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Treating Heel Pain: A 2018 Update

Find out how the experts approach the most common of all podiatric presentations.

BY MARC HASPEL, DPM

By most accounts, the complaint of heel pain is the most common one of presenting patients in a typical podiatric practice. Headed by the diagnosis of plantar fasciitis, there can be many causes for pain in this part of the foot. Fortunately, podiatric physicians are well-armed to handle this symptom. To begin with, once patients arrive with heel pain, there are a variety of effective diagnostic modalities, including superior imaging beyond plain radiographs, such as diagnostic ultrasound and MRI, and certain blood tests that can be ordered to help determine the root cause. Some physicians even order neurologic testing when indicated. Once a diagnosis is made, there are even more options available when establishing a treatment plan.

These options usually start with established conservative measures including taping, stretching and icing, use of night splints and/or wraps and the prescribing of anti-inflammatory medication in oral, injectable and topical form. Of course, the fabrication and dispensing of custom orthoses still remains a cornerstone of these conservative measures. In addition, effective orthotic therapy is usually coupled with appropriate shoe therapy. Further, treatments may continue on to more advanced non-invasive techniques such as shock wave therapies, platelet-rich plasma (PRP), and the use of new injectable amniotic agents that have recently become popular. Lastly, podiatric physicians may turn to direct invasive surgical procedures such as percutaneous tenotomy, endoscopic plantar fasciotomy and open procedures in very resistant cases.

Podiatry Management Magazine has invited several notable podiatric physicians to participate on this roundtable panel to discuss heel pain. These panelists, each with a varied area of concentration in podiatric medicine, have graciously taken the time to share their insights.

Joining this roundtable panel are:

Allen Jacobs, DPM is in private practice in St. Louis, Missouri. He is board certified by the American Board of Foot and Ankle Surgery, is a Fellow of the American College of Foot and Ankle Surgeons and an inductee in the *PM* Podiatry Hall of Fame.

Doug Richie, DPM is an associate clinical professor at the California School of Podiatric Medicine at Samuel Merritt University. Dr. Richie is a Fellow and past president of the American Academy of Podiatric Sports Medicine.

Jeffrey Ross, DPM is a podiatric physician in Houston, TX specializing in diabetic foot amputation pre-

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vention and limb salvage. He is an associate professor in the division of Vascular Surgery and Endovascular Therapy in the Michael E. DeBakey Department of Surgery at Baylor College of Medicine. He graduated in 1979 from New York College of Podiatric Medicine. He later fulfilled a two-year residency with the Harris County Podiatric Residency Program, Podiatric Medicine and Surgery. Seeking to expand his knowledge base even further, Dr. Ross graduated with his Doctor of Medicine degree from the University of Health Sciences, Antigua School of Medicine in 2003.

Lisa Schoene, DPM is a sports medicine podiatric physician practicing in Chicago and Gurnee, IL. She is board certified with the American Board of Foot and Ankle Surgery and the American Board of Podiatric Medicine, and is a certified athletic trainer. She treats many athletes, runners, and dancers. She works with many dance companies in the Chicagoland area, and has been the podiatric consultant to the DePaul Blue Demons for the past twenty-six years.

Lowell Weil, Jr., DPM, is chief executive officer of the Weil Foot & Ankle Institute. He served as fellowship director from 2000—2017. He is also the founder of Foot & Ankle Business Innovations (FABI), which has been helping podiatric physicians around the country improve patient care and practice profitability while creating better work/life balance since 2014. He has published more than fifty articles and peer-reviewed papers on treatment of foot and ankle conditions and has lectured nationally and worldwide.

James Wrobel, DPM is a clinical associate professor of the Department of Internal Medicine in the Division of Metabolism, Endocrinology, and Diabetes at the University of Michigan. He received his DPM degree from the Ohio College of Podiatric Medicine. He completed a podiatric surgical residency at North Detroit General Hospital and is board certified by the American Board of Podiatric Medicine with Certificate of Added Qualification, Amputation Prevention & Wound Care. Dr. Wrobel has seventy-nine peer-reviewed and in-press publications with research interests including health services research, clinical epidemiology, and biomechanics of the diabetic foot.

PM: *How prevalent is heel pain in your practice? What key findings would you expect in taking a history and performing a physical examination on a patient complaining of heel pain?*

Richie: Heel pain is the most prevalent complaint of new patients presenting to my practice. Approximately one in three new patients present with heel pain.

The key part of the history is determining causative factors. For my athletic patients, there has usually been a change in intensity or frequency of training. I also often find that they have started a new activity, which often involves ballistic loading of the foot.

Also, a key contributing factor is improper footwear. This must be identified, and corrected, or else all treatment interventions will fail. Often, people overlook proper footwear in the home, yet stand for hours in the kitchen on a hard floor surface. I practice in a beachside community in southern California, where a barefoot or flip flop lifestyle is prevalent, which is predictably why I probably see so much heel pain.

As I am concerned about the overall health status of the patient, I always consider the possibility of an autoimmune-mediated inflammatory reaction at the plantar fascia origin or at the Achilles insertion. I make sure that my history recording takes into account any other areas of pain and swelling in the body, as well as any diagnosed autoimmune disease. I feel that all patients should be asked about stiffness in the low back in the morning, which may point to the possibility of ankylosing spondylitis.

I believe gait analysis is critical to the physical exam as it will demonstrate the severity of pain, presence of equinus, and abnormal alignment of the rear foot. The off-weight-bearing exam will confirm equinus as well as any other limitations of joint range of motion. Certainly, palpation is also critical to determine if the pain is located in the plantar fascia, or perhaps might be more medial and proximal at the inferior calcaneal (Baxter's) nerve. For that pathology, I always ask patients to spread their toes to activate their abductor digiti minimi brevis muscles. It is surprising how often these small muscles are compromised in patients who present with long-term chronic heel pain.

Wrobel: Heel pain is the dominant reason for a new patient referral. I ask about trauma or changes in activity levels, footwear, or types of activities. In my region of the country, I see this quite frequently when the seasons change and people drastically change their footwear and activities. These times include during spring and fall cleaning, with ladder use, or use of shovels, etc. I focus on the usual history of present illness variables including quality, and quantity, of morning pain with the first few steps and later day pain. I definitely want to know what these patients have tried in the past, and how beneficial (or not) those treatments were. For the physical exam, studies suggested that severity of equinus, and heel valgus, were predictors of treatment failure. I examine for pain with dorsiflexion of the ankle and digits, palpate the plantar medial fascial band, plantar central tubercle of the calcaneus, and compress the medial/lateral aspects of the calcaneus. I, too, will also observe for any inflammatory changes,

"I always consider the possibility of an autoimmune mediated inflammatory reaction at the plantar fascia origin or at the Achilles insertion."—Richie

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and look for increased vibratory sensation of calcaneus. I will also percuss the tibial nerve, and use neural stretch with dorsiflexion and eversion.

Jacobs: Obviously, plantar fasciitis represents a common pathology encountered in the daily practice of most podiatric physicians. Key findings include a history of post-static dyskinesia, and inferior heel pain. I find that the absence of significant swelling or discoloration are equally important. The presence of painful compression of the calcaneal body might suggest stress fracture, and the presence of fluctuance, or crepitus, might suggest bursitis. It is important to listen carefully to patients for any characteristics of their pain suggestive of a neurologic ideology. It's also important to rule out sciatica, Baxter nerve entrapment, calcaneal nerve entrapment, and tarsal tunnel syndrome.

Schoene: To be sure, heel pain is a very common diagnosis with which patients present in my office. If their pain is at the medial plantar aspect of their heels, then pathology of the plantar fascia is suspected at first. The key signs and symptoms include pain at the medial plantar tubercle, and sometimes along the band. These patients may complain of foot or leg tightness or cramps, but often absent are warmth, swelling, ecchymosis, nighttime pain. Common etiologies of plantar fasciitis that I find are: increase in activity from work, or exercise, increasing body weight, either from directly gaining weight, or prolonged lifting/carrying. The third common etiology is absence of footgear and poorly fitting, old, or unsupportive footwear.

Weil: Plantar fasciitis happens to be the single most common problem for which people are seen in the Weil Foot & Ankle Institute. As such, I think getting a good history is one of the key components in diagnosing heel pain. Too often, people are diagnosed with plantar fasciitis without taking a good history of the present illness. The key things that I ask are some of the most obvious: like pain first steps in the morning, or after prolonged sitting. I have found, however, that asking more specific questions like at what time is the pain the worst, or whether there is pain while driving, or during sedentary activities such as watching television or reading, can be important. Moreover, I want to know if there is pain the longer the patients are on their feet such as on line in a store. Further, I question them whether shoes, arch supports, or orthoses help the problem. I ask about the presence of back pain. Certainly, I feel that relevant questions can help narrow down some of the different causes of heel pain.

"It is important to listen carefully to patients for any characteristics of their pain suggestive of a neurologic ideology."—Jacobs

From an examination perspective, pain at the plantar medial heel or inferior heel can be plantar fasciitis. Side-to-side compression of the calcaneus can help determine if there is pain coming from the calcaneal body, possibly indicative of stress fracture or stress syndrome. Pain on stimulation to the tarsal tunnel, porta pedis or calcaneal branches of the tibial nerve are also indicators of possible neurologic contributions to heel pain. I also find pain in the body of the plantar fascia to be rare, and usually a sign of a neurologic factor related to pain.

PM: *What diagnoses are included in your differential for a patient with heel pain? What diagnostic studies would you order (e.g., diagnostic ultrasound, blood work, MRI, etc.)?*

Ross: The diagnoses that I include in my differential for patients with heel pain are usually the following: a) fracture of the calcaneus, b) tear or partial tear of the

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plantar fascia, c) septic arthritis, d) periostitis of the calcaneus, e) rheumatoid arthritis, f) entrapped medial calcaneal nerve branch, g) Sever's disease or calcaneal apophysitis in the adolescent, h) unicameral or aneurismal bone cyst.

The diagnostic studies that I typically will order are: x-rays, particularly lateral and posterior axial views, to rule out fracture, MRI to rule out thickening of the plantar fascia, nerve entrapment, medullary edema of the calcaneus. CBC with differential and sedimentation rate to rule out infection or septic arthritis, RA factor C-reactive protein to rule out inflammatory response for rheumatoid arthritis.

Wrobel: The diagnoses I consider include arthritic spur sensations such as ankylosing spondylitis, spinal stenosis, fat pad atrophy or morphology changes, compression neuritis, stress fracture, bone tumors, etc. If I am suspicious of other causes, I will get a plain x-ray. If I am concerned about various forms of arthritis, I may consider a lab work-up. For chronic conditions, suspicious-looking space-occupying mass in the porta pedis, or signs of trauma, I may consider an ultrasound. If I am concerned about stress fracture, I choose an MRI.

"My favorite diagnostic test in addition to traditional weight-bearing x-rays, is diagnostic ultrasound."—Schoene

Schoene: The differential diagnoses for heel pain I consider include: plantar fasciitis, hypertonic plantar fascia, plantar fibroma, fibro-adipose nodules, medial calcaneal nerve impingement, radicular issues from the lower back, posterior heel issues, i.e., insertional Achilles tendonitis, or exostosis pain issues. Occasionally a patient with an autoimmune-driven enthesiopathy condition may present to the office. My favorite diagnostic test in addition to traditional weight-bearing x-rays, is diagnostic ultrasound. I refer patients out for the test, as I am fortunate to have a very experienced musculoskeletal ultrasonographer near my office. This test affords excellent soft tissue evaluation, and functionality. This physician also measures the thickness

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and detailed evaluation of the fascial fiber alignment, and can pick up very small tears down to less than 1 mm. I rarely order blood work, unless I suspect gout or an autoimmune issue.

Jacobs: Beyond standard x-rays, for the patient with recalcitrant heel pain, my go-to test would be an MRI. MRI would be helpful for the diagnosis of any type of osseous pathology as well as soft tissue pathology such as bursitis. In the presence of a nerve entrapment, the MRI may demonstrate atrophy or deterioration of the intrinsic musculature. In the absence of inflammatory changes in the plantar fascia, an MRI might suggest the possibility of a less common ideology to the heel pain.

Weil: Plantar fasciitis, calcaneal stress syndrome, calcaneal stress fracture, nerve entrapment, and radiculitis make up ninety-nine percent of the heel pain I see. I would order bilateral weight-bearing x-rays. I believe that if patients have long-standing heel pain or multiple previous heel pain experiences, I would expect there to be inferior bone spurs. An absence of heel spurs leads me in the direction of other causes of heel pain such as neurologic. If there is long-standing heel pain that has not responded to previous appropriate care, or substantial pain, I order an MRI. An MRI can help determine whether there is pathology in the plantar fascia, the morphology of the plantar fascia to determine best treatment options, microfracture and bone marrow edema in the calcaneus, stress fracture of the calcaneus, degenerative abductor digiti minimi (neurologic component), mass in the tarsal canal, or some unusual findings. I find MRI far more useful than ultrasound in diagnosis-recalcitrant heel pain. I will order EMG/NCV when history and clinical symptoms indicate. On the other hand, I rarely order blood work.

Richie: I think it is safe to assume that ninety percent of patients who present with plantar heel pain actually have plantar fasciopathy. I rarely order any diagnostic tests other than plain radiographs on the initial office visit for patients who present with plantar heel pain. Entrapment of the inferior calcaneal nerve (i.e., Baxter's nerve) would be the second most likely cause of plantar heel pain, and is often seen in combination with chronic plantar fasciopathy. Stress fractures of the calcaneus are rare. I have a very busy sports medicine practice, and I see less than one calcaneal stress fracture per year. I commonly see bone marrow edema on MRI in patients with severe chronic plantar fasciopathy, and this could be considered a form of a stress reaction or

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fracture. Patients with severe plantar heel pain are going to be treated the same, with or without MRI. I would order ultrasound, and MRI, if all treatments had failed and I was contemplating radiofrequency nerve ablation, or possibly plantar fasciotomy.

Q ***PM:*** *Assuming you have a patient with plantar fasciitis, what conservative treatment do you order? How effective are strappings, tapings, night splints, and plantar fasciitis sleeves for this condition?*

Weil: I have a standard, evidence-based protocol that I utilize for heel pain on initial presentation. It starts with recommending proper footgear. Shoes with higher heels relax the equinus, and unload the heel and plantar fascia, which provides relief. Running shoes are best. I tell patients to avoid low heels, sandals that are flat, slippers, and bare feet. All patients are urged to purchase medical grade arch supports from our retail store and/or recommended to get custom orthotic devices. The arch supports can be sufficient as a starting point, but even when orthotic devices are needed, getting them arch supports for the time it takes the devices to be ready is important. I do not tape and strap. I have personally found that patients prefer the arch supports than tape on their skin. I dispense a night splint at the initial visit for nearly all patients with plantar fasciitis. This has evolved over my career, as research has corroborated its use, and it is now a mainstay in my treatment. I also refer patients to physical therapy as a rule. I start patients on NSAIDS, and recommend icing. I also educate them on proper non-weight-bearing exercise until the problem is under control.

"Shoes with higher heels relax the equinus, and unload the heel and plantar fascia, which provides relief. Running shoes are best."—Weil

Ross: For a patient with a diagnosed plantar fasciitis, the conservative treatments that I order are as follows: icing, using a frozen water bottle, stretching, night splints, not ambulating barefooted, wearing arch-supportive flip flops in the house at the minimum. I prefer deep cross friction massage, physical therapy modalities, low energy nerve stimulation, ultrasound, low dye strapping, temporary insoles in advance of prescription orthotic devices, and non-weight-bearing for short periods, even via the use of a knee scooter or pair of crutches. I do turn to therapeutic steroid injections in cases of extreme pain, or after other modalities that have been attempted have had limited success. I also like platelet-rich plasma injections, and occasionally, amniotic stem cell injections. I order shock wave therapy after previous therapies fail. Non-steroidal anti-inflammatory oral and topical cream medication also have an important role.

Taping is very effective for a short period of time after administration. The patients usually quickly state the foot feels better following taping after taking a first step. Night splints also have truly been one of my most effective therapies.

Wrobel: I find my initial treatment plan really depends on what the patients have tried in the past. Initial management certainly depends on severity of pain. With severe pain that is being worked up with ultrasound or MRI, I may start with a CAM boot. For moderate pain levels, I will use just about everything else. I will typically give them a home program for stretching and direct ice massage that was validated in our plantar fasciitis study. These modalities alone have been proven to result in a significant reduction of pain before patients acquire their orthotic devices and shoes. I am also a big fan of physical therapy that consists of deep tissue massage, ultrasound, and stretching. I also favor this modality when chronic conditions exist that may influence the onset or outcome, such as posture, gait, mobility restrictions, strength asymmetries, etc. Sometimes, I may go with a pre-fabricated foot orthosis. I will also prescribe a custom foot orthosis, and the prescription is dependent on the patients' activities and body habitus. Our data showed that patients were more active sooner, and use less ice in the custom foot orthosis prescription group.

"With severe pain that is being worked up with ultrasound or MRI, I may start with a CAM boot."—Wrobel

I will use plantar fascia night splints, especially with significant morning pain. Typically, I will have them wear these during the evening hours the first week, and try sleeping with it at night the following weekend. I will use taping and strappings on occasion, especially with the popularity of kinesiotape. I find that podiatric physicians sometimes tend to overlook this strategy. In our plantar fasciitis study, patients treated with a removable longitudinal metatarsal pad reported significant improvement in pain before receiving the shoes and orthoses. If there is significant inflammation, I will sometimes go with an Unna boot and application of external functional tapings, such as a Campbell's, low dye, and/or J strap.

Schoene: I tell patients I have a "recipe" for treating plantar fasciitis; I feel, as podiatric physicians, we need to treat acute foot pain, and

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get patients out of pain as soon as possible. My regimen includes corticosteroid injection and icing, coupled with mechanical treatments which are the most important. I use longitudinal and metatarsal arch pads, calf stretching, and heels with high profile for all patients. I advise against barefoot training. In fact, I recommend cross training only, with no running or fitness walking. If my patients are not at least seventy-five percent better in one visit, we add more treatments on the second visit while continuing the regimen for the first visit plus physical therapy treatments, including myofascial therapy, ultrasound, class III or IV laser, ball rolling, and use of night splints.

If the compliant patients are not eighty percent better by the third visit, I order the diagnostic ultrasound tests, and decide if I need to change directions into more chronic mode protocols. I find the longitudinal and metatarsal arch pads are my most prized part of the treatment plan. I make them for just about every mechanical issue patients present with at the office. After making probably twenty thousand pads over the years, patients continue to rave about their effectiveness. They act, of course, as a precursor to fabrication and dispensing of custom orthoses.

Richie: One of my mantras when I lecture on this subject is the fact that podiatric physicians are the best specialists to treat plantar heel pain based upon knowledge of the contributing factors, and are able to directly implement all of the effective treatment interventions. Still, I see many of my colleagues treating the new patient with plantar heel pain exactly the same as any primary care physician would, with instructions for stretching, icing, massage, use of night splints, and perhaps, recommending an over-the-counter arch support. All of this information can be found on the Internet. I believe that chances are that the patient has already tried these interventions. Therefore, I feel that this condition must be treated as a biomechanical disorder.

Research has shown that there are three mechanical factors which cause overload of the plantar fascia: excessive tension on the Achilles, abnormal arch mechanics, and dysfunction of the windlass mechanism. Podiatric physicians should be able to evaluate and determine the contribution of any three of these factors, and then intervene appropriately.

The Achilles tendon often needs to be neutralized with a heel lift. The arch needs to be stabilized with strapping. This is mandatory on the first visit, and I often teach patients how to self-tape. The windlass load may be neutralized with stiff sole shoes or rocker bottom shoes such as the Hoka. A walking boot can neutralize the Achilles tendon and contains a rocker sole, and sometimes is required for severe cases of plantar heel pain.

PM: *What role do non-steroidal anti-inflammatory medications play in your treatment of plantar fasciitis? Do you use Medrol dose packs in your treatment plan?*

Jacobs: Typically, if prescribing oral steroids, I will utilize prednisone 40 mg daily for three days, then slowly taper patients off with a small dose every three subsequent days. If I choose to order an anti-inflammatory medication, I will use a long-acting one, such as piroxicam. More frequently, I will utilize a topical anti-inflammatory together with a local anesthetic in the form of a compounded medication.

Wrobel: I will also use these medications on occasion depending on the severity of pain and would prefer a single daily dosing strategy, but limit the treatment course to four to six weeks. I rarely use the Medrol dose pack.

Weil: I standardly prescribe non-steroidal anti-inflammatory medications. NSAIDS help reduce pain in a non-habit forming way, which is critical in today's environment, reduces swelling, and breaks the pain cycle. Normally, people want prescriptions instead of being told to take over-the-counter medications. I do use Medrol dose packs occasionally when pain and swelling dictate and there is no fracture, but that is rare.

"I try to avoid oral medication, particularly in cases of chronic kidney disease, or in the patient who has a pain level of six or above. Conversely, I routinely prescribe topical anti-inflammatory medication."—Ross

Richie: There is a big difference between the effectiveness of non-steroidals as compared to steroids when treating plantar heel pain. Many studies have verified that there is minimal evidence of inflammation in plantar fasciitis, thus the reason for the term plantar fasciopathy. Compared to NSAIDS, steroids have potential to reverse collagen hyperplasia, which occurs commonly in plantar fasciopathy. If the mechanical load on the plantar fascia is minimized, steroid therapy, both oral and injectable, can be very helpful in the treatment. That is why in the literature, steroid injections, not NSAIDS, are always cited as the most effective treatment of plantar heel pain.

Ross: Non-steroidal anti-inflammatory medications both oral and topical play a strong adjunctive role in the treatment of plantar fasciitis. I try to avoid oral medication, particularly in cases of chronic kidney disease, or in the patient who has a pain level of six or above. Conversely, I routinely prescribe topical anti-inflammatory medication. Moreover, I try to avoid prescribing Medrol dose packs in my treatment plan. I prefer not using steroids, since they only mask the problem, and inhibit the healing process. I prefer the platelet rich plasma or amniotic stem cell

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injections to stimulate growth factors in order to jump-start the healing process.

Schoene: I actually do not prescribe any oral medications for most of the musculoskeletal conditions at my office. I prefer injection therapy at the site of the problem.

PM: *When do you turn to administering injectable corticosteroids for plantar fasciitis, and what is the course of your injection therapy? Where do you prefer to locate the site of the injections? When would you discontinue this therapy?*

Schoene: I use a corticosteroid injection as my first line treatment for each patient, but only along with the other mechanical treatments. I find that it is not only therapeutic, but also diagnostic. If the patient does well with the first round of treatments on the first visit, then I think the problem is acute. I believe, then, that it will most likely resolve quickly with a bit more care and time. If, on the other hand, the patient returns, claiming complete compliance, but reporting very little relief, then I change direction towards a more chronic mode protocol. If the patient is about between forty to sixty percent better, I will consider a second steroid injection, but always add the additional treatments, along with my original protocols. I typically administer the injection from the medial side at the insertion point. On occasion, I will administer the injection directly plantar, if I suspect or receive an ultrasound report back that there is a fibro-adipose nodule, since the injection directly into the nodule typically resolves pain very quickly.

Wrobel: Based on our study, I would use this strategy if there is a biconvexity pattern on diagnostic ultrasound imaging. I will also use it with refractory cases to all the above strategies described, and if there is a focal trigger point. I prefer to administer this injection medially. If there is no response to the first two injections, however, then I will typically not continue this strategy.

Ross: When I do administer steroid injections, which I do rarely, for plantar fasciitis, I will use Decadron phosphate 1 ml, Marcaine 0.5% plain 1.5 ml, Xylocaine 1% plain 1.5 ml, Vitamin B-12 1 ml. The first injection is for extreme pain with a level of eight to ten, or after conservative modalities have not proven to be successful with the pain level not being reduced to a four or less. After a first injection, a second may be attempted two to four weeks later, and no more than three injections are given in total. My preferred point of injection is the medial aspect of the heel at the medial band, and at the insertion of the plantar fascia to the calcaneus. After the first injection, or possibly the second injection, if there has been no significant improvement, then I, too, would discontinue the injection therapy.

Richie: I am very likely to inject corticosteroids on the initial visit of a patient with plantar heel pain, particularly if the symptoms have been present for over two months. Although there are documented cases of rupture after steroid injection, I have never seen one my thirty-seven years of practice. I actually have seen at least twenty cases of spontaneous rupture of the plantar fascia in an athlete who never had received a steroid injection.

I would never inject a steroid, however, without addressing the mechanical causes of plantar fascia overload, so taping the arch is mandatory on the day of the injection. I try to limit the injections to one time only. If I do two, or rarely three injections, I space them at one month apart. My injection is 0.5 cc Celestone Soluspan mixed with 2 cc 0.5% Bupivicaine, administered under a posterior tibial nerve block. This allows me to target the point of maximal tenderness marked out before the block, and using a plantar approach to the target, rather than a medial approach. I inject directly into the fascia itself, not above or below it.

Jacobs: In recalcitrant cases, I first will reconsider the leading diagnosis. When an injection is indicated, I will inject through a medial approach. Personally, I do not utilize ultrasound guidance as the literature available does not suggest there is any benefit to the use of ultrasound guided heel spur injections versus touch-guided injections.

"With more research showing the deleterious effects of cortisone, I'd rather find regenerative ways to help patients."—Weil

Weil: As my career has progressed, my utilization of cortisone injections for plantar fasciitis has substantially lessened. I have found that most cases are manageable without cortisone. With more research showing the deleterious effects of cortisone, I'd rather find regenerative ways to help patients. I also almost never perform an injection on initial presentation. Ironically, my belief is I am doing a disservice to the patients in making them immediately pain-free. If they become pain-free, most of them will not follow the directions of mechanical change of footgear and orthotic support, and improving their condition of equinus. Then, when the injection wears off, they are in worse shape.

Interestingly, there are virtually no studies validating the benefits of cortisone injections for heel pain. In the unusual event that patients have complied with previous treatments, and have not responded, having continued pain and swelling, I will utilize a cortisone injection. I will rarely perform a second injection. I use a combination of 1.5 cc of 0.5% Marcaine plain, 0.5 cc of dexamethasone and 0.5cc of Kenalog in a 3cc syringe, and a thirty-gauge needle. Under ultrasound guidance, I intro-

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duce the needle from directly medial and inject the contents between the plantar fascia and calcaneus.

Q ***PM:*** *What physical therapy modalities would you order in treating plantar fasciitis? Do you perform these treatments in-office, have a physical therapist on staff, or do you refer them out?*

Ross: I typically would order physical therapy modalities consisting of nerve stimulation, ultrasound, deep cross-friction massage, eccentric contraction stretching, and occasionally sport laser. At one time, in my practice, I perform the physical therapy modalities myself, or have my assistant perform them. Now, however, I refer the patients out to a physical therapist and physical therapy facility. I will check periodically as to their progress, and to determine if there has been a reduction in the pain level.

Wrobel: As previously mentioned, I am a very big fan of physical therapy for this condition for the reasons that I have outlined. I am fortunate to practice in a hospital system that has access to several excellent physical therapists as well as modalities, so I don't use them in the office.

Richie: We happen to have an in-house physical therapy team. The team is integral to our success in treating heel pain. I always tell my patients that I have never seen physical therapy not help heel pain. Therapeutic massage is probably the key ingredient, followed by ultrasound.

Schoene: We also offer many physical therapy treatments in our office and make them a very integral part of the protocol, for plantar fasciitis, i.e.: various manual massage techniques with massage therapists, ultrasound, electric stimulation, class III and IV laser treatments, kinesiology tape, and sometimes Tens units. These all work very well when integrated with the traditional podiatric protocols. The staff in the office can administer most of the treatments.

"With regard to physical therapy, I rely upon simple splinting, stretching, and range of motion exercises."—Jacobs

Jacobs: With regard to physical therapy, I rely upon simple splinting, stretching, and range of motion exercises. Iontophoresis and ultrasound have been shown to be of some benefit for treatment of recalcitrant heel pain.

Weil: I think impacting the posterior muscles and tendons is critical here. In my mind, it is all about loosening that tissue through stretching, manual manipulation, and stimulation. Also, building strength in the extremity is important. Often, the hip flexors are weak, which can impact everything. We have physical therapists on staff who take care of ten to fifteen percent of our patients who need physical therapy. The rest are referred out.

Q ***PM:*** *What role does orthotic therapy play in treatment of heel pain, and how are orthotics biomechanically effective in treating this condition?*

Richie: I am a big proponent of custom foot orthotic therapy in treating plantar heel pain. I realize that there are several studies published that show no superiority of custom foot orthoses over pre-fab devices in treating plantar heel pain. That has not been verified, however, by my own experience. At least half of new patients presenting with heel pain in my practice are already using some type of pre-fab arch support, which has failed to resolve their pain. Regardless of what some research shows, custom foot orthotic therapy following Root principles will give positive results ninety percent of the time, in my experience. Patients should be casted non-weight-bearing, with a neutral suspension technique, everting the forefoot on the rear foot as much as possible. Pushing down on the first ray will assure pronating or everting the forefoot during the casting procedure. The lab should intrinsically balance the positive cast to capture this position. The everted forefoot will offload the plantar fascia, as research has shown.

"A soft material accommodative insole is not what I consider a true functional orthotic device."—Schoene

Jacobs: I believe that orthoses represent a mainstay of long-term management. In the pronated foot, I typically will treat the patient utilizing 5° of hind foot varus with an extrinsic post, and 3° forefoot with an intrinsic posting. I will typically include heel spur padding with the orthotic device. With a high arch or more rigid foot, I usually line the orthotic device with shock absorbable material and adjust material distribution into the arch to offload the medial arch of the foot.

Schoene: I feel orthoses are a very important tool that all podiatric physicians should be utilizing for all musculoskeletal conditions that they treat. Podiatric physicians should be considered as the experts in biomechanical evaluation of the foot and ankle, as it relates to overall skeletal health. Having said this, I feel there is a timing issue as to when to dispense the devices to patients with plantar fasciitis. I prefer to use a true functional orthotic for this patient category, which I consider to be a rigid or semi-rigid device that corrects all biomechanical faults and

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supports the body weight properly. The orthoses should be evaluated, measured, and fabricated with a meticulous impression technique. Of course, a soft material accommodative insole is not what I consider a true functional orthotic device.

Until the heel pain is at least ninety percent improved, patients will often complain that the controlling custom orthotic devices are not comfortable, and the treatment plan will backfire. For the patients demonstrating tight gastroc-soleus musculature, often the compensation is to pronate at the mid-tarsal joint. The firmer device will not allow the compensation to occur, so typically the plantar and posterior heels might naturally become irritated once again. Because of this scenario, I prefer to use the longitudinal and metatarsal pads until at least that ninety percent improvement has been obtained. I then gradually ease my patients into the new devices, very slowly. I have found this approach to be more comfortable for them as it allows their feet to accommodate to the new desired alignment. For this reason, I always instruct patients to increase their stretching routines when breaking in orthotic devices.

Ross: The role of orthotic therapy is extremely important, and is an effective adjunct in the treatment of plantar fasciitis. It is a standard course of treatment for my patients with this condition. From a biomechanical standpoint, if my patients have pes planus, or are excessive pronators, orthotic devices will be of great benefit, contrary to some evidence-based studies. I will biomechanically evaluate all of my patients, taking measurements, and conduct a mat scan pressure gait analysis to determine asymmetries, and any gait pathology. The prescription orthoses should biomechanically allow for sub-talar joint neutrality, yet provide the ability to pronate and supinate, while maintaining a stable medial column and mid-tarsal and talo-navicular joint. Concomitantly, they should provide forefoot stability in cases of forefoot varus, or forefoot valgus. Other modifications I have ordered for patients with a functional hallux litmus include a first ray cut out and Morton's extensions. I typically add a heel pad bilaterally for all patients with chronic heel pain.

Wrobel: Based on the results of our randomized study, the custom foot orthosis group demonstrated significantly faster return to activity than other groups, and those patients reported less of a need to use direct ice massage. Describing orthoses as biomechanically effective is a broad term that encompasses changes in kinematics, kinetics, and muscle activation magnitude and timing. In healthy subjects, kinematic and kinetic differences with use of custom foot orthoses while running have been found. I do not believe there are studies that have looked at these variables with foot pathology, such as biomechanical etiologies from different foot types with pathological conditions, and then at the kinematic or kinetic changes before and after the use of orthotic devices.

It is also more difficult to detect differences with normal walking unless one uses invasive bone pins as done in select studies. There is literature that supports the use of custom foot orthoses for reducing pain in pes cavus foot types. Anecdotally speaking, I do use less functional foot orthotics for people who have increased standing times with their occupation or recreational activities. I will still use functional orthotics in those patients who are not custom foot orthotic-naïve, active in recreational activities, or have worn them in the past. I also believe they also have a significant role for foot type extremes.

Weil: Simply put, I feel that orthotic therapy plays a huge role. I, however, utilize a softer, tri-laminate device than typical functional devices. I have found that patients with heel pain respond much better to these softer, more forgiving devices. In my practice, we have an in-house lab that fabricates these types. It is important to note that when patients are not getting improvement with orthotic devices, the problem may have evolved from plantar fasciitis into more of a neurologic entity. I caution practitioners to not be so arrogant to tell their patients that their previous orthotic devices were not made correctly and that they can make a better pair of devices. In these cases, the devices might not be the problem; rather, an improper diagnosis may be.

Q ***PM:*** *What shoe therapies and modifications would you consider in patients with plantar fasciitis?*

Richie: Proper footwear is essential to complement all aspects of heel pain treatment. There are three key shoe components: a heel drop of twelve millimeters or more, a stiff shank, and a stiff stable forefoot with minimal flexion. Stiff, rocker style shoes have shown ability to offload the plantar fascia, and this design can be found in some athletic shoe designs. I like some of the Hoka shoe models as long as the heel drop is over twelve millimeters. Hiking shoes and work boots can provide these same criteria. For women, a wedge slide or clog with a thick forefoot platform can be ideal, but may not be suited for custom foot orthotic therapy intervention.

Schoene: I instruct patients to always wear shoes, even in the evening at home, instructing them to wear a very supportive shoe, sneaker, or slipper around the house. I suggest wearing the longitudinal and metatarsal pads with all shoes. For women, I ask them to wear heels as much as possi-

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"There is literature that supports the use of custom foot orthoses for reducing pain in pes cavus foot types."—Wrobel

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ble, and for men, to wear the highest heel profile shoe they have too. The shoe aspect of treatment is so important for resolution, and very helpful for symptom control. I feel that the athletic shoe industry's new standards of the low profile, zero drop, isn't helpful for plantar fascia or posterior heel conditions, so I, too, try to instruct patients to look for a higher heel drop for the duration of the treatment regimen.

Wrobel: I am a big fan of using orthopedic sandals as house shoes when immediately initiating activity such as rising out of bed. I find that it also depends on the foot type. Sometimes, I will use an accommodative foot orthotic device with a motion control shoe and rocker soles. Other times, I will use a neutral cushioning running shoe with a functional orthotic device. It is important to take advantage of the mechanical properties of each footwear strategy in conjunction with the patients' foot types.

Ross: For patients in need of shoe therapies, particularly for those with limb length discrepancies, heel lifts are very important. On occasion, additional heel padding, or medial wedges to create rear foot varus posting can be effective. For the lateral heel and forefoot striker, lateral phalanges have also proven to be effective.

Jacobs: In the majority of patients, I also recommend an elevated heel, and avoidance of flat shoes, as well as shoes that have no support within the insole. Frequently, I will also recommend a shoe that has good shock absorbency characteristics.

PM: *Some of the more advanced therapies for heel pain include the use of ESWT, EPAT, and cryosurgical units, as well as lasers; newer contenders include percutaneous tenotomy (e.g., Tenex, Hydrocision), amniotic membrane matrix, and platelet-rich plasma (PRP). Do you include one or more of these in your protocol?*

Weil: The vast majority of patients will improve with conservative treatment. There are, however, a few things to consider. Patients may want to try to get better faster. With higher deductibles, patients may not want to go through the standard care, and prefer to get to more advanced therapies more quickly. I have been using ESWT/EPAT for eighteen years. It has proven to be better than ninety percent effective in our research. In fact, I believe the less than ten percent on whom it has not been effective have actually had another cause of heel pain that went undiagnosed. High-level research supports ESWT/EPAT more than all other treatments combined, including surgery. I have had patients who requested EPAT/ESWT much earlier in the treatment paradigm than I recommended, because they wanted to take an aggressive approach.

"For patients in need of shoe therapies, particularly for those with limb length discrepancies, heel lifts are very important."—Ross

Understandably, many have shied away from cash services like ESWT/EPAT. Now, however, in the world of high deductibles, we are dealing with cash services on nearly every patient. When presented in the right way, ESWT/EPAT is fantastic for plantar fasciitis. Over the last year and a half, I have increased my usage of placenta-derived injections. I much prefer them over cortisone. They are regenerative and non-harmful. I often use them in combination with ESWT/EPAT, and have anecdotally found quicker and better response compared to each individually. I have mostly given up on PRP as I did not see the results that others have reported.

Richie: If one looks at the research, two therapies stand out which have shown impressive results for treatment of chronic heel pain: ESWT, and radiofrequency nerve ablation. EPAT is essentially the same as radial shock wave, and it shows similar excellent results compared to ESWT. None of the other therapies mentioned in this question have been tested, or proven effective in any quality prospective studies. I was one of the co-authors of the original study of radiofrequency nerve ablation, by Landsman et al., which was a blinded, prospective, placebo-controlled study. This Level 1 study showed that 80% of patients with chronic heel pain can be successfully treated with radiofrequency ablation of the inferior calcaneal nerve with a high level of satisfaction and zero complications. Since then, there have been four other high-quality studies of radiofrequency nerve ablation of the inferior calcaneal nerve showing similar impressive results. In our practice, we use radiofrequency nerve ablation, EPAT, which is really radial shockwave, and PRP injections. We have great success with the first two therapies, and moderate success with PRP. Patients usually prefer shockwave because it is less invasive than radiofrequency nerve ablation, although the latter procedure is more successful.

Wrobel: There was a promising study published in *Foot & Ankle International* by Monto in 2014 that found PRP had an increased and more durable response compared to steroid over a two-year follow-up period. In Michigan, carriers don't cover PRP or ESWT. My preferred last line of treatment would be percutaneous tenotomy (available from Tenex and Hydrocision). I am looking forward to future studies in these areas, which should be soon with as many as twenty-seven plantar fasciitis trials active on ClinicalTrials.gov.

Ross: The more advanced modalities that I have included in my protocol for chronic heel pain are platelet-rich plasma injections (PRP) and amniotic stem cell injections, in conjunction with a posterior tibial nerve block. I conducted a two-year study of over thirty patients with the

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use of PRP, and reported a significant reduction in pain of over sixty percent of the patients. The amniotic stem cells' effectiveness is still too anecdotal, but the early results have been promising, with significant reduction of pain. The injections themselves, however, can be painful. I refer patients out for the sport laser treatment. On occasion, I do perform ESWT, but my results have only been fair to good over the years.

Jacobs: It is interesting that an eclectic array of therapies have all been suggested as effective in treating heel pain. Frankly, I have excellent success with standard therapy, and have not required the use of new wave therapies. The majority of such therapies have very little solid literature to support their use. They are typically tilted in papers which have been produced through corporate support.

Schoene: In regard to some of the newer technologies, I do feel that they work well. In my opinion, they are only designed to stimulate collagen production. The main reason I don't utilize shock wave, PRP, and the like, is that insurance coverage is scarce, and there is often added out-of-pocket cost for these protocols, and possibly, surgical intervention. I typically use in-office protocols when the condition is deemed chronic. I utilize a needling prolotherapy approach, coupled with stringent myofascial therapies, along with the previously mentioned treatments. These treatments are covered by insurance, and can be done in the office easily with less time, money, and insurance expenditures. I feel this is a win-win for the patient, doctor, and insurance carriers.

Q ***PM:*** *When do you decide to operate on patients with plantar fasciitis, and what is your procedure of choice?*

Jacobs: In the unusual circumstance that I am required to consider surgical intervention for this problem, I consider performing a tendoAchilles lengthening, or gastrocnemius recession, appropriate nerve decompression surgery if indicated, or pronation-limiting surgery. If I do section the plantar fascia, I release the entire plantar fascia.

Wrobel: When everything else fails, I recommend percutaneous tenotomy. Even with selected medial plantar fascia release, patients can still experience lateral column instability despite good post-operative orthotic devices and shoes. I am intrigued by the distal plantar medial percutaneous fasciotomy; however, I have not seen outcomes reported yet.

"When I do operate, I perform a percutaneous release of the medial one third of the central band of the plantar fascia."—Richie

Weil: It is very rare that I have to take someone to surgery for isolated plantar fasciitis. More commonly, the surgery performed is a tarsal tunnel release, and micro-fasiotomy with coblation. I am now frequently finding evidence of calcaneal stress syndrome, with micro-fracture and bone marrow edema on MRI. As a result, I have been performing a subchondral drilling technique with biologic stabilization of the micro-fracture with results that are not short of amazing. People with months of substantial problems are pain-free within days after the procedure. It has been one of the most game-changing things I've done in years.

Richie: With our newer treatment modalities, our need to operate on chronic heel pain has been reduced to about one percent of all patients who present with this condition. When I do operate, I perform a percutaneous release of the medial one third of the central band of the plantar fascia. I do not like endoscopic plantar fasciotomy because it limits the release to the plantar fibers only, while a release of the medial fibers is necessary, in my opinion. The percutaneous approach is a quick and easy procedure, but the recovery from any plantar fasciotomy is unpredictable. I really do not like cutting the most important ligament support of the human foot. I keep the patients non-weight-bearing for six weeks, and in a waking boot for a total of twelve weeks. I believe the fascia does repair in a lengthened fashion, and does become functional again with this protocol. Fortunately, however, I rarely have to perform this procedure anymore.

Ross: My decision for surgical intervention for the chronically painful heel patient is made only after exhaustive conservative care has been attempted with various modalities: night splints, injections, and the use of prescription orthotic devices. If, after conservative measures have failed, only then do I consider surgical intervention as a last resort. I would preface by saying, that over the years, eighty-five percent of my heel pain patients' conditions resolve with conservative treatment, and they can avoid surgical intervention.

My preferred procedure is the endoscopic plantar facsciotomy. I only release the medial band and a small portion of the middle band of the plantar facsia. The real keys are exploring for an entrapped medial calcaneal nerve branch and performing a decompression of the nerve branch. Moreover, I rarely perform complete plantar fasciotomy, and resection of the heel spur. It is important to reiterate that after EPF, orthotic therapy is essential to maintain the lateral column of the foot, and prevent calcaneal-cuboid joint dysfunction and forefoot compensation. **PM**

Dr. Haspel is senior editor of this magazine and past-president of the New Jersey Podiatric Medical Society. He is a member of the American Academy of Podiatric Practice Management.