van Dijk, MD, and his team in the AMC Hospital in Amsterdam. Today Ankle Platform has members from 115 countries worldwide.*



**KINETIC
RESEARCH**

THE NEXT GENERATION
IN CARBON FIBER TECHNOLOGY

The Noodle AFO™ Family

Off-the-Shelf Build-to-Order Custom from Cast/Scan





The
Noodle

The
Noodle
TA

The
Noodle
Classic

**WITH
D.E.R.S.
Dynamic Energy Return Strut**

**Maximum Performance
with
Minimum Weight**

www.kineticresearch.com
800-919-3668

Made in the
USA 

“Why are certain of my colleagues always on the news, quoted in articles, or constantly in the media?”



If you're like most, you probably wonder how some of your colleagues achieve so much notoriety. Why are they considered “experts” and you're not? The difference is the amount of publicity they create. The good news is: You can build your own media presence and we'll show you how.

Think about the patient. How does the patient know who is an expert and who is not? The only thing the patient sees is who is on the news and who is quoted in the newspaper or who comes up first on Google or Twitter. Patients often assume the more publicity a provider receives, the better provider they are. But we know there are plenty of excellent providers who never get quoted in the press. The patient doesn't realize that you may be as good as—if not better—than the providers they see in the media. Is it time for you to get noticed?

We know what you're thinking: ***I don't know how to do that.*** True: Most healthcare professionals are more focused on their work and less focused on their marketing and public relations efforts.

Let's look at how we can help you create the visibility and exposure that you need to help grow your practice. For 10 years, you have placed your trust and loyalty in LER. Now it's time to let us help you develop a complete branding and market differentiation plan for patient retention, patient satisfaction, and greater patient referrals. Let our team of marketing, public relations, and branding experts take your practice to the next level.

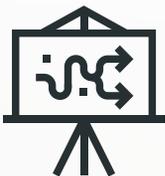
We are offering a complimentary practice-building strategy session to the first 10 applicants who log on to the address below by August 31, 2022. Let us help you take your practice to the next level.

Visit www.lermagazine.com/expert to schedule your strategy session.

SIGN UP FOR YOUR FREE PRACTICE-BUILDING STRATEGY SESSION TODAY



We will evaluate your marketing and public relations efforts and identify what is holding back your practice. We will determine where patient referrals are being lost and what is limiting your visibility in the media.



We will share multiple strategies on how to increase your presence in the media so you can retain existing patients longer, generate more patient referrals, and grow your practice to new levels.



As a bonus, we will create and provide you with samples of your own custom-branded PDF magazine for distribution to your patients.

lerEXPERT

BY WINDY COLE, DPM, CWSP

A crucial component of wound management is regular debridement. The goal of debridement is the removal of all necrotic, fibrous, and devitalized tissue from the wound bed. Devitalized tissue in wounds produces a physical barrier to formation of new tissue and therefore decreases healing rates. If devitalized tissue remains in the wound bed, bacterial colonization is more likely. Standard of care remains that unhealthy tissue be sharply debrided to bleeding tissue to 1) allow for visualization of the extent of the ulcer, 2) to detect underlying exposed structures, deep bacterial contamination, or abscesses, and

3) to assess the quality of the peri-wound tissue. Frequent and thorough debridement reduces bacterial bioburden. In some cases, although the debridement adequately removes devitalized tissue, the remaining wound bacteria may become problematic.

Bioburden is an all-encompassing term that includes necrotic material, non-viable tissue, wound exudate, as well as bacteria and other microbes (eg, fungi). Bioburden tends to continually accumulate in chronic wounds because of the underlying pathogenic abnormality caused by systemic conditions such as diabetes or venous disease. The inability to fully resolve

these fundamental physiologic issues makes chronic wound bed management with aggressive and complete debridement even more crucial.

Biofilm management however is a more complicated problem. Biofilm is an assemblage of surface-associated microbes enclosed in a self-produced matrix. Identifying and managing biofilm have recently become two of the most important aspects of wound care. The US Centers for Disease Control and Prevention and the National Institutes of Health have estimated that 65% – 80% of infections are caused from biofilms. Generally, it is believed that biofilms develop in stages (Figure). The initial stage is

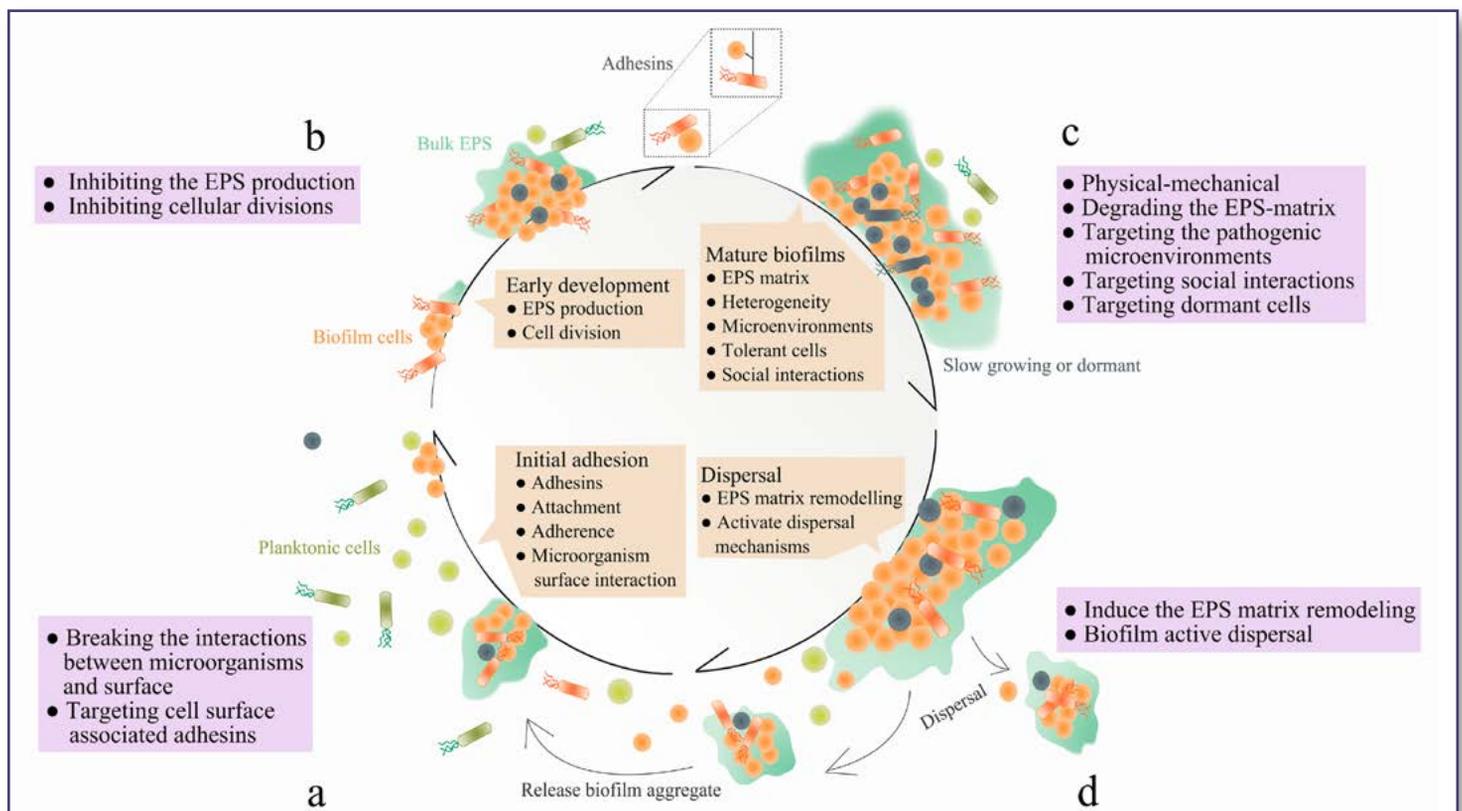


Figure. Four stages of biofilm formation: a) “initial adhesion”—microorganisms bind to host or medical device surfaces through cell surface associated adhesins; b) “early biofilm formation”—cells begin to divide and produce extracellular polymeric substance (EPS) to enhance adhesion, while forming matrix that embeds the cells; c) “biofilm maturation”—EPS matrix develops 3-D structures which is multi-functional and protective, allowing heterogeneous chemical and physical microenvironments to be formed where microorganisms co-exist within polymicrobial and social interactions; d) “dispersal”—cells leave the biofilm, returning to the planktonic phase. Therapeutic interventions can be targeted at each stage of biofilm development. a) For example, the initial phase of biofilm formation can be disrupted by breaking the interactions between microorganisms and surface, through targeting cell-surface associated adhesins. b) The early stages of biofilm development can be disrupted by inhibiting the EPS production and cellular divisions. c) Mature biofilms can be removed by physical-mechanical approaches, degrading the EPS-matrix, targeting the pathogenic microenvironments and social interactions within polymicrobial biofilms, as well as eliminating dormant cells. d) Induce the EPS matrix remodeling or biofilm active dispersal events. From: Jiang Y, Geng M, Bai L. Targeting biofilms therapy: current research strategies and development hurdles. *Microorganisms*. 2020;8(8):1222. Use is per CC BY.

Continued on page 31

FOR ADULTS & CHILDREN GUARANTEED FOOT DROP SOLUTIONS

DORSI-LITE™ FOOT SPLINT

DORSI-STRAP™ FOR FOOT DROP

**USE WITH
OR WITHOUT
SHOES**



**FOR USE
WITH
SHOES**



Also available,
Dorsi-Strap PRO Heavy-Duty, \$45

- Outstanding comfort.
- Easy On & Off
- Ultra-low profile
- Near-Normal Gait
- Will not slip off
- Also use in bath or swimming pool
- \$60/EA. + \$7 Shipping/Order
- Optional EXPRESS shipping: \$30
- Low cost replacement parts available

- No Special Shoes Needed
- Nothing put into the shoe
- Outstanding comfort
- Ultra-low profile, 3OZ
- Near-Normal Gait
- Easy On & Off
- In White, Black, or Brown
- \$42/EA. + \$7 Shipping/Order
- Optional EXPRESS shipping: \$30
- Low cost replacement parts available

30 DAY MONEY-BACK WARRANTY

X-STRAP® SYSTEMS
9 Stonegate Drive
Hyde Park, NY 12538

www.x-strap.com
(845) 233-4713

11/20

SPECIAL 15% OFF/ORDER: CODE MDAZ, AT CHECKOUT

composed of small communities of bacteria that begin to attach to the wound surface. These polymicrobial colonies are commonly composed of bacteria, fungi, and other microorganisms. Biofilm is most susceptible to debridement and topical therapies at this stage. Unlike planktonic bacteria, biofilm bacteria form attachments with one another. At this juncture, the community has formed more permanent attachments to the wound surface, creating a more cohesive symbiotic community. They then can share information and gene-expression through a cell-cell communication mechanism called quorum sensing. Finally, biofilm colonies will begin to secrete a protective glycocalyx that also adheres to the wound surface. This entire process typically occurs in 2 to 4 days, unless disrupted. This extra polymeric substance is difficult to penetrate with systemically administered antibiotics and topical therapies.

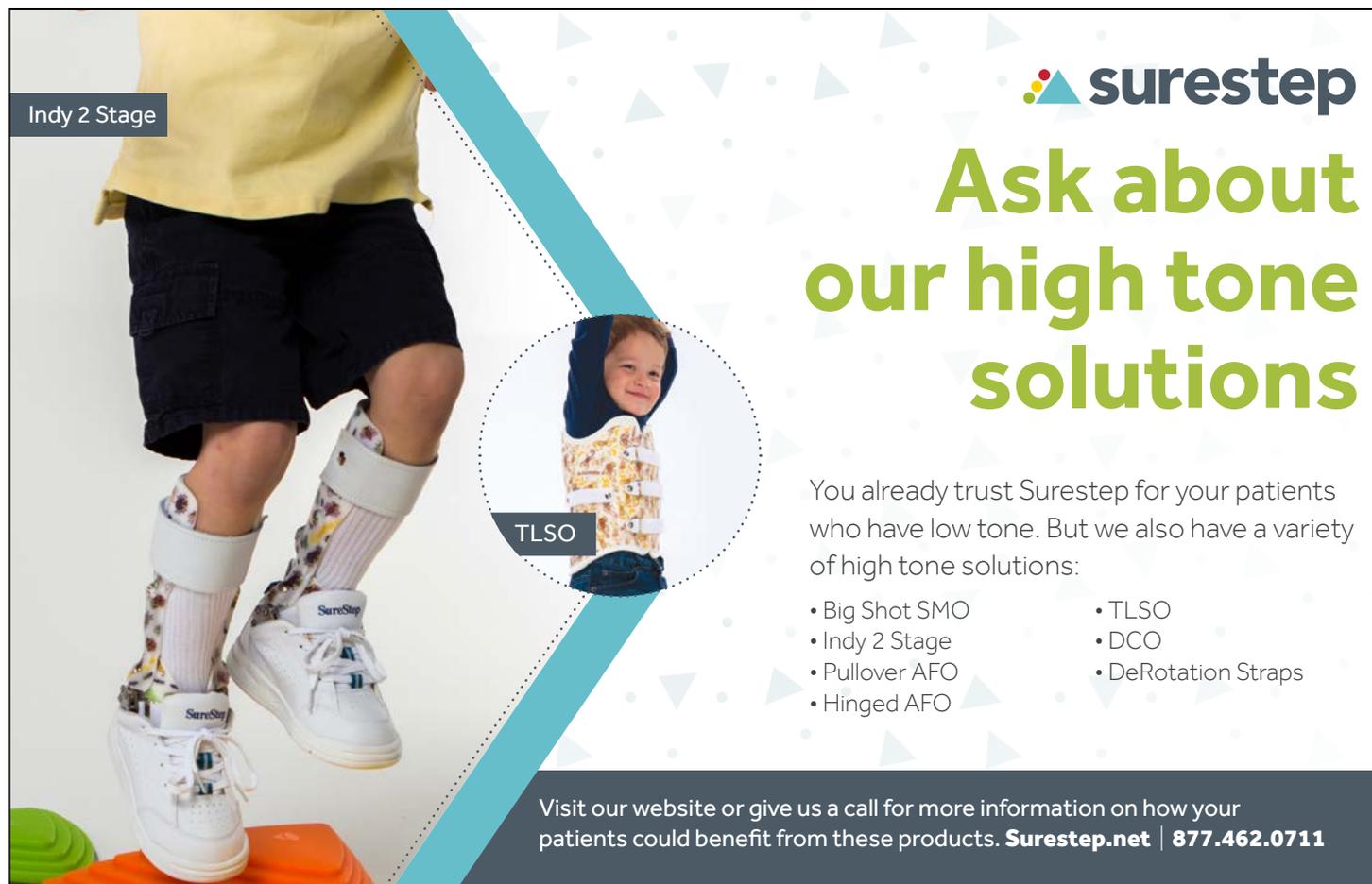
Mature biofilms house mostly senescent bacteria that function at a lower energy state than active planktonic bacteria. As biofilms

continue to evolve, they continue to change their phenotype and they share their resistance to antibiotics with the community. These factors make effective biofilm elimination a complicated matter. Even with thorough debridement biofilms may persist. These bacterial colonies have a significant impact on wound healing by causing prolonged inflammatory responses in the patient as well as contributing to acute bacterial infections.

Wound care clinicians must understand the best practices in biofilm management to be successful. Debridement is still thought to be the most effective way to remove biofilm. Even after an aggressive debridement biofilm can reform in as little as 24 hours. It is unlikely that complete removal of biofilm can be achieved with debridement alone. Debridement only temporarily eliminates biofilms. Employing adjunctive therapies in addition to regular debridement is often necessary. Research has shown that the best window of opportunity for biofilm prevention exists directly following debridement up to

24 hours. Biofilm is at its most susceptible and data illustrates that topical therapies are most effective during this period. Optimizing the effects of regular debridement utilizing a multi-tiered treatment approach is the most promising way to win the biofilm struggle. 

Windy Cole, DPM, CWSP, is an adjunct professor and Director of Wound Care Research at Kent State University College of Podiatric Medicine. Dr Cole also serves as the National Director of Professional Development and Clinical Education for Woundtech. She is board certified by the American Board of Foot and Ankle Surgery and the American Board of Wound Management. She is a wound care advocate on the forefront of wound research and was the 2020 World Union of Wound Healing Silver Medal Award recipient for her work in Technology-driven Research. And she is a member of the LER Editorial Advisory Board.



Indy 2 Stage

TLSO

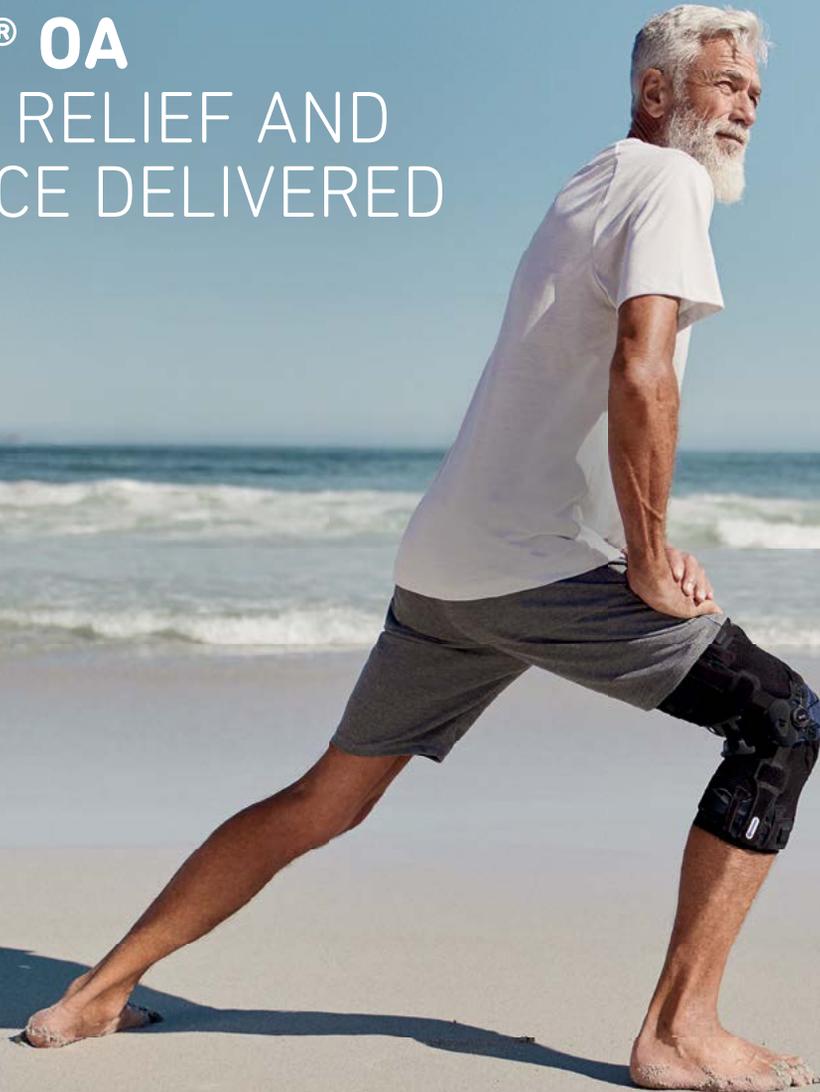
 **surestep**

Ask about our high tone solutions

You already trust Surestep for your patients who have low tone. But we also have a variety of high tone solutions:

- Big Shot SMO
- Indy 2 Stage
- Pullover AFO
- Hinged AFO
- TLSO
- DCO
- DeRotation Straps

Visit our website or give us a call for more information on how your patients could benefit from these products. Surestep.net | 877.462.0711


GenuTrain® OA
TARGETED RELIEF AND
COMPLIANCE DELIVERED
**GenuTrain® OA**

- + INNOVATIVE UNLOADING SYSTEM**
PROVIDES TARGETED PAIN RELIEF
- + EASY ADJUSTABLE RELIEF**
WITH BOA® FIT-SYSTEM
- + ALL-DAY WEARING COMFORT**
LIGHTWEIGHT, LOW-PROFILE DESIGN

For more information

Please contact info@bauerfeindusa.com
or call (800) 423-3405

Adaptations in the Lower Extremity During Pregnancy

Ask any woman who's been through it, and they'll easily confirm: Pregnancy is a life-changing event with numerous hormonal, physiological, morphological, functional, and biomechanical adaptations. Here we summarize and excerpt a round-up of recent research findings that show the impact of pregnancy on tendons in the lower extremity, on foot loading and plantar pressures in gait, and on morphological and postural changes in the foot, as well as the benefits of compression stockings during this unique period.



Istockphoto.com #1146101557

Changing Tendons

As the need for physical activity, or at least non-sedentary behavior becomes more evidence-based for the general population, many clinicians find that encouraging pregnant women to be more active can be met with resistance as the specific evidence base is scant at best for this group. The ongoing weight gain of a healthy pregnancy leads to a constant change in one's center of mass which requires a compensation in motor response—often altering foot and ankle biomechanics, making many women feel unstable and therefore unwilling to take what they perceive as any unnecessary risk. But times are changing and with the advent of published guidelines encouraging women to be physically active throughout their pregnancy, many of today's women of child-bearing age are taking up—and maintaining during pregnancy—not only strength training but vigorous-intensity activities.¹ While this trend is to be commended, the potential for increased musculoskeletal injury cannot be ignored.

While most would agree that physical activity can be healthy for the mother and fetus, it is also true that the many hormonal changes of

pregnancy can affect the musculoskeletal system in ways that are only beginning to be studied. Writing in a recent case study in the *Journal of Applied Physiology*, Waugh and Scott¹ note that such hormonal changes could increase the risk of soft tissue injury. They cite the known gender differences in injury rates for the anterior cruciate ligament (ACL), which have made it a target for research related to relaxin, estrogen, progesterone, and testosterone. In addition to pregnancy, these sex hormones are known to fluctuate during monthly menstrual cycles as well. For example, they note the elevated levels of estrogen (10- to 100-fold) during the preovulatory phase of the menstrual cycle are associated with reduced tissue stiffness and increased injury rates, such as increased ACL laxity causing knee displacement.

In their case study, they were able to collect connective tissue properties on load-bearing tendons from a single recreationally active individual during 2 successive pregnancies. Using a variety of techniques, they evaluated morphological, mechanical, and functional properties of the Achilles, ACL, and mid-patellar tendons, as well as gait kinematics and kinetics. Their findings show subtle changes in tendon organization and

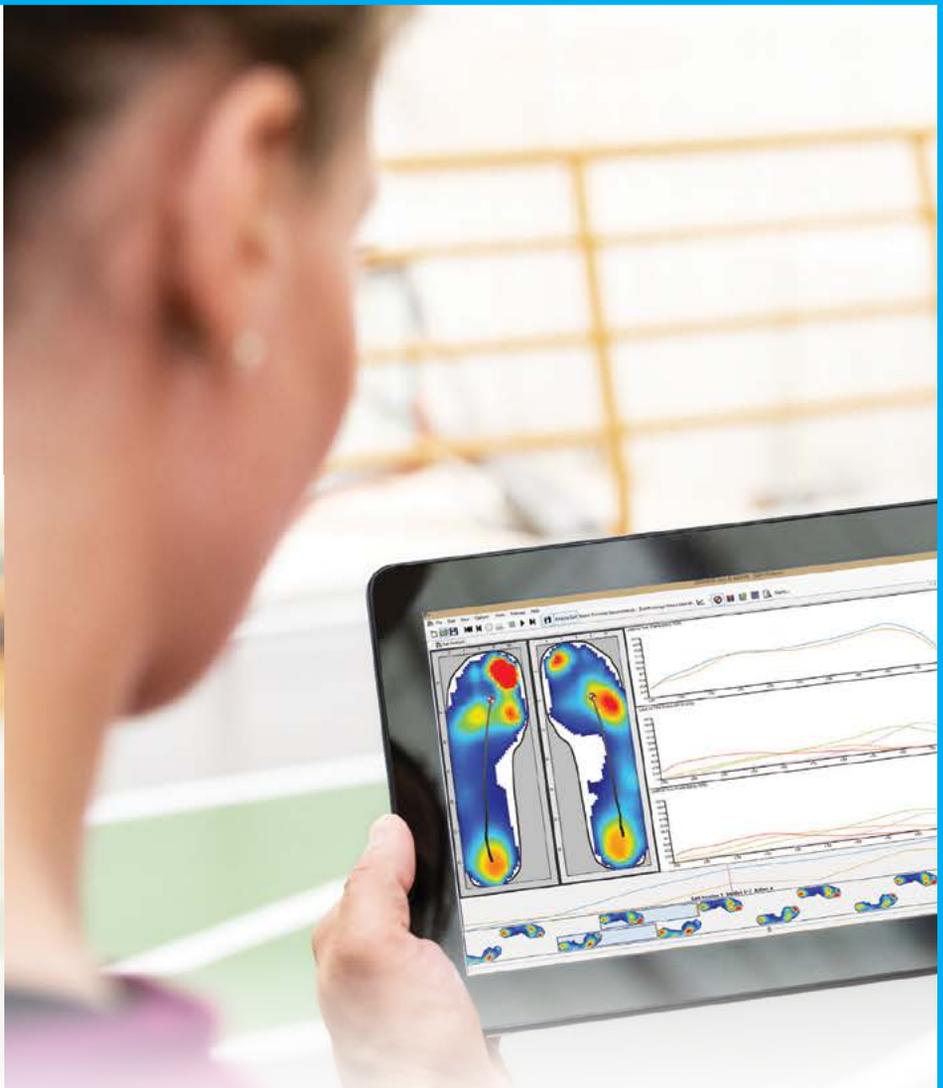
stiffness throughout the course of the pregnancy and into parturition. The authors conclude by calling for further study of musculoskeletal adaptations during pregnancy, particularly as they relate to both increasing physical activity and injury risk.

Biomechanics

Writing in the *Journal of Functional Morphology and Kinesiology*, Conder et al² highlight the numerous biomechanical and hormonal changes of pregnancy as they relate to spinal curvature, balance, and gait patterns as well as quality of life (QOL) changes such as back pain and the increased risk of falls. In their systematic review of 50 research papers, they found that angles of lordosis and kyphosis are significantly—though not consistently—increased in pregnancy. Back pain is significantly increased in pregnant women, although this is not significantly correlated with spinal changes. Increased movements of center of pressure (COP) and increased stability indexes indicate postural control is reduced in pregnancy.

Specifically related to static stability and

Continued on page 35



MAKE CONFIDENT DECISIONS WITH RELIABLE, HIGH-RESOLUTION LAB-QUALITY INSOLE PRESSURE DATA

For foot clinicians and physical therapists, XSENSOR®'s X4 Intelligent Insole System provides accurate foot function, gait analysis, and plantar pressure data for any patient evaluation scenario. With fast, compact, and discreet on-shoe wireless electronics paired with durable, thin, and flexible sensors, the X4 system offers assurance of quality data to better understand the impact of orthotic, surgical, or therapeutic interventions and pathology.

EASY TO USE

Fast set-up and user-friendly software means you can capture and review plantar data in under 10 minutes

UNPARALLELED IMAGERY

Highest quality, high-resolution dynamic pressure data and imagery

ADVANCED FUNCTIONALITY

Complete analysis for clinical and research testing with XSENSOR's Foot & Gait VU software

LAB-QUALITY DATA

High-speed sampling allows for collection of anatomically accurate in-shoe data from 230 sensing points per foot

WIRELESS & UNDETECTABLE

Ultra-thin sensors conform to the footbed and compact on-shoe electronics are virtually undetectable to the wearer

ROBUST SENSORS & ELECTRONICS

Easy-to-use sensors are ready out of the box and support trouble-free testing

CONTACT US TODAY TO LEARN MORE

www.xsensor.com | sales@xsensor.com

XSENSOR

Intelligent Dynamic Sensing



visual cues, the authors found that when women are asked to keep their eyes open, stability has been shown to improve and in conditions that require women to keep their eyes closed, path length of the COP is increased by pregnancy. It is reported that the condition of closing eyes affected both pregnant and non-pregnant women in the same way, and it is concluded that the destabilization is due to poor somatosensory processing rather than anatomical changes of pregnancy. This highlights the importance of visual cues for the maintenance of balance. Interestingly, in instances where the eyes are closed, sufficient balance has instead been maintained by spreading the feet apart. The idea here is that increasing the width of the stance increases the base of support and therefore is an attempt to improve stability and lateral balance.

Joint Kinematics: As for joint kinematics, some studies show that there are significant reductions in the peak hip flexion and peak hip extension in the sagittal plane during the second and third trimester of pregnancy compared to non-pregnant women. In the frontal plane, there is conflicting evidence whereby some studies report higher hip adduction in pregnant women during gait, whereas others report larger peak hip adduction angles in postpartum women. This may be due to comparing pregnant women to different sorts of controls, where some studies use non-pregnant women and others use postpartum measurements of the same women. Decreased thigh abduction is observed in the developing pregnancy and compared to non-pregnant women. In the transverse plane, peak external rotations (lateral and medial) of the hip are shown to be significantly higher in pregnant women, and these are at their highest in the third trimester. In an interesting study, Branco et al³ report that in terms of hip joint power, there are significant predictors in pregnant women. It was observed that thigh fat area is a significant predictor of hip joint power during the second trimester, while body weight is a significant predictor of hip joint power during pregnancy.

The knee joint shows increased maximum flexion sagittally in the developing pregnancy, while displaying significant reductions in maximum extension of the knee when compared to non-pregnant women.

Regarding the ankle, increased inversion and eversion are observed in both the developing pregnancy and when compared to controls in the frontal plane. This coincides with increased rotation of the foot during pregnancy, tending toward pronation. A significantly reduced plantar flexion is also observed during pregnancy. However, there are also studies that have found no significant changes to the ranges of motion in the ankle, knee, and hip, including no changes to ankle inversion/eversion and knee flexion/extension.

It is likely that these kinematic effects are connected in some way, especially since it is known that an increased pelvic tilt can reduce the flexion moment in the hip. The literature makes little reference to changes in the adduction of the knee joint. There is evidence suggesting that increased inversion and eversion in the ankle (observed in pregnancy) can result in reduced adduction of the knee. This should be explored further in relation to the effects of pregnancy

Body Mass: Body mass significantly increases with the developing pregnancy, while the trunk becomes longer and abdominal girth significantly increases. This increase in body mass is most significant in the third trimester. Increases can also be observed in the breadth of the thorax, girth of the gluteals, girth of the calves, and biceps and tricipital skinfolds during pregnancy. Furthermore, there is an increase of fat in the calves observed as well as a significant reduction in calf muscle. However, changes of this likeness are not observed in the thighs. In terms of the foot, pregnant women display a significantly reduced arch between the first and third trimesters, as well as a significant increase in the width of the foot. This results in an increased area of contact between the middle of the foot and the floor as well as the lateral heel. An increased pressure in the second metatarsal of the foot was also observed in the third trimester compared with both earlier pregnancy and postpartum. Findings also show that pregnant women have higher recorded Foot Posture Indices (FPI) in the third trimester. An increase in FPI describes the foot of a pregnant woman late in her pregnancy.

It is known that water retention is increased in pregnancy, particularly in the ankles, which is a likely explanation for the increase in foot

width and contact with the floor. Also, higher relaxin levels may play a role in relaxing the plantar fascia, the ligament on the sole of the foot that supports the arch. A weakened plantar fascia combined with increased weight from pregnancy pushing downward is a likely explanation for a reduced arch height, and thus an increase in foot contact with the floor. In terms of QOL, associations have been made between higher reported pain levels in women with flat feet in the general population.

Trunk range of motion, hip flexion, and extension are reduced, stride length and gait velocity are decreased, and step width increased; again, not consistently. It is likely that each woman adopts unique techniques to minimize the effects, for example increasing step width to improve balance. Further research should focus on how altered limb kinematics during gait might affect QOL by influencing the human body, as well as assessing parameters in all planes to develop a wider understanding of pregnant biomechanical alterations.

Plantar Pressures, Flattening Arches

In a recent study out of Poland that was published in *PLoS One*, Maslon et al⁴ sought to understand how pregnancy affects foot loading patterns in gait and if it is related to the body's adjustments to the growing fetus over the course of the pregnancy. They looked at 30 women in 3 sessions, 1 in each trimester of pregnancy (P1, P2, P3). They took anthropometric measures of body mass and waist circumference, and the women did walking trials at a self-selected speed along a ~6m walkway, with vertical pressures recorded via a force plate in the middle of the walkway.

In what appears to be the first longitudinal study in which the relation between abdominal size and plantar pressure distribution pattern was analyzed, their findings show that the correlation of individual foot loading parameters across different trimesters was relatively high, more noticeably for dynamic longitudinal arch index (DAI) and foot angle ($r \sim 0.9$) and less for the medial lateral index, and forefoot-rearfoot index measurements ($r \sim 0.5-0.8$). Nevertheless, there

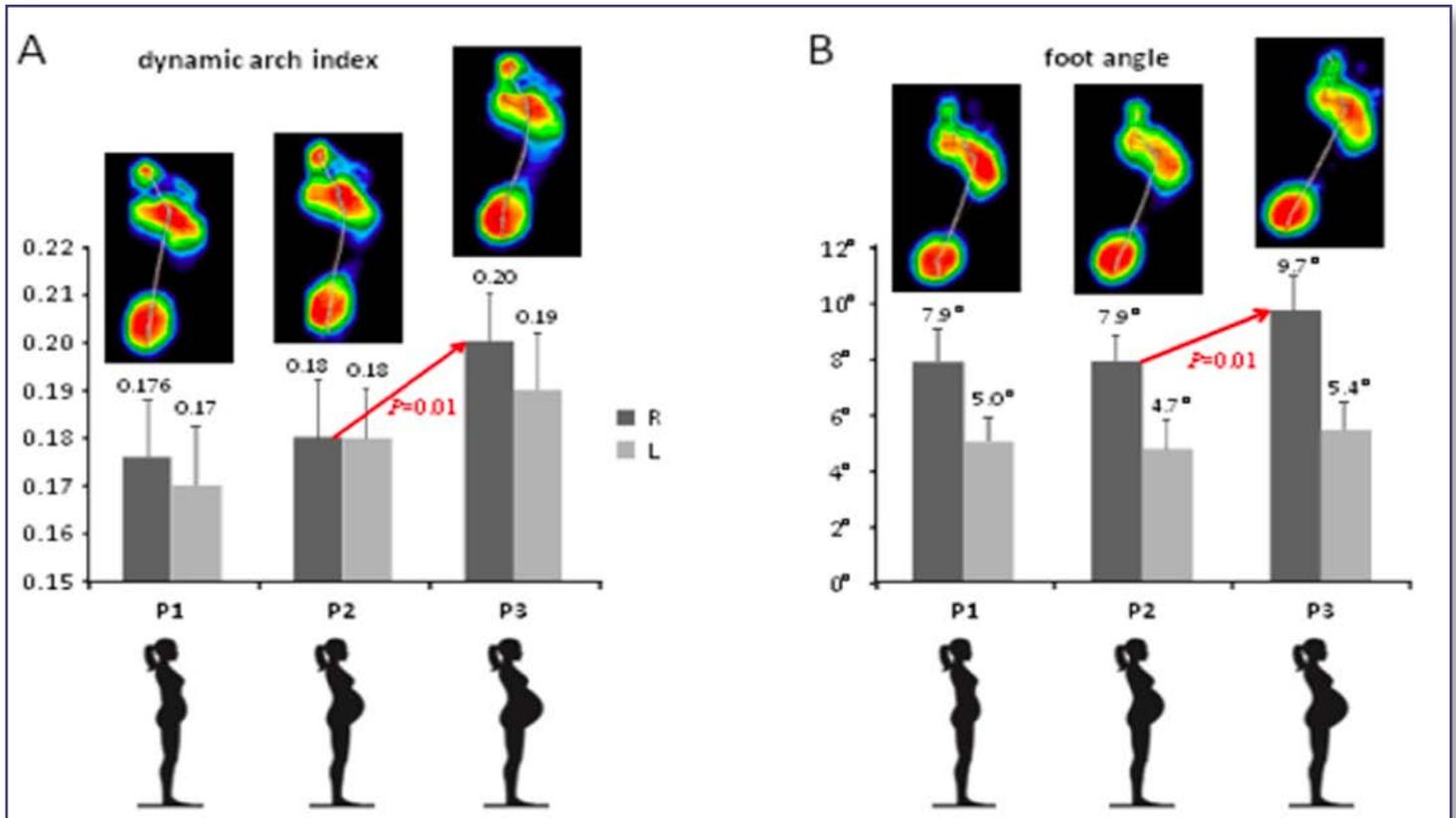


Figure. Foot loading characteristics in the 1st (P1), 2nd (P2) and 3rd (P3) trimesters of gestation. A—dynamic arch index (mean±SD). B—foot angle (mean±SD). Upper color footprints in A and B illustrate examples of averaged right foot pressure distribution patterns of individual subjects in the 1st, 2nd and 3rd trimesters of gestation.

were also changes depending on the phase of pregnancy. Plantar pressure alterations that occur during pregnancy may be related to both biomechanical factors and gait adaptations.

Arch Flattening: Foot arch flattening during gait was evaluated by measuring the DAI parameter, which correlated with the body mass in all trimesters, consistent with the influence of individual biomechanical factors (eg, internal loads related to the anatomical structure of the body) on foot loading. An increased body mass generally evokes changes in the height of the foot arch during posture; the higher the weight, the more significant changes can be observed, resulting in the increase in midfoot contact area and midfoot plantar pressure in late pregnancy. Body mass in pregnant women increases significantly during a relatively short period of time, by an average of 11 to 16 kg [24 to 35 pounds]. In the presented sample of participants, the mass gain was about 11 kg. As for the longitudinal changes during gait, the results showed a tendency of longitudinal foot arch flattening for both feet (increasing values of DAI); however, the observed changes were statistically significant ($P = 0.01$) only for the right

foot when comparing P2 and P3 (see figure).

Not only mass gain but also body mass distribution can be linked to plantar pressure changes. About half of body mass gained during pregnancy is situated in the abdominal area (anterior part of the trunk), which leads to changes in the center of gravity and greater oscillations of the COP. The compensations, which are believed to follow the center of gravity deviation, include increased lumbar lordosis, sagittal pelvic tilt, and a more posterior upper body tilt. Also, forward shift of plantar loading has been reported.

One of the study's objectives was to examine how the anthropometric characteristics may influence the foot loading pattern depending on the phase of pregnancy. In particular, they found that while foot arch flattening correlated with the body mass in all trimesters (as mentioned above), the medial-lateral loading index correlated only in the first and second trimesters. The forefoot-rearfoot loading index was not influenced by the body mass. Waist circumference changes significantly influenced dynamic arch flattening but only in the late pregnancy (P2 and P3). In the third trimester of pregnancy, a small though significant

increase in the right foot angle was also observed (Figure 2B). Their findings also revealed a slight 'asymmetrical' adaptation of foot placement characteristics in the sample of right-leg dominant women (greater DAI in P3 for the right foot, Figure 2A, and greater right foot angles, Figure 2B). While these changes were relatively small, they might be functional constituting body adaptation to remain stable besides pregnancy-related anthropometric changes. Functional asymmetry has been defined as a consistent task discrepancy between the 2 lower limbs. Within the concept of the limb dominance, the non-dominant lower limb contributes more to support, while the dominant lower limb contributes more to forward propulsion. For instance, other examples are known of subtle but functional asymmetries during stepping, or when gait asymmetries, not evident during normal walking, appear during more challenging walking tasks.

Mass and Gravity: Mass gain and the ventrally driven center of gravity induce gait disturbances in a pregnant woman. Adaptations throughout pregnancy are recognized to provide

Continued on page 39

Don't bury your head in the past

The future is far too bright



Call us toll-free (888) 895-1305
OrthoticaLabs.com



The path to
FOOT PAIN RELIEF
has never been
EASIER



Better for YOU. Better for YOUR PATIENTS.



Northwest Podiatric
Laboratory provides
industry-leading value



Everything you need -
custom & OTC orthotics,
scanning, AFOs & more

Since
1964

Unbeatable NWPL support,
reliability & patient outcomes
for nearly six decades

EST. **NW** 1964
PODIATRIC
LABORATORY



LEARN MORE AT NWPODIATRIC.COM

© 2021 by Northwest Podiatric Laboratory, Inc. All rights reserved.

safety and stability. The most important features identified by the authors are as follows: reduced walking velocity as a result of lower frequency and smaller length of the steps, longer stance time, and increased stance width compensated by the mediolateral component of ground reaction force. Additionally, considering the lower limbs adjustments, the most affected by the continuous overloads in the course of pregnancy occurred to be a hip joint, as being closer to the body region with greater anatomical and morphological changes. As mentioned, to improve gait stability, pregnant women walk with a wider support base, which is especially visible in the third trimester. The base of support can be wider due to both increased distance between the ankles and as a result of a greater foot angle. In a prior longitudinal study, these authors found that the angle of the foot tends to increase with the advancement of pregnancy, though changes in the foot angle were significant only for the right foot.

Their findings showed that individual anthropometric characteristics affect plantar pressure distribution in pregnant women. However, they also revealed modifications or adaptations that depend on the period of pregnancy, eg, significant correlations of MLI—the ratio of medial and lateral foot loading—in the first and second trimesters but not in late pregnancy. Plantar pressure distribution changes may play a role in improving gait stability in the stance phase. For instance, Mei et al suggest that flattening of the medial longitudinal arch can result in a decreased stability during pregnancy; therefore, the observed increase in the foot angle on the same side as medial arch collapse may constitute the adaptation to keep gait stability despite medial arch collapse. This might be especially important since P3 is the time of pregnancy when the incidence of falls resulting in hospitalization is the largest and concerns almost 80% of pregnant women.

Compression & Edema

Saliba-Junior et al⁵ observed that pregnancy is a leading cause of varicose veins, which can lead to venous insufficiency and leg edema.

In this Brazilian study published in *v*, they sought to evaluate the effect of compression stockings on lower limb edema in pregnant women and their perceptions of wearing them.

This was a randomized, controlled, prospective, parallel, blinded clinical trial conducted with 60 pregnant women randomly distributed into 2 groups: an intervention group ($n = 30$) wearing compression stockings and a control group ($n = 30$). Standardized ankle and calf measurements were taken of all 120 lower limbs using a tape measure. At the end of the study, a questionnaire was administered to identify perceived difficulties and advantages related to wearing compression stockings.

Their results showed that pregnant women in the intervention group had a significantly smaller increase ($P < 0.05$) in calf and ankle diameters compared to those in the control group. The mean differences from the beginning to the end of gestation in the diameters of the right calf, left calf, right ankle, and left ankle, respectively, were 0.30 cm, 0.30 cm, 0.15 cm, and 0.15 cm in the intervention group and 1.95 cm, 1.73 cm, and 1.87 cm in the control group. Most of the pregnant women had no difficulty wearing the compression stockings and all reported that they felt a difference in leg symptoms and would wear stockings again.

In their discussion, the authors wrote that the intervention group members' perceptions of using compression stockings demonstrate the ease of use of this prophylactic and therapeutic measure. All of the pregnant women reported that they felt a difference in leg symptoms and that they would wear compression stockings again. The findings of this study are in agreement with a study about acceptance of compression stockings conducted by Allegra et al⁶, who found that leg symptoms and pain were reduced in pregnant women who wore compression stockings. Allegra et al also observed that improvement of symptoms was associated with regularity of wearing stockings, demonstrating the importance of wearing them continuously to improve the QOL of pregnant women. Saliba-Junior et al also noted studies that demonstrate that multiparous women are at greater risk of developing varicose veins over time, irrespective of weight gain associated with pregnancy. These changes are present in approximately 13% of primiparous women, 30% of those in their second gestation, and up to 57% of multiparous women. There is also evidence that multiparity (≥ 4 deliveries)

constitutes a relevant risk factor for occurrence of venous thromboembolism during pregnancy.

In their conclusion, Saliba-Junior et al wrote that compression stockings were effective for preventing lower limb edema in pregnant women who had a positive perception of wearing them. 

Editor's Note: All 4 of the articles excerpted here are available open access and readers are encouraged to use the doi numbers in the reference list to find and read them fully.

References

1. Waugh CM, Scott A. Case Studies in Physiology: Adaptation of load-bearing tendons during pregnancy. *J Appl Physiol* (1985). 2022 May 1;132(5):1280-1289. doi: 10.1152/jappphysiol.00555.2021. Use is per CC BY.
2. Conder R, Zamani R, Akrami M. The biomechanics of pregnancy: a systematic review. *J Funct Morphol Kinesiol*. 2019;4(4):72. doi: 10.3390/jfmk4040072. Use is per CC BY.
3. Branco M, Santos-Rocha R, Vieira F, Silva M-R, Aguiar L, Veloso AP. Influence of body composition on gait kinetics throughout pregnancy and postpartum period. *Scientifica*. 2016;12: 3921536. doi.org/10.1155/2016/3921536
4. Masłoń A, Suder A, Curyło M, Frączek B, Salamaga M, Ivanenko Y, Forczek-Karkosz W. Influence of pregnancy related anthropometric changes on plantar pressure distribution during gait-A follow-up study. *PLoS One*. 2022 Mar 11;17(3):e0264939. doi: 10.1371/journal.pone.0264939. Use is per CC BY.
5. Saliba-Júnior OA, Rollo HA, Saliba O, Sobreira ML. Positive perception and efficacy of compression stockings for prevention of lower limb edema in pregnant women. *J Vasc Bras*. 2022 Jan 31;21:e20210101. doi: 10.1590/1677-5449.210101. Use is per CC BY.
6. Allegra C, Antignani PL, Will K, Allafort F. Acceptance, compliance and effects of compression stockings on venous functional symptoms and quality of life of Italian pregnant women. *Int Angiol*. 2014;33(4):357-64. PMID:25056167.

Peripheral Artery Disease

Peripheral Artery Disease (PAD) is a deadly chronic condition that can lead to heart attack, stroke, or amputation.

1 in 3

- » Diabetics age 50+
- » Smokers age 50+
- » Everyone age 70+

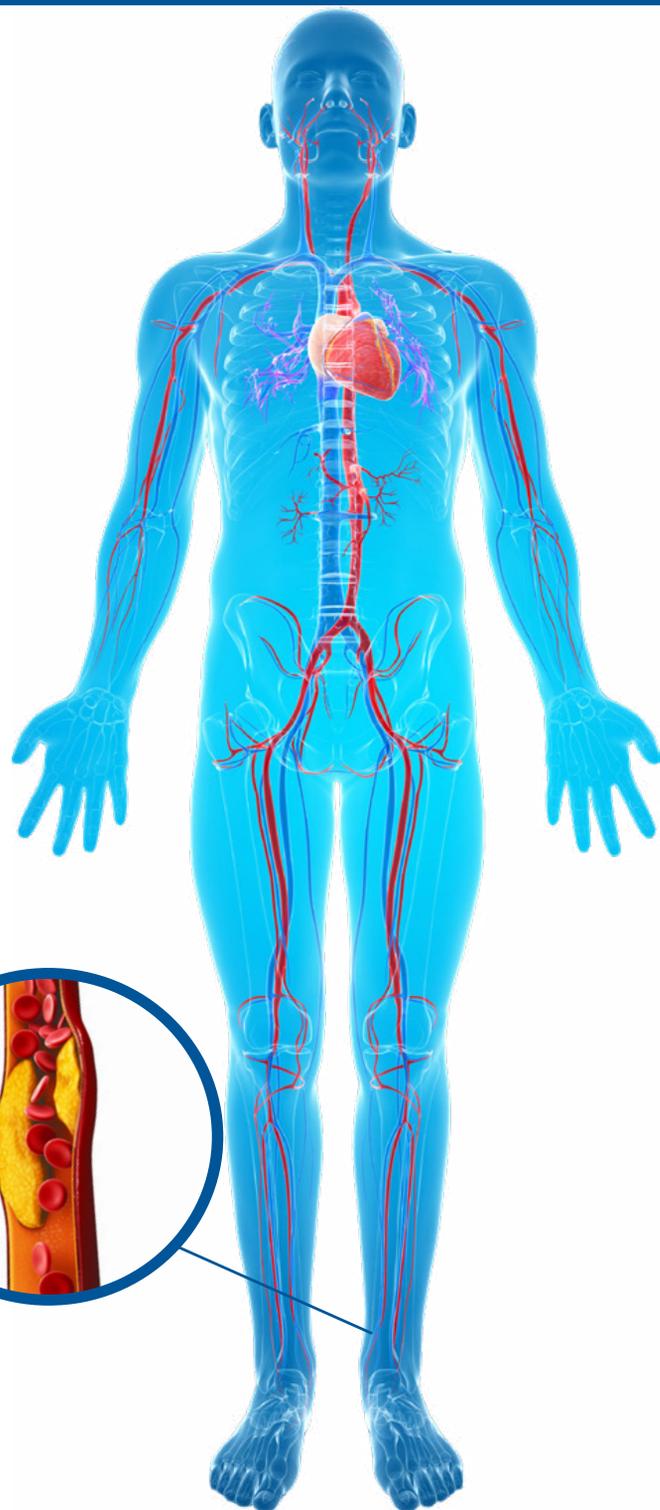
Have PAD

\$390 billion

annual US healthcare costs attributable to PAD

100,000 amputations

of lower extremities in the US annually, due to vascular disease



Biomedix is a market leader in PAD diagnostics, delivering products and services that feature a cloud-based platform enabling community-based collaborative care.

Visit [biomedix.com](https://www.biomedix.com) to discover more about how we can help you cost-effectively save limbs and save lives.

Dog Leash-Related Injuries of the Lower Extremity Treated at Hospital Emergency Departments

BY MATHIAS B. FORRESTER, BS

Background: There are millions of pet dogs in the United States (US), and thousands of people are treated at US hospital emergency departments (EDs) each year for dog leash-related injuries. The objective of this study was to describe dog leash-related injuries of the lower extremity treated at US hospital EDs.

Methods: An analysis was performed of dog leash-related injuries of the lower extremity using data from the National Electronic Injury Surveillance System (NEISS) of the US Consumer Product Safety Commission (CPSC) during 2000-2020.

Results: A total of 1,788 dog leash-related injuries of the lower extremity treated at a sample of US hospital EDs was identified during 2000-2020, resulting in a national estimate of 77,238 such injuries. Of the estimated injuries, 63.3% involved a trip or tangle and 29.2% a pull. By three-year period, 4.8% of the injuries occurred during 2000-2002, increasing to 27.8% during 2018-2020. Patients age 40 years or older accounted for 64.4% of the injuries; 76.5% were female. The most common injuries were strain or sprain (34.8%) and fracture (24.1%). The most frequently affected body part was the knee (33.2%), ankle (30.6%), and lower leg (16.6%).

Conclusions: Dog leash-related injuries of the lower extremity most often resulted from a trip or tangle. The injuries increased during the 21-year study period. Patients with injuries tended to be older, and the majority of patients were female. Their injuries were most frequently a sprain or strain and most affected the knee.

.....

According to the American Veterinary Medical Association (AVMA), by year-end 2016, there were reported to be 76.8 million pet dogs in the United States (US), and 38.4% of US households owned a dog.¹ One of the most common causes of dog-related injury is dog bites. Dogs bite approximately 4.5 million people in the US annually,² and during 2005-2013, an average of 337,000 visits to US hospital emergency departments (EDs) per year were for non-fatal dog bites.³

However, dogs can be a source of injury in ways other than bites. For instance, studies have



described injuries due to dog-bicycle interactions (51% of which did not involve dog bites)⁴ and falls associated with dogs.^{5,6} Injuries may also occur due to dog leashes, while a person is walking a dog on a leash or other circumstances involving the leash.^{7,8} Thousands of dog leash-related injuries are treated at US hospital EDs each year, a portion of which affect the lower extremity.⁷ The objective of this study was to describe dog-leash related injuries of the lower extremity treated at US hospital EDs.

Methods

This study used data downloaded from the National Electronic Injury Surveillance System (NEISS) website at <https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx>. The NEISS is operated by the US Consumer Product Safety Commission (CPSC). The NEISS collects data on consumer product-related injuries in the US from the EDs of a stratified random sample of 100 hospitals with 24-hour EDs and six or more beds selected from the more than 5,000 hospitals in the US. The random sample is stratified by hospital size, geographic location (so that all parts of the US are represented), and hospital type (general and pediatric hospitals). The hospital size is categorized based on the annual number of ED visits reported by each hospital and are divided into

four strata: small, medium, large, or very large. A fifth stratum is designated for pediatric hospitals. The CPSC recruits hospitals selected by its random sampling criteria, and most hospitals agree to participate, as compensation is provided. If a hospital declines to participate, another hospital is selected from the same stratum and geographical location. Hospitals continue to participate in NEISS until a sample redesign reselects another stratified random sample. Sample redesigns take into consideration changes in hospital size, new hospitals, and hospitals that are no longer in operation.⁹⁻¹¹

Professional NEISS coders view the medical charts at participating hospitals and, for patients with injuries that meet NEISS inclusion criteria, collect and code information such as treatment date; patient age, sex, and race; injury diagnosis and body part injured; discharge disposition; consumer product(s) involved in the injury; location where the incident occurred; and a brief narrative describing the incident. The NEISS Coding Manual indicates that most of the fields in the NEISS database are numeric codes, and if a variable, such as patient race, is unknown or not documented in the medical record, it is assigned a code to indicate this. The reporting of cases to NEISS is done electronically.^{9,11} Data are publicly

Continued on page 42

Table 1. Selected characteristics of dog leash-related injuries involving the lower extremity treated in United States emergency departments, National Electronic Injury Surveillance System, 2000-2020

VARIABLE	NO.		EST.		
	NO.	%	NO.	%	95% CI
Circumstance of injury					
Trip/tangle	1,177	65.8	48,899	63.3	39,417-58,381
Pull	472	26.4	22,590	29.2	17,539-27,641
Other/unknown	139	7.8	5,749	7.4	3,986-7,513
Patient age (years)					
0-5	60	3.4	1,766	2.3	968-2,563
6-12	98	5.5	3,390	4.4	2,176-4,604
13-19	83	4.6	3,429	4.4	2,206-4,653
20-29	194	10.9	8,653	11.2	6,264-11,041
30-39	247	13.8	10,260	13.3	7,541-12,979
40-49	305	17.1	13,052	16.9	9,778-16,326
50-59	347	19.4	14,945	19.3	11,306-18,584
60-69	243	13.6	11,407	14.8	8,457-14,357
70-79	146	8.2	6,680	8.6	4,711-8,649
80+	65	3.6	3,657	4.7	2,378-4,936
Patient sex					
Male	444	24.8	18,128	23.5	13,891-22,366
Female	1,344	75.2	59,110	76.5	48,010-70,210
Location of injury incident					
Home/mobile home	703	39.3	29,257	37.9	23,035-35,480
Other public property	250	14.0	9,613	12.4	7,026-12,200
Street or highway	163	9.1	7,658	9.9	5,478-9,837
Place of recreation or sports	41	2.3	1,624	2.1	865-2,383
School	1	0.1	64	0.1	-
Not recorded	630	35.2	29,023	37.6	22,841-35,205
Total	1,788		77,238		63,352-91,125

No. = Number

Est. = Weighted estimate (sum of the Weight numeric field in the National Electronic Injury Surveillance System database). The numbers in the Weight field are not whole numbers but include decimals. As a result of rounding to whole numbers when performing analyses, the sum of the estimates for a given variable might not equal the total. The Consumer Product Safety Commission considers an estimate unstable and potentially unreliable when the number of records used is <20 or the estimate is <1,200.

95% CI = 95% confidence interval. Not calculated if the estimate is <1,200.

available and de-identified; therefore, the study is exempt from institutional review board approval.

Cases were dog leash-related injuries of the lower extremity included in the NEISS database during 2000-2020. Although the NEISS database includes three numeric fields for coding the product involved in the injury (Product_1, Product_2, Product_3), there is no specific code for dog leashes. Code 1715 (Pet supplies) is not specific to dog leashes, and dog leash-related

injuries may be assigned other product codes. Thus, in order to identify cases, the Narrative text field (a brief summary of the circumstances of the injury) of all records, including those not assigned product code 1715, was searched for any mention of the word "leash." For the resulting subset of records, the narrative field was reviewed to determine whether the leash was described as a "dog leash" or a dog was otherwise mentioned. Records involving leashes for other

types of animals or leashes not associated with a dog were excluded. Of the remaining records, those where the dog leash appeared to be directly involved in the injury were included in the study, whether or not the leash was attached to a dog, while records where the leash did not appear to be directly involved in the injury were excluded from the study. For instance, records that stated

Continued on page 45



**Cutting Edge
Technology
from a name
you can Trust.**



Dynamic, Floor Reaction, Carbon AFO

- Clinically designed and tested in conjunction with certified orthotists at Atlanta Prosthetics & Orthotics (APO) (call for details)
- Anterior and Tuberosity relief
- Fully lined calf-band
- Designed for non-contact in critical, pressure point areas
- Does not excessively push out the shoe
- Structurally reinforced in high stress junctions
- Non-obtrusive brace design
- Forefoot Dorsi-assist
- Optional leather valgus/varus strap
- One Year Warranty



NOW AVAILABLE **\$195**
...as low as
Call for details.

Ez stride APO

2020 DESIGN UPGRADES

- New manufacturing process increases strength 5X
- Trimmable Footplate
- Deep, High Gloss Luster Finish
- Top/Bottom Footplate Non-Skid Surface
- Removable/Washable liner
- Customizable strap length

FITTING SAMPLES AVAILABLE FOR \$95!

O&P Solutions

1625 Rock Mountain Boulevard, Suite H-J
Stone Mountain, Georgia 30083
800-922-5155 | 800-813-8139 Fax

www.oandp.solutions

Formerly **Spinal Solutions**



Footmaxx Orthotics

Completely custom in every detail, for every patient.

Get started today!
1.800.779.3668

Footmaxx
Footmaxx.com/get-started

the patient tripped over a leash, whether or not the leash was attached to a dog, were included while records that stated the patient tripped over a dog that just happened to be on a leash were excluded. Cases were included in the study only if either the *Body_Part* or *Body_Part_2* numeric fields containing codes for a lower extremity body part (upper leg, knee, lower leg, ankle, foot, toe).

The variables examined were the time of treatment (grouped by 3-year period), patient age and sex, circumstance of the injury, location where the injury incident occurred, patient disposition, type of injury, and body part affected.

The method of the injury could be grouped into several broad categories:

Trip/tangle: The patient tripped over the leash or got caught or tangled in the leash.

Pull: The patient was holding onto the leash and was pulled (jerked, yanked, dragged, etc.) by the dog or was pulling the dog. Included were instances where any part of the patient's upper extremity was reported to be caught or wrapped in the leash whether or not being pulled was mentioned.

Other/unknown: This includes all other circumstances (being hit by the leash, strangled by the leash, the leash breaking, etc.)

The Narrative field for each record was reviewed, and each record was assigned to 1 of these 3 categories. The NEISS Coding Manual indicates that the *Diagnosis_2* and *Body_Part_2* fields were added in 2018,¹⁰ although these fields do not appear to have been used until 2019.

Analyses were performed using Office Professional 2007 Access and Excel (Microsoft Corporation, Redmond, Washington, US). The distribution of cases and national injury estimates were determined for the variables. National injury estimates were calculated by summing the values in the Weight numeric field in the publicly available NEISS database, and 95% confidence intervals (CIs) were calculated for the estimates. The CPSC considers an estimate unstable and potentially unreliable when the number of records used is <20 or the estimate is <1,200.⁹ For those variable subgroups where the estimate was <1,200, 95% CIs were not calculated.

Results

A total of 1,788 dog leash-related injuries of the lower extremity treated at a sample of US

Dog and cat populations increased

More households have pets, but they have fewer pets

2020

- 83.7 million dogs
- 1.46 dogs per household
- 45% of households own dogs
- 65% own just 1 dog
- 60 million cats
- 26% of households own cats
- 56% own just 1 cat

2016

- 76.8 million dogs
- 1.6 dogs per household
- 38% of households owned dogs
- 60% own just 1 dog
- 58.4 million cats
- 25% of households owned cats
- 53% own just 1 cat

© Copyright 2021, American Veterinary Medical Association. All rights reserved.



hospital EDs was identified during 2000-2020, resulting in a national estimate of 77,238 (95% CI 63,352–91,125) such injuries, representing 18.0% of the total 429,256 estimated dog-leash related injuries of any body part.

Table 1 presents the distribution of the injuries by selected variables. Trips and tangles resulted in approximately 65% of the leash-related injuries while pulls resulted in almost 30% of the injuries. The number of injuries increased during the study period. The annual injury estimate was 889 in 2000, increasing to 6,257 in 2019 (a 422% increase) before declining 22% to 4,794 in 2020. The majority of patients were age 20 years or older with the highest proportion of injuries among the 50-59 year age group. Patients age 40 years and older accounted for 61.9% of the cases and 64.4% of the estimated injuries. Over 75% of the patients were female. Of those injuries where the location of the injury incident occurred was known, most occurred at home followed by other public property and a street or highway.

Table 2 shows the distribution of injuries by diagnosis, body part, and disposition. The most frequently reported diagnoses were strain or sprain, fracture, and contusion or abrasion. The most commonly affected body parts were the knee, ankle, and lower leg. The majority of patients were treated or examined at the hospital and released.

Discussion

This study found that approximately 65% of dog leash-related injuries of the lower extremity treated at US hospital EDs were due to a trip or tangle with the leash while almost 30% were due to a pull. This pattern may be related to the mechanics involved in these circumstances of injury. A

trip or tangle is likely to directly involve the lower extremity, and injuries may occur as the person falls or attempts to break their fall. In contrast, a pull typically occurs while the person is holding onto or attached to the dog leash with their hand or arm. As a result, their upper extremity may be more likely to be injured. Pull injuries might affect the lower extremity as the person tries to maintain control of the dog or is pulled off their feet or dragged by the dog.

Dog leash-related injuries of the lower extremity increased during 2000-2020 with over one-quarter of the injuries treated during the last 3 years of the study period (2018-2020). A previous study of fractures in elderly adults while walking leashed dogs reported the estimated number of injuries treated at hospital EDs increased from 1,671 in 2004 to 4,396 in 2017.⁸ The increasing trend in dog leash-related injuries of the upper extremity may partly be related to an increase in the number of pet dogs in the US. According to the AVMA, the rate of households owning dogs in the US increased from 36.1% in 2001 to 38.4% in 2016, and the estimated number of pet dogs increased from 72.1 million in 2006 to 76.8 million in 2016.¹ However, the increase in the number of dogs cannot account for all of the increase in dog leash-related injuries of the lower extremity because the number of dog leash-related injuries in 2020 was over 4 times that in 2000. As a result of the health benefits of pet ownership, more people might be walking a new dog or more dogs with leashes or walking with dogs on leashes more often, leading to an increase in dog leash-related injuries.

The majority of lower extremity injuries involved adults, particularly those 40 years or older.

Continued on page 47

MultiMotion

Pediatric Hip Abduction System

FOR SAFE TREATMENT

of correctable pediatric hip contractures!



- Safe and gradual joint mobilization
- Improved joint movement
- Stretch spastic muscles

allard | **USA**

allardusa.com

ALLARD USA, INC.
300 Forge Way, Suite 3
Rockaway, NJ 07866-2056

info@allardusa.com
Toll Free 888-678-6548
Fax 800-289-0809

Table 2. Type and disposition of dog leash-related injury involving the lower extremity treated in United States emergency departments, National Electronic Injury Surveillance System, 2000-2020

VARIABLE	NO.		EST.		
	NO.	%	NO.	%	95% CI
Most common type of injury					
Strain or sprain	616	34.5	26,866	34.8	21,059-32,673
Fracture	467	26.1	18,581	24.1	14,259-22,902
Contusion or abrasion	378	21.1	17,765	23.0	13,594-21,935
Laceration	80	4.5	3,404	4.4	2,186-4,621
Dislocation	22	1.2	904	1.2	-
Avulsion	15	0.8	883	1.1	-
Body part affected					
Knee	550	30.8	25,625	33.2	20,036-31,215
Ankle	561	31.4	23,671	30.6	18,427-28,915
Leg, lower (not including knee or ankle)	308	17.2	12,794	16.6	9,570-16,017
Foot	196	11.0	8,645	11.2	6,258-11,032
Leg, upper	104	5.8	3,574	4.6	2,315-4,833
Toe	81	4.5	3,474	4.5	2,239-4,708
Disposition					
Treated or examined in the emergency department and released	1,617	90.4	70,659	91.5	57,773-83,545
Treated and admitted for hospitalization	149	8.3	5,527	7.2	3,813-7,241
Treated and transferred to another hospital	8	0.4	521	0.7	-
Held for observation	4	0.2	115	0.1	-
Left without being seen, left against medical advice	10	0.6	417	0.5	-
Total	1,788		77,238		63,352-91,125

No. = Number

Est. = Weighted estimate (sum of the Weight numeric field in the National Electronic Injury Surveillance System database). The numbers in the Weight field are not whole numbers but include decimals. As a result of rounding to whole numbers when performing analyses, the sum of the estimates for a given variable might not equal the total. The Consumer Product Safety Commission considers an estimate unstable and potentially unreliable when the number of records used is <20 or the estimate is <1,200.

95% CI = 95% confidence interval. Not calculated if the estimate is <1,200.

Records during 2019-2020 can have two coded diagnoses and affected body parts.

In contrast, a study of nonfatal unintentional fall injuries associated with dogs reported only 37% of the patients to be 55 years or older.⁵ Because of the physical requirements for walking dogs on leashes, especially if the dogs are large, it might be more likely for adults to walk dogs, and thus more likely to be at risk of leash-related injuries.

The patients also were more likely to be female, accounting for over 75% of all injuries of the lower extremity. Other studies that examined dog-related injuries treated at hospital EDs likewise reported most patients to be female.^{5,8} It may be that females are more likely to walk dogs or more likely to suffer injuries while

walking dogs.

Most dog leash-related injuries might be expected to occur while walking the dog. Thus, it might be expected that the majority of injuries of the lower extremity would occur away from home. However, the highest proportion of injuries

Continued on page 49

ProtoKinetics

The New Standard in Gait Analysis



©Photo by Michael Halberstadt

Healthcare innovation is no longer optional. **Technology Driven Progression** is required to make patient care more efficient, evidence-based and profitable.

Managing and synthesizing accurate gait and balance data are vital to **Optimizing Patient-Centered Mobility Performance** and understanding the effectiveness of interventions that portray patients' mobility in, and capacity for, daily activities.

Contact us today to learn how quickly and easily you can integrate the **Zeno Walkway Powered by PKMAS Software** into your operations!

www.protokinetics.com ☎ 610.449.4879 ☎ info@protokinetics.com

with a known location occurred at home followed by other public property and a street or highway. The study of nonfatal unintentional fall injuries associated with dogs found 62% of the injuries occurred at home.⁵ That most of the injuries occurred at home may be due to the person being injured while setting out on or returning from a walk with the dog or while interacting with the dog at home or in their yard.

The most commonly reported injuries were strain or sprain followed by fracture and contusion or abrasion. In most instances, these types of injury might not be expected to require hospitalization. In fact, this study found that the majority of patients were treated or examined at the hospital ED and released. This is consistent with the study of nonfatal unintentional fall injuries associated with dogs treated at hospital EDs that reported 92% of the patients were treated and released from the ED.⁵

This study does not provide data on how to reduce or prevent dog leash-related injuries. However, other sources have provided suggestions. People can be informed that certain activities involving dog leashes may lead to injuries. Obedience training for dogs can be recommended to encourage appropriate leash behaviors (eg, training the dog to walk beside you, not in front) and reduce behaviors that may lead to leash injuries (eg, pulling on the leash or running around the walker). People can be advised not to wrap the leash around their fingers or hand, use shorter leashes, not walk the dog while riding a bicycle, scooter, etc., wear appropriate shoes, and pay attention to their surroundings.¹²⁻¹⁴

This study has limitations. Cases were identified by searching for “leash” in the NEISS Narrative field. Dog leash-related injuries where this term was not documented in the Narrative field would not be included in the investigation. In addition, the further selection of records to be included in the study and the sorting of them into the various circumstances of injury (trip or tangle, pull, other/unknown) was performed by a single person and based on the Narrative field, which contains a limited amount of information. Errors in the selection and classification of records may have resulted in records being included or excluded erroneously or misclassified. Only those dog leash-related injuries of the lower extremity treated at EDs were included in the

study. The number of such injuries not seen at EDs is unknown. Also, since the NEISS database is a consumer product-related injuries database, there may be some skepticism regarding its utility for analysis of dog leash-related injuries. However, the NEISS database has been used to examine other dog-related injuries.^{4,8}

In conclusion, the most common type of dog leash-related injuries of the lower extremity treated at US hospital EDs occurred due to a trip or tangle followed by a pull. The number of injuries increased during the time period studied. The majority of the persons who experienced such injuries were adults, particularly age 40 years or older, and most were female. The injuries most often occurred at home. The most common injuries were strains or sprains followed by fractures and contusions or abrasions and the most common affected body parts were the knee, ankle, and lower leg. Most patients were treated or examined and released from the ED. 

Mathias B. Forrester, BS, is an independent researcher in Austin, Texas. Now retired, he previously performed public health research for various university and government programs for 34 years.

References

1. American Veterinary Medical Association. AVMA Pet Ownership and Demographics Sourcebook. 2017-2018 Edition. American Veterinary Medical Association; Schaumburg, Illinois, 2018.
2. World Health Organization. Animal bites. February 5, 2018. Available at <https://www.who.int/news-room/fact-sheets/detail/animal-bites>. Accessed May 31, 2022.
3. Loder RT. The demographics of dog bites in the United States. *Heliyon*. 2019;5(3):e01360.
4. Loder RT, Yaacoub AP. Injuries to cyclists due to a dog-bicycle interaction. *Vet Comp Orthop Traumatol*. 2018;31(3):170-175.
5. Stevens JA, Teh SL, Hailey T. Dogs and cats as environmental fall hazards. *J Safety Res*. 2010;41(1):69-73.
6. Centers for Disease Control and Prevention. Nonfatal fall-related injuries associated with dogs and cats – United States, 2001-2006. *MMWR Morb Mortal Wkly Rep*. 2009;58(11):277-281.

7. Forrester MB. Dog leash-related injuries treated at emergency departments. *Am J Emerg Med*. 2020;38(9):1782-1786.
8. Pirruccio K, Yoon YM, Ahn J. Fractures in elderly Americans associated with walking leashed dogs. *JAMA Surg*. 2019;154(5):458-459.
9. United States Consumer Product Safety Commission. National Electronic Injury Surveillance System (NEISS). Available at <https://www.cpsc.gov/Research--Statistics/NEISS-Injury-Data/Explanation-Of-NEISS-Estimates-Obtained-Through-The-CPSC-Website>. Accessed May 31, 2022.
10. United States Consumer Product Safety Commission. NEISS Coding Manual. January 2021. Available at <https://www.cpsc.gov/s3fs-public/January-2021-NT-CPSC-only-NEISS-Coding-Manual.pdf?xanMM1kB4SGpuSMOwf0NHkkkIqNcn8F>. Accessed May 31, 2022.
11. Huang G [Internet]. Improving the capture of poisonings in children and youth by the Canadian Hospital Injury Reporting and Prevention Program. July 28, 2011. Available at https://dspace.library.uvic.ca/bitstream/handle/1828/3812/Huang_Grace_MPA_2j011.pdf?sequence=1&isAllowed=y. Accessed May 31, 2022.
12. Direct Orthopedic Care. Is Your Pet's Leash Causing Your Shoulder or Knee Pain? 3 Tips to Avoid Dog Walking Injuries! March 29, 2021. Available at <https://www.directorthocare.com/is-your-pets-leash-causing-your-shoulder-or-knee-pain-3-tips-to-avoid-dog-walking-injuries/>. Accessed May 31, 2022.
13. BBC News. Surgeons warn of serious hand injuries from dog leads and collars. May 24, 2019. Available at <https://www.bbc.com/news/health-48382570>. Accessed May 31, 2022.
14. Germany J. Preventing Dog Walking Injuries. Rush University Medical Center. Available at <https://www.rush.edu/health-wellness/discover-health/preventing-dog-walking-injuries>. Accessed May 31, 2022.



GAITRite BASIC[®]
www.gaitrite.com

Clinical Reports tailored to your patient conditions



MOST AFFORDABLE GAIT ANALYSIS
SPECIFICALLY TAILORED FOR O&P
IMPROVE PATIENT OUTCOMES
OBJECTIVE MEASURES FOR REIMBURSEMENT

✉ sales@gaitrite.com

🌐 www.gaitrite.com

☎ 888-482-2362

FULLY PORTABLE
compact storage

QUICK SET UP
under 75 seconds

MINIMAL TRAINING
easy reporting features



Bisphosphonates, Atypical Femur Fractures, and Health-Related Quality of Life

BY JONATHON SPANYER, LAUREN A. BARBER, HARRISON LANDS, ALEXANDER BROWN, MARY BOUXSEIN, MARILYN HENG, AND MADHUSUDHAN YAKKANTI

Bisphosphonates are currently one of the most commonly prescribed medications to prevent osteoporotic fractures. Bisphosphonates are frequently used as first-line agents for postmenopausal osteoporosis. Alendronate was first synthesized in the 1970s, and by 2006 about 30 million prescriptions were written annually in the United States, accounting for nearly 15% of postmenopausal women. Because the incidence of osteoporotic fractures is expected to increase with the aging population, the prescriptions of bisphosphonates had also been predicted to increase. Yet with the advent of newer medications to treat osteoporosis, and with concerns about rare side effects from bisphosphonates such as osteonecrosis of the jaw and atypical femoral fractures (AFFs), a relative decrease in projected bisphosphonate utilization in the past decade has been realized.

Not limited to management of osteoporosis, bisphosphonates have been used to treat a variety of pathologies ranging from Paget's disease of bone to hypercalcemia of malignancy. Safety profiles for bisphosphonates show they are generally well-tolerated, but more recently there have been concerns about the long-term use of bisphosphonates. In 2005, Odvina et al first reported on a small number of patients who experienced primarily non-spinal fractures of the lower extremity and femur while on bisphosphonate therapy, with histological analysis showing markedly suppressed bone formation after prolonged bisphosphonate use. Subsequently, several authors have reported similar findings, all associated with chronic



bisphosphonate use. In each case, the fractures were found to be secondary to low-energy mechanisms, presented with prodromal thigh pain, and demonstrating a prominent femoral cortex medial spike radiographically (Figure 1). Bilateral AFFs have been reported in up to 48% of cases. Cortical thickening near the

fracture site and delayed union after surgical repair have also been reported.

A taskforce committee report commissioned by the American Society for Bone and Mineral Research (ASBMR) has established definitions of the emerging phenomenon to standardize investigations into the pathophysiology, epidemiology, and orthopedic clinical and medical management of AFFs. Numerous authors have reported on patients who have sustained AFFs, including presentations, treatments, duration and type of bisphosphonate use, and final clinical outcomes. Although the radiographic characteristics and potential risk factors for AFFs have been well-described, less has been reported about the health-related quality of life (HRQOL) outcomes after patients have undergone surgical treatment for their AFF.

Safety profiles for bisphosphonates show they are generally well-tolerated, but more recently there have been concerns about the long-term use of bisphosphonates.

This article has been excerpted from "Health-related quality of life outcomes after surgical treatment of atypical femur fractures: a multicenter retrospective cohort study," by the authors noted above, which was published in the September 2021 issue of the *Journal of Bone and Mineral Research*. 2021;5(11):e10514. doi: 10.1002/jbm4.10514. Editing has occurred, including the renumbering of tables, and references have been removed for brevity. Use is per CC BY 4.0.

Continued on page 53

Prevent Falls & Gain

Stability

THE STABILIZER

DEVELOPED BY



surestep

A GAIT STABILIZING ORTHOSIS FOR ADULTS

The Surestep Stabilizer is a device that provides mediolateral stability, as well as stabilizing the foot/ankle in the sagittal plane, facilitating clearance during swing phase for patients with dropfoot. With the carbon fiber insert on the posterior strut, the Stabilizer helps to bring the foot up as the leg swings across, but also helps to assist with deceleration of the foot after heel strike. This makes for a much more normal, natural gait.

Visit our website for resources including our **fall risk assessment** and **measurement order form**.

The objective of this study was to collect HRQOL outcomes from patients who underwent surgical treatment for their AFFs and compare them to a similar cohort who underwent surgical treatment for diaphyseal femoral fractures. In this way, we aimed to determine the relative effect of repaired AFFs compared with an otherwise healthy cohort sustaining a similar isolated fracture on quality-of-life (QOL) measures.

Methods & Results

Two large trauma center databases were retrospectively queried for surgically treated femur fractures. Fractures were grouped into AFFs and compared to a control cohort. Controls for the AFF group included women with diaphyseal fractures without additional AFF characteristics. Patients were contacted for administration of the Short Form36, version 2 (SF-36v2) Health Survey. Surveys were completed an average of 30.3 months (range, 6–138 months) and 25.5 months (range, 5–77 months) postoperatively for the AFF and non-AFF groups, respectively. All patients were female, with 46 patients in the AFF and 26 patients in the non-AFF group. The average age of the AFF group was 70.1 years compared with an average age of 67.4 years in the non-AFF group ($P = 0.287$). Over 90% (91.3%) of patients in the AFF group had a history of bisphosphonate use while 26.9% of patients in the non-AFF group had used bisphosphonates ($P < 0.0001$).

Table 1 details the group comparisons. Patients with AFF reported their postoperative physical and mental health to be no different than similarly aged patients with femoral diaphyseal fractures, as measured by the SF-36v2 Health Survey. These data suggest that mid-term patient-reported QOL outcomes are similar among women who sustain an AFF compared to a cohort of more typical femoral diaphyseal fractures.

Discussion

In this study, we aimed to assess self-reported HRQOL outcomes in women who sustained atypical femur fractures compared to those



Figure 1. Representative atypical femur fracture radiograph. A 65-year-old female patient was taking bisphosphonates for 6 years, with 6 months of progressive prodromal thigh pain. She had seen an orthopedic surgeon 1 month prior to the fracture with pelvic X-rays showing no evidence of significant osteoarthritis at the time. Note the periosteal thickening of the lateral cortices (black and white arrows), noncomminuted transverse fracture, and the medial cortical spike (big arrow) that are typically seen in atypical femur fractures.

with isolated femoral diaphyseal fractures, both of whom underwent surgical repair of their fractures. The SF-36v2 questionnaire used to assess an individual's health status can be used to compare outcomes between groups of patients by type of intervention or disease. The

questionnaire consists of 8 scales yielding 2 summary measures: Physical Component Score (PCS) and Mental Component Score (MCS). With an average follow-up time of 2.4 years, both groups reported similar postoperative PCS

Continued on page 54

Table 1. Group Comparison

Group variable	AFF	Non-AFF	<i>p</i>
Patients, <i>n</i>	46	26	
Age at fracture (years), mean ± SD	70.1 ± 8.8	67.4 ± 10.8	0.287
Bisphosphonate use, <i>n</i> (%)	42 (91.3)	7 (26.9)	<0.0001
Bisphosphonate duration (years), mean ± SD	9.4 ± 5.6	5.6 ± 4.0	0.060
Time postoperation to survey follow-up (months), mean ± SD	30.3 ± 29.1	25.5 ± 18.7	0.397
Number low energy mechanism, <i>n</i> (%)	44 (95.7)	18 (65.4)	0.002
PCS score, mean ± SD	38.5 ± 10.5	35.9 ± 10.4	0.323
MCS score, mean ± SD	52.7 ± 11.5	51.4 ± 11.7	0.636

and MCS.

Our finding of similar self-reported HRQOL between AFF and non-AFF patients was unexpected, given that the AFF group generally experienced lower-energy trauma (ground level fall, break while walking), compared to the non-AFF group. Other authors have shown that high-energy trauma can

adversely affect HRQOL outcomes in orthopedic patients. However, Ko and Chang also reported on long-bone fractures with similar outcomes for overall SF-36v2 scores between higher-energy femoral shaft fractures and lower-energy isolated tibial shaft fractures after intramedullary nailing and subsequent implant removal and healing. Yet when divided into the

survey's domains, the PCS had a higher score for femoral shaft fracture patients ($P = 0.002$). Our study suggests that although generally lower-energy mechanisms were involved in the AFF group, the health effect upon the patient was still similar to the higher energy traumas in the non-AFF group. The clinical significance of our study is that patients with AFF may ex-

Discover the DAFO[®] Experience Creation Station

A kid-friendly tool for choosing custom brace patterns and colors

Decking out custom DAFOs has never been easier—not to mention fun and creative! Use our interactive online tool to combine transfer patterns with our various strap designs and padding colors on a virtual DAFO. It's easy to use on all devices, and favorite designs can be shared in an instant.



Transfer designs & coloring pages too!
visit cascadedafocom/creation-station

cascadedafocom



Helping kids lead healthier, happier lives[®]

1360 Sunset Avenue, Ferndale, WA 98248 | ph: 800.848.7332 | fax: 855.542.0092 | intl: +1 360 543 9306

CASCADE[®]
daFO

Continued on page 55

pect similar mid-term patient-reported physical and mental outcomes to their higher-energy non-AFF counterparts.

Although our study suggests similar mid-term outcomes between the cohorts after healing, other authors have reported higher rates of early postoperative complications among AFF patients with bisphosphonate use. A study by Edwards et al in 2013 reviewed data from the United States Food and Drug Administration Adverse Event Reporting System (FAERS), which revealed that 26% of cases of AFFs exhibited delayed healing or non-healing. Additionally, Bogdan et al in 2015 reported a 12% failure rate as well as delayed average time to union after surgical repair of AFFs.

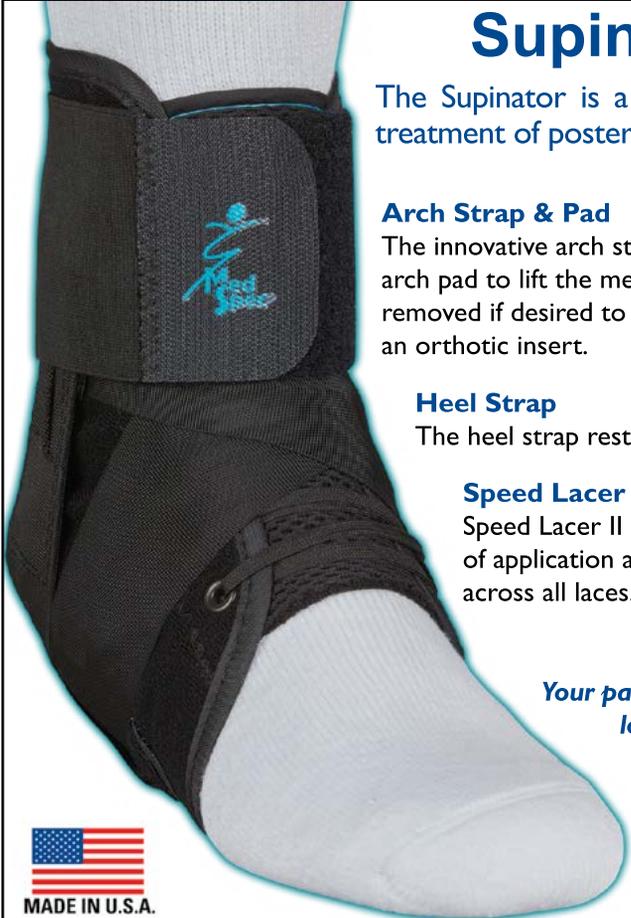
Although we realize that bisphosphonates remain a choice of therapy for individuals at high risk for fracture, the potential concern of AFFs has come to the attention of practitioners and patients, and prescriptions for bisphosphonates have declined in the past decade. However, the fracture prevention benefits of

The clinical significance of our study is that patients with AFF may expect similar mid-term patient-reported physical and mental outcomes to their higher-energy non-AFF counterparts.

bisphosphonates remain, and it should be noted that the overall risk-benefit profile of bisphosphonates should be carefully considered in at-risk patient populations. The current study indicates that mid-term health-related outcomes following surgical repair of AFF are similar to those of surgically repaired diaphyseal fractures of the femur.

Conclusion

In spite of the small number of patients, to our knowledge, this is the first study to include standardized HRQOL outcomes, SF-36v2, for patients treated surgically for AFFs. The information presented will be useful to the practicing orthopedic surgeon and the medical community, particularly with regard to counseling patients on mid-term postoperative expectations after AFFs. 



Supinator™ PTT Stabilizer

The Supinator is a comfortable and low-profile brace for the treatment of posterior tibial tendon dysfunction (PTTD).

Arch Strap & Pad
The innovative arch strap works in concert with a repositionable arch pad to lift the medial arch. The arch pad may also be removed if desired to allow for the Supinator to be worn with an orthotic insert.

Heel Strap
The heel strap restricts eversion of the calcaneus (heel).

Speed Lacer
Speed Lacer II closure system allows for ease of application and provides equal tension across all laces.

Your patients will appreciate the Supinator's low-profile design and comfort.




MADE IN U.S.A.

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

EVEN[®] by OPED up

Shoe Lift for Leg Length Discrepancy

**MAKES
WALKING
MORE
BALANCED!**



Available in 7 Sizes and
3 Height Adjustment Capabilities

Size	Child	Ladies	Mens	Height
XXXS	9-12			8mm, 13mm or 25mm
XXS	13-2			
XS	3-5			
SMALL		5.5-8.5	6-8	1/2", 3/4" or 1-1/4"
MEDIUM		9-11	8.5-10	
LARGE		11.5-13.5	10.5-13	
X-LARGE		14+	13.5+	

OPED
Keeps you going.

OPED Medical, Inc.
5212 Belle Wood Ct
Buford, GA 30518
(800) 334-1906

www.opedmedical.com

Allard USA 46 888/678-6548 allardusa.com	Darco 8 800/999-8866 darcointernational.com	O&P Solutions 43 800/922-5155 oandp.solutions.com
Allied OSI Labs 26 800/444-3632 alliedosilabs.com	Digitsole Pro 6 digitsolepro.com	OPED Medical 56 770/945-0150 opedmedical.com
Amputation Decision Aids 20, 21 amputationdecisionaids.com	Footmaxx 4, 44 800/779-3668 footmaxx.com	Ortho-Rite inside back cover 800/473-6682 ortho-rite.com
Arize back cover arizeclinical.com	GAITRite 51 888/482-2362 gaitrite.com	Orthotica Labs 12,37 888/895-1305 orthoticalabs.com
Bauerfeind 32 800/423-3405 bauerfeind.com	Insightful Products 16 insightfulproducts.com	PFA 17 229/389-3440 pedorthotics.org
Biomedix 41 888/889-8997 biomedix.com	Kinetic Research 27 800/919-3668 kineticresearch.com	ProtoKinetics 48 610/449-4879 protokinetics.com
Cascade DAFO 22, 54 800/848-7332 cascadedafocom	lerEXPERT 28 518/221-4042 lerMagazine.com/expert	Surestep 31, 53 877/462-0711 surestep.net
CASPR Group 14 viruskillertechnology.org	lerMARKETPLACE inside front cover 518/221-4042 lerMARKETPLACE.com	XSENSOR 34 403/266-6612 xsensor.com
Celia Ruiz 11, 24 410/206-8890 celiaruizusa.com	Medical Specialties 55 800/582-4040 medspec.com	X-Strap 30 845/233-4713 x-strap.com
CustomComposite 20 866/273-2230 cc-mfg.com	Northwest Podiatric Laboratory 38 800/675-1766 nwpodiatric.com	

Please Support our Advertisers...
Visit us online at lermagazine.com

Because of them, we are able to provide you with this
unique, informative and invaluable magazine!



New & Noteworthy

Noteworthy products, association news, and market updates

COMPEX AYRE COMPRESSION BOOT



The Compex Ayre Compression Boot was developed for physical therapists, coaches, and elite and recreational athletes, and is used for rapid recovery of aching muscles, muscle swelling, and vein issues. Designed to help improve blood flow and circulation in the legs by mobilizing lactic acid, excess fluids, and other toxins, the compression boot uses a dynamic pulsing compression that starts with the feet and moves all the way up to the thighs for the duration of its use, which helps promote quick healing. The intermittent pneumatic compression breaks up the small molecules that make up lactic acid and sends stimulus to the nervous system. The Ayre Compression Boot comes in 2 sizes: S/M - inseam 32" (81cm) or under, height = 6' (183cm) or under; and L/XL - inseam over 32" (82cm), height = over 6' (184cm).

Compex
877/266-7398
compex.com

DIRK NOWITZKI LAUNCHES SIGNATURE COMPRESSION LINE BY BAUERFEIND

Dirk Nowitzki, a German former professional basketball player who spent his entire 21-year NBA career with the Dallas Mavericks, officially launched the Dirk Nowitzki Signature Line by Bauerfeind at the American Medical Society

for Sports Medicine (AMSSM) Annual Meeting in April and was a special guest speaker for the session, Insights from Basketball Legend Dirk Nowitzki, a Symposium for Sports Medical Professionals.

Nowitzki has broken records, scored over 31,000 points, and is one of the players with the most minutes played in the entire NBA. Bauerfeind partnered with the NBA legend to develop the exclusive Dirk Nowitzki Signature Line with quality compression. Exclusively designed for the needs of basketball players, the line includes the Sports Compression Knee Support and the Sports Compression Arm Sleeve. Bauerfeind's targeted compression technology promotes blood circulation, improves muscle economy, and helps prevent injuries.

ADAPTTECH INSIGHT SYSTEM FULL PRODUCT RANGE



Adapttech's flagship product, the INSIGHT system, has been upgraded into a full product range, with several new options for orthotic and prosthetic (O&P) professionals. This includes INSIGHT Sense, an affordable, portable, and standalone real-time analysis pressure measurement system targeted at smaller O&P clinics to reduce hardware costs and help them provide house calls to remote patients. INSIGHT Digitizer is a standalone digitizer for prosthetic sockets that creates high-resolution 3D models and is targeted at central fabrication and large O&P clinic groups. INSIGHT Pro combines both the INSIGHT Digitizer and

INSIGHT Sense and is targeted at larger O&P clinic groups, central fabrication, and research facilities and universities.

Adapttech
800/888-0865 (Cascade Orthopedic Supply)
adapttech.eu

METEOR MASSAGE BALL



MyoStorm's Meteor is a recovery product for soft tissue and joint pain. This massage ball boasts 4 levels of vibration specifically designed to be therapeutic, a portable size and shape, and a heating feature, which reaches 120 degrees. The Meteor is popular among everyday athletes while also becoming a staple for many clinicians who have used it to help in a range of treatments including plantar fasciitis, shin splints, sciatica, and more. Its size and shape make it perfect for targeting stiff muscles, knots, and general soreness after workouts and it's calibrated for everyday aches and pains. The Meteor was created by a team of professional athletes, engineers, and doctors to be effective and versatile. Using hundreds of hours of research, the team designed the Meteor around the specific amplitudes and frequencies that scientific studies have shown to be effective at reducing pain and promoting muscle recovery.

MyoStorm
sales@myostorm.com
myostorm.com

SWIFT RAY 1



The Swift Ray 1 device wirelessly attaches to a smartphone camera and captures comprehensive clinical data to better support assessment, treatment, and monitoring of skin and wound conditions. This advanced imaging captures and analyzes important physiological characteristics of wounds that can indicate causes for concern and/or improper healing, such as signs of infection, bacterial colonization, tissue compromise, perfusion, inflammation, and blood oxygen levels, regardless of skin tone. The device works seamlessly with Swift Medical’s proprietary wound management software application and integrates directly into many of the leading electronic health records to help clinicians improve clinical efficiency and ensure all relevant medical information is recorded in the patient’s chart. The Swift Ray 1 supports a variety of use cases, including early detection of deep tissue injuries, prevention of pressure injuries, identification of wound infections and inhibited wound healing, and remote physiological monitoring of patients.

Swift Medical
888/755-2565
swiftmedical.com

EXOSKELETONS WITH
PERSONALIZE-YOUR-OWN
SETTINGS

Exoskeletons need to interact seamlessly with their user, providing the right level of assistance at the right time to cooperate with muscles as the user moves. To help achieve

this, University of Michigan researchers gave users direct control to customize the behavior of an ankle exoskeleton. Not only was the process faster than the conventional approach, in which an expert would decide the settings, but it may have incorporated preferences an expert would have missed. For instance, user height and weight, which are commonly used metrics for tuning exoskeletons and robotic prostheses, had no effect on preferred settings.



A study participant walks on a treadmill with a tablet that allows them to change the timing and torque of the exoskeleton they are wearing. Image courtesy of Kim Ingraham.

Experts usually tune powered exoskeletons to consider the varied characteristics of human bodies, gait biomechanics, and user preferences. This can be done by analyzing quantifiable data to minimize energy expenditure from a user, or more simply by asking the user to repeatedly compare between pairs of settings to find which feels best. However, what minimizes energy expenditure, may not be the most comfortable or useful. And asking the user to select between choices for numerous settings is time consuming and also obscures how those settings might interact with each other to affect the user experience.

By allowing the user to directly manipulate the settings, preferences that are difficult to detect or measure could be accounted for by the users themselves. Users could quickly and independently decide what features are most important—for example, trading off comfort,

power, or stability, and then selecting the settings to best match those preferences.

Tests have shown that when told to find their preference while walking on a treadmill, the users who had no previous experience with an exoskeleton were, on average, able to confirm their optimal settings in just under 2 minutes. In addition, user preference changed over the course of the experiment. As the first-time users gained more experience with the exoskeleton, they preferred a higher level of assistance. And those already experienced with exoskeletons preferred a much greater level of assistance than the first-time users.

These findings could help determine how often an exoskeleton needs to be retuned as a user gains experience and supports the idea of incorporating direct user input into preferences for the best experience.

HANGER, OTTOBOCK
REACH ENROLLMENT
MILESTONE IN ASCENT K2
CLINICAL TRIAL

Hanger, Inc. and Ottobock announced a critical enrollment milestone has been reached in the ASCENT K2 (ASsessing outComes with microprocEссор kNee uTilization in a K2 population) clinical trial. The study began enrolling patients in July 2021, and has now closed enrollment, having met the target enrollment of 100 K2-level community ambulators. The landmark 5-year clinical trial is collecting data that measures potential health benefits when microprocessor-controlled knees (MPK) are integrated into the care pathway for patients 65 and older. The enrollment milestone is double the size of any previous interventional trial assessing MPK use in K2 ambulators. The findings from this trial are designed to support new coverage policies, potentially providing expanded access to seniors with transfemoral limb loss.

The Hanger Institute for Clinical Research and Education and Ottobock have partnered with Hanger Clinic prosthetists from across

NEW & NOTEWORTHY

the country to accomplish this prospective randomized trial. As part of the study, half of the participants have been randomly assigned to have an Ottobock MPK integrated into their prosthesis. Specific data points being measured include health-related quality of life, participation in society and activities, fall rates, and participants' fear of falling. Participants will be assessed at various points throughout the clinical trial, with the initial primary analysis occurring once all subjects have completed the 12-month follow-up assessment. Longer-term follow-up will occur every 12 months for the duration of 5 years.

PROPRIOCEPTIVE TRAINING MAT



Naboso's textured mats are designed to improve posture, balance, and strength through stimulation of the nervous system through skin on the bottom of the feet, helping to benefit professional athletes and those with chronic neurological disorders like Parkinson's disease and multiple sclerosis. The 1.5mm Naboso Training Mat is catered toward barefoot weight training, kettlebell exercises, and lifting. The 1.5mm Naboso Pro Training Mat is best used in professional facilities for training or rehabilitation. It has been used by basketball, baseball, and football players to enhance postural control, reduce risk of injury, and aid in a faster recovery after an injury.

Naboso

347/705-0702
naboso.com

ACTIVE BUNION IMPLANT



CoLink Vallux™ Active Bunion is a new, minimally invasive, joint-sparing correction technique for moderate to severe bunions. Surgeons can correct joint alignment in multiple dimensions while avoiding any restriction of the joint space and not fusing the joint at the midfoot. The implant, a zero-prominence CoLink Vallux™ plate and a choice of non-locking and variable angle locking screws, and guided translational osteotomy technique improve on traditional open fixation approaches as well as newer bunion surgeries by providing surgeons with a simpler, faster procedure that can address over 90% of bunion cases. Active Bunion's small incision of 1–2cm and technique as a whole reduces internal scarring compared with other bunion corrections, decreasing typical postoperative stiffness, pain, and potential for wound complications. The procedure can typically be completed in about 20 minutes, compared to 40–60 minutes for other more invasive and complex corrections.

In2Bones

844/602.6637
i2b-usa.com

FLEXIBLE PRINTABLE ELECTRICAL PATCHES FOR ACCELERATED WOUND HEALING

Electrical field (EF) stimulation has been shown to accelerate wound healing with limited side effects. However, the wearable EF stimulation devices that have been devised to date use bulky, inflexible electrodes, resulting in conformational incompatibility with the wound. Fabricating these electrodes also requires dedicated technologies.

Now, a collaborative team from the Terasaki Institute for Biomedical Innovation (TIBI) has developed a 'smart' flexible electric patch (ePatch) that addresses the challenges posed by existing EF stimulation wound-healing devices and offers many advantageous features, in addition to being easy to make and cost effective.

The team chose silver nanowires as electrodes as they provide antibacterial properties and also deliver high conductivity under strain. They embedded the electrodes in alginate, a gelatinous substance that maintains good moisture levels and biocompatibility and is presently used in absorbent surgical dressings. By chemically modifying the alginate and adding calcium, they produced a material that would increase electrode stability and function. Further adjustment of the silver nanowire/modified alginate ratio enabled them to obtain a flexible, precisely printable bio-ink, which would produce a patch with customizable conformity to various wound shapes and sizes. In addition, the calcium induced cell proliferation and migration to the wound site, which in turn would promote blood vessel formation.



Mechanical tests demonstrated that the ePatch exhibited improved electrode stability and conductivity, and strain tests results showed good tolerance, on a level needed for normal skin deformation. Further, tests conducted on cells cultured on the ePatch showed that ePatches pulsed with EF stimulation exhibited significantly faster cellular proliferation, migration, aggregation, and alignment, as well as an increased secretion of growth factors—all factors that contribute to faster wound healing. The results of studies on rats with open wounds showed that significantly accelerated

wound healing results were obtained with the ePatch and there was also a more directional healing process, resulting in minimal scarring, deposition of normal skin layers, and hair growth following wound closure. Other experiments confirmed the antibacterial properties of the silver nanowire electrodes, independent of the amount of EF stimulation applied. Still other experiments found that the silicone component of the ePatch provided an effective, non-stick surface for cells, which helps minimize skin damage and excessive scarring.

X-COLLECTION PROSTHETIC COVERS



UNYQ has released a prosthetic cover that can be stocked up and fitted in a single visit. X-Collection covers are now available for OttoBock C-Leg4 and 3R80 models, with more to come. Available from UNYQ partner clinics around the world, the covers bring durability and protection to lower limb amputees who want to keep their prostheses safe but are not prepared to compromise on quality and stylish design. The U Design, with a black gloss finish, appeals as a timeless classic that's both elegant and contemporary. With minimum cutting to suit the end user, carried out by the clinician, X-Collection covers provide a suitable solution for the prosthetic leg user who is not looking for a full custom cover but wants to have the certainty of protection on their knee, as well as enjoying the benefits of better fitting clothes.

UNYQ

866/286-9773

unyq.com

FUELMEEFOOT LOW-CUT COMPRESSION SOCKS



FuelmeFoot's low-cut compression socks are designed to provide the support needed to relieve heel, ankle, and foot pain. The socks are fabricated using breathable, moisture-wicking fibers to keep feet dry. The reinforced heel and toe are designed for extra durability and comfort in high-wear areas. The hand-linked, seamless toe provides seam-free comfort. Targeted arch compression helps reduce foot fatigue and keep the socks from slipping down. The Y-stitch heel ensures a perfect fit with an extra-deep heel pocket, keeping the heel stable and secure. The socks are available in 2 sizes: S/M and L/XL. This product is great for people who sit or stand for long periods of time, runners, nurses, the elderly, travelers, pregnant women, and more.

FuelmeFoot

fuelmeFoot.com

WEBSITE FOR GAIT STRATEGIES FOR PARKINSON'S PATIENTS LAUNCHED

Radboud University Medical Center, Nijmegen, Netherlands, launched a platform for people with Parkinson's Disease. It contains 7 gait strategies that can help Parkinson's patients with walking. The website has been developed for patients, their loved ones, and Parkinson's healthcare providers. It is dedicated to the creative ways to improve gait.

The platform offers a video overview of the known gait strategies, including background information. In addition, individuals have the opportunity to contribute to this overview by sending in videos of their own successful strategies. In this way, this website forms an interactive platform where people with Parkinson's disease and healthcare professionals can learn from each other.

Among the strategies discussed on the website are: Changing the Balance Requirements, Adopting a New Gait, Internal Cues, and External Cues. Also available is a downloadable poster with illustrations of 55 different strategies used by people with Parkinson's to improve their walking.



To access the website, visit www.radboudumc.nl/en/patientenzorg/aandoeningen/ziekte-van-parkinson/walking-with-parkinson.

THE BANANA IS THE #1 FRUIT FOR ATHLETES. WHAT DOES THE SCIENCE SAY ABOUT IT?

THE MULTIPLE ADVANTAGES OF BANANAS FOR THE ATHLETE

References: Nieman et al. PLoS ONE 2012, 2018 Designed by @YLMSportScience

Images provided by PresentArtMedia

One medium banana (~120 g) contains 105 kcal, ~27 g carbohydrate (half as sugars), ~3 g dietary fiber and is a good source of potassium and vitamin B6

The ~15g sugars in a medium banana are a mixture of glucose, fructose and sucrose, what is interesting for long-duration efforts

The glycemic index of bananas is 51 (low-to-medium rating), like pineapples, raisins, orange juice, and honey

The antioxidant value of bananas is similar to kiwi fruit and orange juice

The soluble sugar content increases during ripening. Most carbohydrates in green bananas cannot be digested and should be avoided on race day!

... and for attenuating metabolic perturbation and inflammation following heavy exertion

Banana has been shown to be as good as 6% CHO sport drink to improve performance during a 2h30 time-trial

In contrast, 21 days is the 'ideal' ripeness [yellow color with potentially some brown specks starting to appear]

The soluble sugar content increases during ripening. Most carbohydrates in green bananas cannot be digested and should be avoided on race day!

Source: Nieman DC, Gillitt ND, Henson DA, et al. Bananas as an energy source during exercise: a metabolomics approach. PLoS ONE. 2012;7(5):e37479. <https://doi.org/10.1371/journal.pone.0037479> and Nieman DC, Gillitt ND, Sha W, Esposito D, Ramamoorthy S. Metabolic recovery from heavy exertion following banana compared to sugar beverage or water only ingestion: A randomized, crossover trial. PLoS One. 2018 Mar 22;13(3):e0194843. <https://doi.org/10.1371/journal.pone.0194843>.

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.

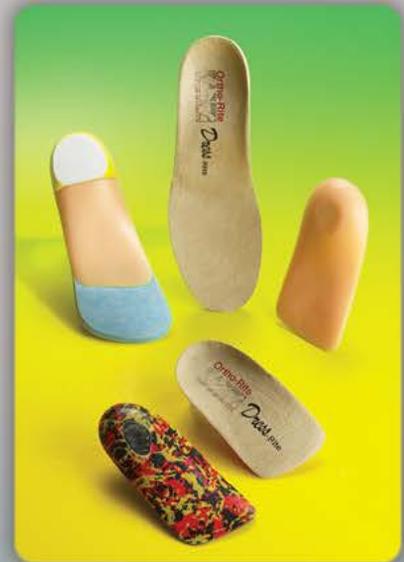
Call Us

*Never hang up
unhappy*



800-473-6682
www.ortho-rite.com

*Here are some of our
orthotic products:*



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



***Productivity made
easy – scan to submit
in 5 minutes***

*See more patients by boosting
your clinic's efficiency.*

Discover more at
ArizeClinical.com

