

Chris Clemow, MD, FACSM
 Brian Pope, MD, MPH
 H. E. Woodall, MD, FAAFP
 AnMed Health Family Medicine
 Residency, Anderson, SC
 Hunter.woodall@anmedhealth.org

Tools to speed your heel pain diagnosis

Quickly zero in on a diagnosis by using our handy “photo guide” and reference table

Practice recommendations

- Advise patients with tendinopathy to decrease physical activity, do stretching exercises (C), undergo eccentric calf muscle training (B), use heel lifts (C), modify shoe fit, and take nonsteroidal anti-inflammatory drugs (NSAIDs) regularly for a few days, then as needed (B).
- The mainstay of treatment for calcaneal apophysitis in children is rest (C). Other options include heel lifts, stretching programs, icing, gel heel cups, and anti-inflammatory agents (C).
- Treatment options for plantar fasciitis include NSAIDs, stretching exercises, gel cups, arch supports, night splints, steroid injections, extracorporeal shock wave therapy, and surgery (B).

Strength of recommendation (SOR)

- A Good-quality patient-oriented evidence
 B Inconsistent or limited-quality patient-oriented evidence
 C Consensus, usual practice, opinion, disease-oriented

One of your patients, a 40-year-old woman, recently began an exercise program, and she now says she has persistent heel pain. Your first suspicion is “another plantar fasciitis case.” However, after asking a few questions and performing a brief examination, you realize the problem is not

what you expected. The pain is in the wrong place for plantar fasciitis and the patient’s history is atypical. How should you proceed?

Knowing the precise location of maximum pain or tenderness (FIGURES 1A–1C) and pairing that with key findings from the exam and history (TABLE 1) can help you reach an accurate diagnosis and formulate proper treatment (TABLE 2).

Each of the 3 general areas of heel pain—posterior, plantar, and medial—

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Quick guide to narrowing the diagnosis

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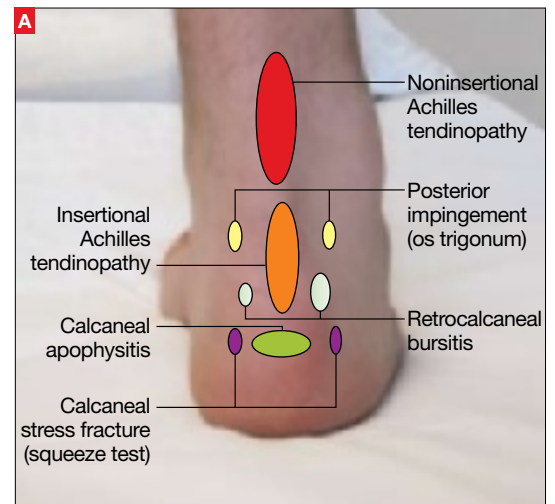
Rating the treatment options

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FIGURE 1

Common causes of

Posterior view



introduces a unique differential. Bilateral symptoms or multiple joint involvement, of course, raises the possibility of associated systemic disease.

■ Posterior heel pain

The common causes of posterior heel pain are Achilles tendinopathy, retrocalcaneal bursitis, calcaneal apophysitis, posterior impingement (**FIGURE 1A**), and Achilles tendon strain or rupture. Rarer causes are sciatica, peroneal tendonitis, Haglund's deformity, pump bump, and systemic disorders. The patient's history and precise location of maximal tenderness¹ differentiates these problems.

Achilles tendinopathy (tendonitis): Is the patient an athlete?

Insertional and noninsertional Achilles tendinopathy are the most common causes of persistent posterior heel pain.^{2,3} The inflammatory process occurs in the fatty tissue surrounding the Achilles tendon (the paratenon) rather than in the tendon itself. Patients tend to be highly active (often athletes) and may have recently increased their activity. Ask pa-

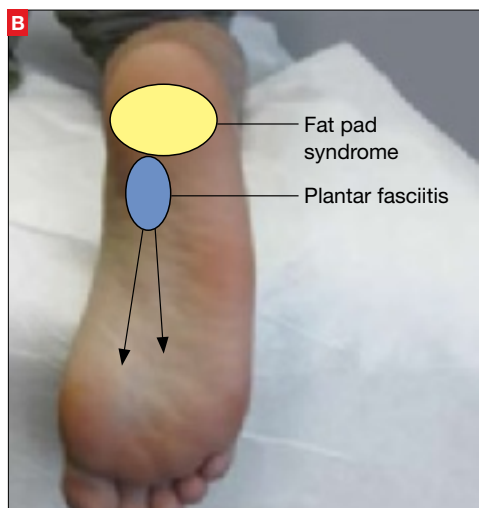
tients, too, whether they have recently taken a fluoroquinolone antibiotic. This drug class is known to increase the risk of both tendonitis and tendon rupture,⁴ and in July of this year the FDA directed drug manufacturers to add a black-box warning to that effect.⁵

Evaluation of noninsertional tendinopathy. Tenderness is usually located 2 to 6 cm above the Achilles insertion. Nodularity, swelling, or fluctuance of the tendon may be evident. Diagnosis generally can be made clinically. If confirmation is needed, consider ultrasonography or magnetic resonance imaging.

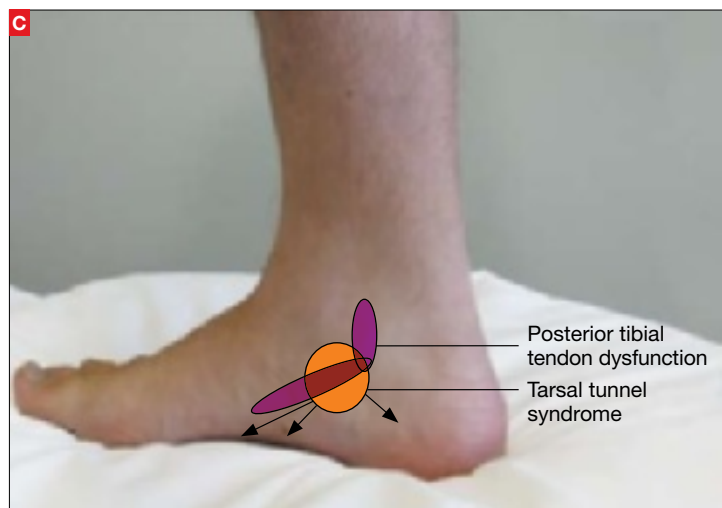
Treatment. Advise patients to decrease physical activity and do stretching exercises, undergo eccentric calf muscle training, use heel lifts, modify shoe fit, and use systemic or topical nonsteroidal anti-inflammatory drugs (NSAIDs) regularly for a few days, then as needed. Refractory cases may require surgery.⁶ New therapies that have proven effective include extracorporeal shock wave therapy (ESWT), prolotherapy (dextrose injections), and local application of nitroglycerin patches or gel.⁷⁻¹⁸ ESWT can be expensive and is not widely available. Prolotherapy can be

heel pain by location

Plantar-surface view



Medial view



performed with minimal training, but is still relatively new. Topical nitroglycerin is affordable, but beware of such side effects as headache and hypotension.

Evaluation of insertional tendinopathy. Inflammation occurs at the tendon's insertion to bone (enthesitis). Pain typically is at the midline and is reproduced by palpating the tendon insertion or by passively stretching the heel. The presentation may be difficult to distinguish from retrocalcaneal bursitis (discussed below).

Treatment is similar to that used for noninsertional tendinopathy. However, if insertional tendinopathy occurs in conjunction with a Haglund's deformity (bony overgrowth of the calcaneus), surgery may be indicated, because noninvasive measures tend to fail.¹⁹

Use steroid injections with extreme caution due to the theoretical risk of tendon rupture.²⁰ Injections are effective when directed at concomitant inflammation of the retrocalcaneal bursa, but accurate positioning and careful postinjection care are paramount. After an injection, a patient may need absolute rest or even immobilization to protect from tendon rupture. Emphasize a careful return to activity or athletic training.

**Retrocalcaneal bursitis:
Look for subtle swelling**

The retrocalcaneal bursa lies between the Achilles tendon and the calcaneus near the tendon's insertion. This bursa may become inflamed with repetitive stress or with insertional Achilles tendinopathy.

Evaluation. Swelling is usually present but may be subtle. Pain is located just lateral to the midline of the posterior heel at the superior angle of the calcaneus, and it may also be medial to the tendon opposite the lateral location.

Treatment. The bursitis often responds to icing and ice massage, shoe-fit adjustments, heel lifts, Achilles stretching programs, and systemic or topical NSAIDs.² Steroid injections are likely beneficial, but use them with caution and take care to avoid the Achilles tendon insertion.

**Calcaneal apophysitis
affects highly active kids**

Calcaneal apophysitis (Sever's disease) is a painful inflammation in the heels of skeletally immature children where the Achilles tendon inserts in the calcaneus apophysis.

Evaluation. Associated with peak growth rate and high activity level, this inflammatory process usually occurs in boys between the ages of 10 and 12 years, and in girls between the ages of 8 and 10 years.²¹ The process is similar to that occurring at other sites of traction apophysitis, such as Osgood-Schlatter disease at the tibial tuberosity. Children most susceptible are highly active, wear poorly fitting footwear, run frequently on hard surfaces, and have tight Achilles tendons. Clinical diagnosis usually suffices, although plain x-ray films can verify an active apophysis and rule out other sources of pain, such as tarsal coalition, calcaneal stress fractures, or infection.²²

Treatment. Calcaneal apophysitis is typically self-limiting, and the mainstay of treatment is rest. Heel lifts, stretching programs, icing, gel heel cups, and anti-inflammatory agents may also be used.²³

**Posterior impingement:
Pain with full plantar flexion**

Posterior impingement at the ankle joint may be self-originating or arise as a consequence of an os trigonum, a posterior sesamoid bone of the talus that exists as a normal variant. In some cases, this bone creates a barrier to full plantar flexion at the ankle joint and creates pain at the posterior heel.

Evaluation. Pain with full plantar flexion is a critical distinguishing feature, because most other pathologies in the posterior heel cause pain with dorsiflexion at the ankle.^{24,25} Patients often are involved in activities that require forced plantar flexion, such as gymnastics or dancing. Diagnosis is clinical for the most part, but plain x-ray films may confirm the presence of an os trigonum. Magnetic resonance imaging (MRI) is

FAST TRACK

The pain of plantar fasciitis is worst with the first step of the morning, and lessens with activity

TABLE 1

A quick guide to narrowing your heel pain diagnosis

AFFECTED AREA	ONSET OF PAIN	HISTORY AND KEY FINDINGS	LIKELY DIAGNOSIS
Posterior heel	Acute	<ul style="list-style-type: none"> • Audible “pop” • Weak or absent plantar flexion • Defect in tendon 	Achilles rupture
		<ul style="list-style-type: none"> • No audible “pop” • Intact plantar flexion 	Achilles strain
	Chronic	<ul style="list-style-type: none"> • Recent increase in activity • Fluoroquinolone use 	Achilles tendinopathy
		<ul style="list-style-type: none"> • Pain adjacent and deep to the Achilles tendon 	Retrocalcaneal bursitis
		<ul style="list-style-type: none"> • Pain at Achilles insertion, in boy (10-12 years) or girl (8-10 years) 	Calcaneal apophysitis
		<ul style="list-style-type: none"> • Pain on full plantar flexion 	Posterior impingement
Plantar surface	Acute	<ul style="list-style-type: none"> • High-impact trauma • Positive squeeze test 	Calcaneal fracture
		<ul style="list-style-type: none"> • Painful “pop” associated with acute stretch injury 	Plantar fascial rupture
	Chronic	<ul style="list-style-type: none"> • Pain worst with first steps in the morning, then diminishes with activity 	Plantar fasciitis
		<ul style="list-style-type: none"> • Patient is distance runner who recently increased activity • Positive squeeze test 	Calcaneal stress fracture
		<ul style="list-style-type: none"> • Diffuse pain in fat pad 	Fat pad syndrome
Medial heel	Subacute	<ul style="list-style-type: none"> • Overuse • No fallen arch 	Posterior tibial tendonitis
	Chronic	<ul style="list-style-type: none"> • Patient is overweight • Fallen arch 	Posterior tibial tendon dysfunction
		<ul style="list-style-type: none"> • Neuropathic pain to arch • Positive Tinel’s sign 	Tarsal tunnel syndrome

FAST TRACK

The pain of a calcaneal stress fracture typically worsens with activity and lessens with rest

warranted for patients with persistent symptoms; it may reveal a hypertrophied synovial lining or other pathology (such as osteochondritis). MRI is also indicated before more invasive therapies, such as steroid injections or surgery.

Treatment. Advise rest with or without immobilization, NSAIDs, or local steroid injections. Severe impingement or recalcitrant cases may require surgical release of the posterior synovium or removal of an os trigonum.^{24,25}

Achilles strain and rupture: Middle-aged men are susceptible

The Achilles tendon is most susceptible to injury in middle-aged men who are active

in sports requiring loading and sudden contraction of the calf muscles, such as basketball or football, although injuries may occur in a variety of other settings. A strain of the Achilles tendon should be carefully differentiated from a complete rupture. While strains can be treated similarly to Achilles tendinopathy, complete rupture is a much larger concern.

Evaluation. When the Achilles tendon ruptures, patients describe sudden pain and a pop that is often audible. Poor plantar flexion of the foot ensues.²⁶ Telltale signs on examination are a positive Thompson’s test (little or no plantar flexion with a calf squeeze) and a visible defect in the tendon. The rupture site is

usually 1 to 2 inches proximal to its insertion on the calcaneus.

Treatment. Most of these patients should be seen by an orthopedic surgeon as soon as possible. For active and younger adults, treatment is almost always early surgical repair.²⁷ For some older individuals who are less active, nonsurgical management includes graduated casting, which progressively lessens plantar flexion over 6 to 10 weeks, followed by physical therapy.

3 less common causes of posterior heel pain

Haglund's deformity is an overgrowth of the calcaneus at the insertion of the Achilles tendon.³ Caused by overuse and poorly fitted shoes, this condition commonly requires surgical intervention.

Pump bump is an inflamed superficial bursa commonly associated with a Haglund's deformity, and it may respond to NSAIDs, shoe-fit modification, ice massage, or steroid injection.

Peroneal tendonitis is a tendinopathy of evertors and external rotators of the foot. The pain will follow the tendons posterior to the lateral malleolus and extend to the lateral midfoot. It is also treated with rest, NSAIDs, icing, and physical therapy.

■ Plantar-surface heel pain

The problems most likely to cause plantar-surface pain (**FIGURE 1B**) are plantar fasciitis, stress fracture of the calcaneus, and fat pad syndrome.

Plantar fasciitis: Pain is worst in the morning

This is by far the most common cause of heel pain primary care physicians will see. Rarely, infection and neoplasia will cause unilateral plantar heel pain.⁴

Evaluation. Tenderness localized to the plantar surface of the heel in adults usually indicates plantar fasciitis.

Pain is worst with the first step of the morning, and lessens with activity.

The tender spot is the medial calcaneal tubercle, with pain radiating through the arch.^{1,28-30}

Treatment. The many therapeutic modalities—NSAIDs, stretching exercises, gel cups, arch supports, night splints, steroid injections, ESWT, and surgery—have been extensively reviewed elsewhere, including in a Cochrane review from 2005.³¹⁻³³

Calcaneal stress fracture: Suspect it in runners

Calcaneal stress fractures are relatively rare, but may occur in those who put significant stressors on their feet, such as avid runners or military recruits.

Evaluation. Most patients report a recent increase in frequency or intensity of activity, and runners can tell you when it is during their run that the pain begins. As the stress fracture worsens, the pain begins earlier in the activity and eventually is present with even minimal activity. A key distinction from plantar fasciitis, in which pain lessens with activity, is that the pain of a stress fracture typically worsens with activity and diminishes with rest.³⁴

Physical exam provides few clues except for the "squeeze test" (**FIGURE 1A**) Putting pressure on both the medial and lateral calcaneal tuberosities will cause discomfort. Pain will be absent in the posterior structures of the heel. Placing a vibrating 128-cps tuning fork on the calcaneus should also increase discomfort.

Plain x-ray films may be falsely negative, especially during the first 2 to 3 weeks of pain. Three-phase bone scans are nearly 100% sensitive for detecting stress fractures, with changes evident in as little as 1 to 2 days after injury. The specificity of MRI scans is superior to that of bone scans and can reveal alternate problems.³⁵

Treatment. Activity modification reduces trauma to the heel. Encourage patients to walk if they are pain free and to increase activity as comfort allows. Tell patients to stop activity if the fracture becomes symptomatic. Advanced fractures demand an absolute absence of weight bearing.

FAST TRACK

Plantar surface pain following a painful "pop" associated with trauma may indicate rupture of the fascia

Pain can be controlled with NSAIDs and ice. Lab and animal data have suggested that NSAIDs may impede fracture healing rates, but no similar data exist regarding their effect on stress fractures.³⁶ Symptoms abate within 2 or 3 weeks. Advise athletes to resume activity slowly in a stepwise progression, letting them know that a return to full activity is likely within 6 to 8 weeks. Have runners restart their routine at half their customary distance, increasing it by no more than 10% to 15% per week.

Any medical condition that weakens the bone may predispose a patient to stress fracture. To prevent primary and secondary stress fractures, correct the patient's underlying medical problems. Evaluate young, thin women with a stress fracture for the "female athlete triad" (osteopenia, disordered eating, menstrual irregularity). The elderly are also at risk for stress fractures due to osteopenia or osteoporosis.

Fat pad syndrome: More diffuse pain than plantar fasciitis

The plantar surface of the heel is protected by a thick fat pad. Those at risk of a thinned fat pad include the elderly (the pad thins with age), the obese (increased stress to the pad), and those who have previously received a corticosteroid injection in the pad. Cumulative or acute trauma to the heel can also cause contusion to the heel pad.

Evaluation. Pain typically is located more posteriorly than classic plantar fasciitis pain and is more diffuse. Pain from the fat pad should not radiate toward the arch and is not exacerbated by dorsiflexion of the foot.¹

Treatment. Recommend relative rest, gel heel cups, NSAIDs, and ice.³⁷

Less common causes of plantar-surface pain

Lateral plantar nerve entrapment may also cause neuropathic pain on the plantar surface. Patients who experience a painful pop in their heel associated with trauma may have **ruptured their plantar fascia**. A fallen arch may also be noted

TABLE 2

Heel pain treatment options: A look at the evidence

DIAGNOSIS	TREATMENTS	SOR	REFERENCE
Achilles tendinopathy	NSAIDs	B	18
	Topical NSAIDs	B	17
	Eccentric calf muscle training	B	12,18
	Stretching	C	16,19
	Heel lifts	C	16,19
	Ice	C	16,19
	Topical nitrates	B	7,10,18
	Prolotherapy (dextrose injections)	B	15,18
	ESWT	B	9,18
	Surgery	C	19
Retrocalcaneal bursitis	NSAIDs	C	2
	Heel lifts	C	2
	Steroid Injections (with caution)	C	2
Calcaneal apophysitis	Rest	C	21,22
	NSAIDs	C	21,22
	Heel lifts	C	21,22
	Stretching	C	21,22
	Icing	C	21,22
	Gel heel cups	C	21,22
Posterior impingement	Rest	C	24
	NSAIDs	C	24
	Steroid injections	C	24
	Surgery	C	24
Plantar fasciitis	NSAIDs	B	28,31
	Stretches	B	28,31
	Gel cups	B	28,31
	Steroid iontophoresis	B	28,31
	Arch supports	B	28,31
	ESWT	B	28,31,33
	Night splints	B	28,33
	Steroid injections	B	28,31
	Surgery	B	28,31
Calcaneal stress fracture	NSAIDs	C	34,36
	Activity moderation	C	34
	Icing	C	34
Fat pad syndrome	NSAIDs	C	37
	Rest	C	37
	Gel heel cups	C	37
	Icing	C	37
Posterior tibial tendon dysfunction	Weight loss	C	40
	Icing	C	40
	Physical therapy	C	40
	Arch supports/bracing	C	41
	NSAIDs	C	38
	Surgery	B	38,39
Tarsal tunnel syndrome	Arch supports	C	1,43
	NSAIDs	C	42,43
	Activity modification	C	42,43
	Physical therapy	C	42,43
	Neuromodulators	C	42
	Steroid injections	C	44
	Surgery	B	46,47

ESWT, extracorporeal shock wave therapy; NSAIDs, nonsteroidal anti-inflammatory drugs.

Strength of recommendation (SOR)

A Good-quality patient-oriented evidence

B Inconsistent or limited-quality patient-oriented evidence

C Consensus, usual practice, opinion, disease-oriented

on exam. Treatment of both of these conditions is similar to that of plantar fasciitis.

Acute calcaneal fracture results from trauma, such as a fall from a height onto the soles of the feet. Look for localized pain and swelling around the calcaneus and evaluate the neurovascular status of the foot. Initial treatment includes elevating the foot, avoiding weight bearing, applying ice, controlling pain, and using a posterior splint. Many of these fractures require surgical fixation.

■ Medial heel pain

Posterior tibial tendonitis/dysfunction and tarsal tunnel syndrome are best classified as medial in location (**FIGURE 1C**). However, the pain is often more diffuse and may radiate to either the posterior or plantar heel.

Posterior tibial tendonitis/ dysfunction are linked to obesity

Posterior tibial tendonitis (PTT) and posterior tibial tendon dysfunction (PTTD) are related diagnoses. PTTD refers to increased laxity of the tendon resulting in flat foot and increased heel varus. It is the most common cause of acquired flat foot in adults. PTT may exist separately or as part of PTTD.

Evaluation. Patients complain of pain at the posterior edge of the medial malleolus that may extend toward the arch of the foot.^{38,39} Patients may also experience swelling or redness in the area. Both PTT and PTTD seem related to overuse and obesity. Young or nonobese patients with PTT or PTTD often have underlying systemic arthropathies.³⁵

Treatment. Early treatment is necessary to prevent progression of tendon incompetence. Interventions include weight loss, NSAIDs, icing, physical therapy,⁴⁰ and orthotics or bracing for arch and ankle support. You may also try immobilization in a short leg cast for 6 weeks.⁴¹ If conservative measures fail, surgery may be necessary for tendon repair, tendon

transfer, calcaneal osteotomy, or tarsal bone fusion.^{38,39}

Tarsal tunnel syndrome: Pain can occur at night

Tarsal tunnel syndrome (TTS) is the most common compression neuropathy of the lower extremity. The tarsal tunnel is a fibro-osseous structure along the medial ankle that contains the tibial nerve, the posterior tibial artery, and the tendons of the tibialis posterior, flexor digitorum longus, and flexor hallucis longus. The posterior tibial nerve can become irritated as it runs through the tunnel. The inciting incident can be either a severe stretch to the nerve (from a medial ankle sprain) or from an anatomic compression. Pes planus foot or posterior tibial dysfunction have also been implicated as common causes.¹

Evaluation. Patients describe poorly localized pain with numbness and burning along the medial ankle, arch, or heel, with radiation proximally.^{42,43} Symptoms are aggravated by exercise, and night pain is not uncommon. The tenderness of TTS is more diffuse than that from plantar fasciitis, and symptoms are evident directly over the tarsal tunnel itself.

The classic finding is a positive Tinel's sign (reproduction of symptoms by tapping over the posterior tibial nerve as it passes through the tarsal tunnel). Placing the foot in dorsiflexion and eversion may also reproduce symptoms.¹

Imaging results are not always definitive, but can be helpful in determining the cause of the compression. Plain films and CT can detect fracture or bony deformity, while MRI is more helpful in evaluating soft-tissue structures, such as ganglions or varicosities. Abnormal nerve conduction studies can be suggestive of TTS, but a normal result does not rule out the diagnosis.

Treatment follows a stepped progression. Initially try activity modification, orthotics, and physical therapy. Physical therapy concentrates on medial arch strengthening, Achilles stretching, and ankle proprioception exercises.

FAST TRACK

In tarsal tunnel syndrome, tapping over the posterior tibial nerve usually causes pain (positive Tinel's sign)

NSAIDs and neuromodulatory drugs (tricyclic antidepressants and antiseizure medications) have shown some success. Steroid injections have been effective when given at the site of entrapment,⁴⁴ but care must be taken to avoid the posterior tibial tendon. If patients do not improve following these measures, they may require cast immobilization.⁴⁵

Surgery is a possibility when other options fail. The cause of the neural compression is identified in 60% to 80% of cases.^{46,47} Success rates for various procedures of tarsal tunnel release and tibial nerve decompression range from 75% to 91%. If neural compression is absent, investigate other systemic causes of peripheral neuropathy, such as diabetes or alcoholism.⁴

Systemic diagnoses

Bilateral heel pain, multiple joint involvement, or fever suggests systemic disease. Common diseases affecting the heel include rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis, reactive arthritis, and inflammatory bowel disease.¹ Successful treatment of these disorders should relieve associated heel pain. ■

Correspondence

H. E. Woodall, MD, AnMed Health Family Medicine Residency, 2000 E Greenville Street, Suite 3600, Anderson, SC 29621; hunter.woodall@anmedhealth.org

Disclosure

The authors reported no potential conflict of interest relevant to this article.

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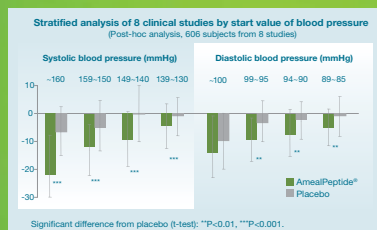
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TABLE W1**Heel pain patient education Web sites****CLICK-AND-PRINT SITES: THESE HELPFUL HANDOUTS ARE EASY TO PRINT OUT FOR PATIENTS****Achilles tendinopathy (tendonitis)**

<http://orthoinfo.aaos.org/topic.cfm?topic=A00147>

<http://www.nlm.nih.gov/medlineplus/ency/article/001072.htm>

Calcaneal apophysitis

<http://familydoctor.org/online/famdocen/home/healthy/physical/injuries/158.html> *(Spanish available)*

http://www.med.umich.edu/1libr/sma/sma_calcapop_sma.htm

Plantar fasciitis

<http://orthoinfo.aaos.org/topic.cfm?topic=A00149>

<http://familydoctor.org/online/famdocen/home/healthy/physical/injuries/140.html> *(Spanish available)*

<http://www.nlm.nih.gov/medlineplus/ency/article/007021.htm>

Retrocalcaneal bursitis

<http://www.nlm.nih.gov/medlineplus/ency/article/001073.htm>

Tarsal tunnel syndrome

<http://www.footphysicians.com/footankleinfo/tarsal-tunnel-syndrome.htm>

MULTI-PAGE SITES: THESE AIDS ARE SEVERAL PAGES LONG AND REQUIRE MULTIPLE CLICKS**Achilles tendinopathy (tendonitis)**

<http://www.mayoclinic.com/health/achilles-tendinitis/DS00737>

Plantar fasciitis

<http://www.mayoclinic.com/health/plantar-fasciitis/DS00508>

Retrocalcaneal bursitis

<http://www.sportsinjuryclinic.net/cybertherapist/back/achilles/achillesbursitis.htm>

Tarsal tunnel syndrome

<http://www.podiatrychannel.com/tarsaltunnelsyndrome/index.shtml>