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Patrick Burns, Christopher F. Hyer, Steven Neufeld and Murray Penner
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Roundtable Discussion

Chronic Achilles Tendon Disorders

How does the average patient present to your practice with Achilles problems other than acute tears, and what diagnostic studies do you use to guide your treatment decisions?

Burns: I tend to see 2 main groups. Many times, it is an athlete or active patient in their fourth decade with acute symptoms from activity. Another large group is the patient in his or her fifth to sixth decade with the more classic tendinosis and acute-on-chronic exacerbations. Younger patients typically have the symptoms of pain and swelling that interfere with their activity without much change to the tendon clinically. Over time, this can become tendinosis with a palpable or visible enlargement becoming more symptomatic even with decreased activity. Initial diagnostic studies are standard weight-bearing films, including hindfoot alignment looking for structural issues. With large tendinosis or chronic tendonitis that is not responding, magnetic resonance imaging (MRI) is the next step to determine extent.

Hyer: Achilles tendon problems that I typically see, aside from acute tears, are 3 groups: insertional pathology, midsubstance tendinosis, and peritendinitis. Of the 3, peritendinitis is the least commonly seen and, for the most part, in active, athletic patients. They typically

complain of a burning or tightening feeling along the length of the tendon, and this is activity related. Peritendinitis is a clinical diagnosis, and I rarely order diagnostic studies.

Insertional and midsubstance problems make up the bulk of the patients who present with Achilles complaints. Complaints often center on pain along the tendon and the posterior heel, aggravated by shoe pressure and increased with activities such as ascending/descending stairs and inclines. Insertional Achilles pain frequently has some degree of enthesophyte growth, which may be an aggravating factor.

Midsubstance Achilles pain often has a palpable and even visible enlargement of the tendon or "knot," which is painful to direct compression. This pathology also has increased pain with activity and often feels better when offloaded in a high-heeled shoe or boot. For both midsubstance and insertional Achilles problems, I'll begin with 2-view weight-bearing calcaneal view radiographs to evaluate for insertional spurs, enlargement of the posterior tuberosity, or intratendinous calcifications. In cases of significant pain or signs of acute inflammation, I'll order an MRI to rule out partial tear and gauge the severity of the tendinosis.

Neufeld: Average patients with chronic Achilles tendon pain can be broken up into 2 types. The first is a middle-aged male, recreational athlete who has recently increased his training

Each issue, we ask 4 different practitioners how they treat a certain condition. This month's topic is chronic Achilles tendon disorders. Our participants are **Patrick Burns, DPM, FAFAS**, Clinical Assistant Professor, University of Pittsburgh School of Medicine, Department of Orthopaedic Surgery, Division of Foot and Ankle, Pittsburgh, Pennsylvania; **Christopher F. Hyer, DPM, FAFAS**, Assistant Academic Podiatric Surgery Residency Director, Grant Medical Center, and Director, Advanced Foot and Ankle Surgery Fellowship, Orthopedic Foot and Ankle Center in Columbus, Ohio; **Steven Neufeld, MD**, Director, Orthopaedic Foot & Ankle Center of Washington in Washington, DC; and **Murray Penner, MD**, Clinical Assistant Professor, Department of Orthopaedics, University of British Columbia Vancouver, Canada.

(eg, preparing for a marathon). He has increased the duration, intensity, and frequency of his running or has recently taken up a new sport. He complains of pain in the mid portion of his tendon. The diagnosis is typically Achilles tendinosis. These patients present with burning/swelling after their activity, they have pain with active and passive motion, and they frequently present with nodules along the Achilles tendon. They have limited tendon excursion and can have loss of push-off strength and disuse calf atrophy.

The second type is a patient who presents with a lump at the Achilles tendon insertion and complains that shoes are uncomfortable. The bony prominence is

frequently irritated, red, and painful to touch. These patients have insertional tendinosis, often in conjunction with a Haglund deformity (prominent posterior-superior calcaneal tuberosity). Frequently, they have an associated retrocalcaneal bursitis, which is swollen, warm, and painful to palpation.

In patients with insertional pain, diagnostic studies start with x-rays to look for calcifications in the tendon, ossification at the bone-tendon junction, or a prominent calcaneal tuberosity (Haglund deformity). Radiographic measurements are taken, including the calcaneal inclination angle. Parallel pitch angles are evaluated, and classification of the foot type as to cavus or pesplanus type is done.

In patients with midtendon pain, an MRI is ordered if surgical intervention is considered. This is used to determine the extent of tendon involvement.

Penner: Most patients present with a referral from a family physician describing persistent Achilles pain of 1 to 2 years' duration, usually diagnosed as Achilles tendonitis. Patients have usually had multiple courses of physiotherapy and are frustrated.

The diagnostic studies I use include, first, a plain standing x-ray of the ankle to identify any potential insertional Achilles changes and to rule out any obvious bony pathology. My practice is a referral practice with a long wait list. As a result, most patients already have had an MRI. If they have not, and I believe they are likely to be surgically treated, I will order an MRI scan to stage the extent and nature of the Achilles pathology.

What types of conservative treatment do you attempt, and how often is conservative treatment successful? Be specific about medication and physical therapy protocols.

Burns: A large majority of the time, I find conservative treatment to be successful in both subsets I see. Typically, it is physical therapy for stretching and ultrasound treatments, heel lifts, and, many times, a night splint for home to address the

tenderness and the typical equinus with these patients. Orthotics are commonly tried to balance mechanical issues. Their current activity is modified to lower impact, and physical therapy is done 3 times a week for 3 weeks. If the patient is able, I have the patient ice and use a nonsteroidal anti-inflammatory drug (NSAID) regularly, such as Feldene. It seems easier to comply with this NSAID because of its once-daily dose. Remember to inquire about the patient's activities and techniques. Improper techniques during activity can play a large role.

Hyer: I'm a big believer in conservative treatment and have had good success in the bulk of chronic Achilles problems. For insertional pathology, I'll offload the posterior heel by having the patient wear open-back shoes or use a gel heel sleeve to relieve shoe pressure. I'll also use a ¼- to ½-in. heel lift into the shoe in the acute setting. In very inflamed cases, I'll use an Achilles boot walker with 20° heel wedge to relieve tension out of the tendon and still allow weight bearing. I'll have the patient take an anti-inflammatory and begin physical therapy. I'll have them go 3 times per week for 3 weeks and have the therapist utilize phonophoresis with dexamethasone gel in addition to deep-tissue massage and controlled stretching.

For midsubstance pathology, I'll use the MRI findings to help prognosticate the chances of success with conservative care and discuss the study published by Nicholson in 1997. As a general rule, if tendinosis is less than 50% of the cross section of the Achilles, I feel conservative care in the form of physical therapy and eccentric heavy calf loading has a good chance of success. There have been several publications in the *American Journal of Sports Medicine* on this modality, and I have had good success utilizing this as well. This will require therapy for at least 6 weeks, and patients should expect it to hurt worse at first. In cases >50%, I'll often still attempt the eccentric loading modality but with the understanding that chances of success are lower and that there is a risk of rupture during the treatment. Although this has

never happened in my experience, it's worth warning the patient of the possibility. When the therapy is successful, pain relief will occur much sooner than the decrease in the size of the tendinosis. I'll tell patients that the "knot" may take a year or more to go away.

In cases of tendinosis, I typically don't use NSAIDs unless acute inflammation is present. Biopsy studies have confirmed an absence of inflammation in these chronic cases, and this process is appropriately labeled *tendinosis* and not *tendonitis*. I also don't utilize corticosteroid injections around the Achilles, and as of yet, I have no experience with prolotherapy in these cases.

Neufeld: For runners, I instruct them to rotate their shoes frequently (usually after 300 to 500 miles), start cross-training, and modify their activity to include swimming, biking, and elliptical training. I use shoe modifications including a heel lift (0.5-1.5 cm) and encourage home stretching programs. I will suggest shoes without heel counters such as mules or clogs. I will frequently prescribe nonsteroidal medications, add a horseshoe pad to their shoe (in cases of insertional pain), and add a night splint. If there is an acute-on-chronic presentation, I will suggest temporary immobilization in a boot or cast. Physical therapy emphasizing eccentric heavy-load calf muscle training and modalities are utilized. If the patient is a pronator, I will add an orthotic device or arch support.

Penner: Because of the referral nature of my practice, conservative treatment has usually been maximized prior to my assessment. Hence, in most of the patients I see, conservative treatment has been unsuccessful.

My conservative treatment recommendations will always include vigorous Achilles and plantar fascia stretching under the supervision of a physiotherapist, together with a 4- to 6-week course of an NSAID (if tolerated; usually naproxen 500 mg twice daily). If the Achilles is clearly very tight, a night splint is also recommended. In addition, I generally recommend a low heel lift, with a good-quality walking/running shoe for

daily wear. Physiotherapy modalities with ultrasound and interferential are usually incorporated, possibly with phonophoresis of an NSAID.

If these measures fail, ultrasonic shock wave therapy is recommended for noninflamed Achilles conditions.

What treatment algorithm do you use for surgical treatment of Achilles tendinopathy without an insertional calcification?

Burns: Surgical treatment depends on the extent of disease and patient activity. For the more active younger patient, typically the tendon pathology is less extensive overall, but others can have quite a large palpable tendinosis. For minimal disease but continued pain, the tendon can be opened and inspected. A no. 11 blade can be used to make multiple perforations in the tendon in the area of disease to stimulate the healing cycle. This is not done often and is only for very small recalcitrant pathology. For disease a little larger but less than 50% of the entire width of the tendon, I will debride the unhealthy portions and tubularize the remaining Achilles. Disease that is more extensive—greater than 50% of the width—I give the patient the option of debridement with allograft or tendon transfer. This is a decision based on activity and what is required in terms of long-term functionality.

Hyer: If we've reached the point of surgical discussion, we'll have failed conservative care and obtained an MRI to evaluate the tendon. In cases without insertional calcification, there is typically some degree of fusiform thickening and chronic tendinosis causing the pain. There may also be a prominent posterior superior tuberosity causing impingement. I'll frequently decompress the posterior tuberosity, debride, and repair the Achilles without deinserting the tendon. It's important to remove inflamed retrocalcaneal bursa as well, if present. In some cases, equinus contracture is a contributing factor, and I'll combine a gastrocnemius recession, which anecdotally seems to speed recovery.

Neufeld: If the tendon is mildly involved, I perform percutaneous longitudinal tenotomy as described by Maffuli with 5 stab incisions (proximal, distal, medial, lateral, and central). In more involved cases, I make a midline incision, excise all degenerated tendon, and repair/tubularize the healthy tendon. I frequently add a gastrocnemius recession to theoretically relieve tension. If more than 50% of the tendon is involved, I will add a flexor hallucis longus (FHL) transfer to augment strength.

Penner: Treatment depends on the site of primary disease and the extent of tendon degeneration. For noninsertional disease involving less than approximately one-third of the cross-sectional area of the tendon, I will simply perform a debridement. If it is greater than one-third to one-half, I will generally augment the debridement with a turndown and/or plantaris incorporation. If it is definitely greater than 50% or requires excision of segment of tendon (less than approximately 3–4 cm), I will segmentally excise the diseased tendon and perform a primary repair, obtaining length with a V-Y lengthening. If the gap is larger than 3 to 4 cm, I will augment with an FHL tendon transfer.

What treatment algorithm do you use for surgical treatment of calcific insertional Achilles tendinitis?

Burns: Insertional tendinitis that does not respond is somewhat different. Most of the patients I see have larger calcifications in the distal tendon or large insertional spurs. These require detachment of the Achilles, debridement of tendinosis and calcifications, removal of bony spurring from the posterior calcaneus, and removal of the associated bursa. The tendon requires reattachment, and I have been utilizing the Arthrex Suture Bridge. This technique has excellent strength, is easy to place, and keeps the number of knots at the reattachment site to a minimum to avoid irritation.

Hyer: I'll address all the pathologies present as mentioned in the noncalcified cases. With insertional spurs, often a partial or complete detachment is needed to adequately decompress this area. I prefer to make a posterior-medial approach off the border of the Achilles. This keeps the scar away from the sural nerve and is a good window for a salvage tendon transfer down the line if needed. Once down to the tendon, I'll keep the majority of the medial investments of the insertion attached as I reflect part of the central attachment and resect the prominent bone. I can then directly repair the tendon down to the raw bone and have a stable insertion. If needed, anchors can be used if the insertion is felt to be compromised.

Neufeld: If there is calcific insertional Achilles tendinosis, I debride as much tendon as needed and repair/tubularize the remaining tendon. If necessary, I use bone anchors or interference screws to reinsert the tendon into the calcaneus. If a significant amount of tendon is debrided (more than 50%), I will augment with a FHL transfer.

In addition, if a Haglund deformity is present, a decompression of the tuberosity and bursectomy will be done. If there is minimal deformity and the majority of the pain is on the superolateral side, a lateral incision is used. If there is more central posterior pain along with a posterior osteophyte, a posterior central incision is used.

Penner: For insertional tendinopathy, I will debride the tendon insertion site, detaching as much of the Achilles as is required to remove all degenerative appearing tendon and calcification. I will use an incision along the edge of the Achilles insertion, which is most tender (although I will always go medially if an FHL transfer is planned).

An excision of Haglund tubercle is always done. If greater than 25% of the tendon is released, a formal repair back to calcaneal bone with bioabsorbable suture anchors is used. If the tendon is grossly degenerative, as is often the case in the older patient (>65–70 years), much

of the tendon needs to be debrided, and an FHL transfer is added.

What is the role of tendon augmentation (tendon transfer or tissue matrix augmentation) in your practice for either insertional Achilles tendonitis or chronic Achilles tendinopathy?

Burns: It plays a large role in my treatment of chronic tendinopathy. Many of these patients have rather large areas of disease and after debridement require some sort of augmentation. For the patient with less than 50% of the tendon width involved, the remaining healthy tendon is augmented with allograft tissue matrix such as GraftJacket. Deficits that require larger debridement or complete resection obviously require augmentation. In these cases, I will either use cadaveric tendon or transfer the FHL. This is a decision made with the informed patient. The FHL transfer is technically very easy to perform and functions well, but I find that more patients decide on cadaveric replacement, and the functional outcomes are similar.

Hyer: Tendon augmentation with a graft or tendon analog is useful in cases of significant tendinosis or when the native tissue is poor. I'll use these materials to reinforce the debridement and repair the midsubstance pathology and occasionally at the insertion. In general, these materials give me a better sense of confidence in the strength of the repair so that I can begin the postoperative therapy on time. Tendon transfer in the form of an FHL tendon transfer is a good alternative in cases of chronic rupture or in cases in which initial debridement/repair hasn't worked. I don't believe tendon transfer has a role as an initial intervention, except in the case of chronic missed rupture. That being said, I find the FHL transfer with a short harvest and interference screw fixation to be a great salvage option with very good long-term results. We've presented and published our results with this technique, and I continue to have good results with this as a salvage option.

Neufeld: In cases of midtendon Achilles tendinosis, if more than 50% of the tendon is involved on the MRI, I will start thinking about using an FHL transfer for the surgical repair. If at the time of surgery inadequate tendon is left after debridement, an FHL transfer is done. In obese patients, or patients with high demands, I often augment the repair with alternative tissue matrix products such as Pegasus (Pegasus Biologics, Inc, Irvine, California) or GraftJacket (Wright Medical Technology Inc, Arlington, Tennessee).

In cases of insertional Achilles tendinosis, if there is less than 50% remaining tendon after debridement, an FHL transfer will be done.

Penner: This is outlined above. I don't use tissue matrix augmentation or allograft. In my practice, if augmentation is needed, I use an FHL transfer.

Describe your postoperative protocols and expectations for recovery.

Burns: For Achilles surgery, my protocol is basically the same. All patients are non-weight bearing in a cast or compression splint for 2 to 3 weeks. Once the incision is healed, the sutures can be removed, and they are then placed into an Achilles walking boot with 4 to 5 wedges in the heel. For allograft and tendon transfer, I will usually use all 5 wedges the boot comes with to start. For smaller debridements, I may start with just 4 wedges. The patient is then permitted partial weight bearing with the boot and crutches, removing 1 wedge per week. Once all wedges are removed, they are then kept at 90° for 2 weeks, weight bearing as tolerated in the boot before starting physical therapy. The patient can move into tennis shoes during therapy, when they feel comfortable. The patient then begins a slow return to activity during the next few months, beginning with lower impact and working up to heavier activity. I expect 75% of these patients to recover to their preoperative activity.

Hyer: My protocol is very similar for insertional and midsubstance repairs as well as FHL transfers. Postoperatively,

I'll use a Jones posterior splint at approximately 20° of plantarflexion for the first week to 10 days. After the sutures are removed, I'll use a non-weight-bearing short-leg cast for 3 weeks, again at 20° plantarflexion. At postoperative week 4, I'll have the patient bear weight to tolerance in the Achilles boot at 30° of plantar flexion. After each week, the patient removes 1 wedge (10°) and continues to bear weight in the boot. Patients are allowed to remove the boot for a gentle range of motion and for hygiene. By the end of week 7, they are completely neutral in the boot and start physical therapy. I have the therapist wean the patient out of the boot. I expect patients to be in a shoe by week 9 and performing light activities. Patients should expect some swelling and even a slight limp for up to 6 months. Complete recovery can take a year, and recurrent degeneration or tendinosis is always possible.

Neufeld: The postoperative course depends on the amount of tendon involved. If a significant amount of tendon is involved and/or an FHL transfer is done, I keep the patients non-weight bearing in a splint or cast for up to 4 weeks. They start formal physical therapy at that time and stay immobilized in a boot for an additional 4 to 6 weeks. Therapy is controlled with active assisted range of motion in inversion/eversion first followed by dorsiflexion/plantarflexion. Progressive return to full activity is at 20 to 24 weeks. I remind patients that they may not return to athletic competitions for up to a year.

Penner: The patient is in a postoperative plaster splint for the first 2 to 3 weeks, non-weight bearing to allow for wound healing.

If they have had a simple debridement, they are placed in a walker boot for 4 weeks and allowed to weight bear fully. Physiotherapy is initiated at 2 to 3 weeks postoperation. I expect notable reduction in symptoms at 6 weeks postoperation, with maximal recovery at about 4 months. Complete or substantial pain relief will be present in about 75% of patients, with variable relief in the remaining 25%.

In those who have a major repair or augmentation, the protocol is much like that for acute Achilles repairs. At 2 to 3 weeks out, they are placed in a removable walker boot with 3 to 4 cm of heel wedging. Wedges are removed at a rate of 1 cm per week. The boot is worn nearly full-time, although very gentle range of motion is allowed. At 6 weeks postoperation, the patient initiates gentle physiotherapy and has no heel wedges. Stretching is very gentle, and only isometrics are allowed, along with ultrasound and interferential modalities. At 9 weeks postoperation, stretching is increased, and gentle concentric exercises are allowed.

Strengthening becomes more vigorous, and the walker boot is discontinued at 12 weeks postoperation. Eccentric strengthening is allowed to begin very gently.

Return to vigorous activity or sport is dependent on rehabilitation but is usually possible at 4 to 5 months postoperation. Again, about 75% of patients can expect the desired outcome of total or substantial pain relief. Unfortunately, about 25% do not obtain as great a degree of improvement as they would have desired.

What conceptual advancements are being researched or are on the horizon for tendon disorders of the foot and ankle?

Burns: Certainly, there are many new areas in the treatment of tendon

pathology. Less invasive techniques such as radiofrequency and shockwave are being utilized more often and may have a place in the treatment of the difficult patient with continued symptoms and minimal tendinosis. This may prove to be useful in the more active patient, in whom the procedure is less invasive and may reduce overall recovery time. Another area is the increasing use of ultrasound for imaging tendon pathology. Ultrasound imaging has not been widely utilized in the past, mostly because of image quality and unfamiliarity. A nice feature is the possible real-time images of tendon movement, but one must also remember that ultrasound is technician dependent, and this may have an impact on overall effectiveness.

Hyer: I think the future advancements for chronic tendon disorders are going to be in reactivating the healing response of the body to repair and regenerate the diseased tendon. There seems to be some sort of biochemical signal that turns off or is overwhelmed in the setting of chronic tendinosis, whether it's the Achilles, posterior tibial tendon, or peroneal tendons. There are various published studies using platelet gel concentrate, bone marrow aspirate, extracorporeal shock wave therapy, radiofrequency, and even percutaneous microtenotomies in chronic tendinosis—all with success. We are currently involved in a study using radiofrequency in chronic Achilles, and we are also seeing some promise.

The common thread seems to be the release of growth factors and inductive proteins to activate the healing cascade and foster tendon repair. As we improve our understanding of this process, open surgery for chronic tendon disorders may rarely be needed, except in cases of rupture or extensive disease. In earlier stages, we may simply inject a bolus of chemical mediators into the area of tendinosis and step back and let the body take over. I guess we'll see.

Neufeld: New technologies for tendon problems include using low-temperature radiowave energy or radiofrequency (TOPAZ; ArthroCare, Sunnyvale, California) to stimulate a healing response in chronically damaged tendons. Preliminary data have been encouraging. Another treatment that is being studied is extracorporeal shockwave therapy, which is thought to stimulate metabolism and enhance vascularization.

Penner: Various tissue augments are available, although their role is yet to be defined. I don't believe they are likely to offer much benefit in general. Rather, I believe the use of biologic mediators, such as rPDGf, may offer some major benefits in speed and degree of healing possible, as well as in mitigation of wound-healing complications. Such research is in its infancy at this stage, however. **FAS**