Assessment and Management of Distal Lower Extremity Injuries

Here is a review of the diagnosis and treatment of some common foot and ankle injuries

BY PETER VANNUCCHI, DPM

Goals/Objectives

1) Present a practical guide to the evaluation and management of common foot and ankle injuries seen in daily practice.

2) Identify the key elements of the history and physical exam for patients with foot and ankle injuries.

3) Explore the strategies for both operative and non-operative management of soft tissue and bone injuries and gain skills in counseling patients on their injuries.

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*Following this article, an answer sheet and full set of instructions are provided (pg. 180).—**Editor***

Introduction

In a medical practice there can be more than one correct answer. Foot and ankle injuries can be treated successfully in multiple ways. Treatment should be tailored to each patient and not limited to surgery alone. Always reserve surgical procedures for a select group of patients.

Sprained Ankles

The sprained ankle is one of the most common musculoskeletal injuries and is as varied as the people who get them. These injuries are generally cared for by different medical specialties, each with varying skills. For podiatrists, treatments are generally conservative and often include immobilization for both moderate and severe sprains.

The biggest problem in treatment is the difficulty in establishing the severity of the injury, and it is estimated that there are more than 25,000 sprains per day in the U.S. At least 90% of these involve the lateral ankle ligament and 10% more are associated with chronic symptoms.

There are two mechanisms for ankle sprains. The one most common is called inversion sprain and often occurs when the ankle is turned over while walking down stairs (Figure 1). It is often referred to as a low ankle sprain and can affect the calcaneofibular ligament (CFL) and the anterior tibiofibular ligament (ATFL).

Eversion Injuries

The eversion injury or high-ankle sprain occurs in about 10% of cases and usually affects the ligaments above the ankle, commonly called a syndesmosis. A syndesmosis is a slightly movable articulation where the contiguous bony surfaces are united by an interosseous ligament, as in the inferior tibiofibular articulation, which is important in maintaining the integrity of the ankle mortise.

The time for healing of inversion sprains varies from days to weeks, but an eversion injury will very often take two to three times as long if there is not a fracture or break in the bones.

There are many methods of classifi-

Continued on page 176

cation that are used, but the simplest method is grade one for ligament stretch injury, grade two for partial tearing of any ligament, and grade three for complete tearing of the ligament.[1]

For all ligament injuries remember the acronym ICE (ice, compression, elevation). ICE is important for treatment.

Treatment for a grade one injury can include an elasticized wrap (more commonly referred to as an Ace Bandage) and oral NSAIDs. Grade two injuries can be treated effectively with an ankle stirrup to prevent inversion and eversion of the ankle. A walking boot is helpful for grade three injuries where the ligament is completely torn. If the patient is no better in around six weeks, some consideration should be given to put the ankle back in motion and balance. Radiographic studies and MRI scans should be done to exclude fractures. For patients who develop chronic instability, a lace-up ankle brace should be used for treatment. The best kind of lace-up ankle brace should have gradual pressure on the ankle as it is laced up.

Surgery becomes an important option for patients with instability and problems walking on an uneven surface, even if the injury is still present in the patient after a year has passed. Many patients admitted into emergency rooms with severe sprains and ankle injuries were referred directly for orthopedic and podiatric consultation that principally resulted in cast immobilization. Often after a 24 hour period following the patient first being seen, the ankle would be so swollen that surgery would be unwise, which can lead to reluctance in performing primary surgical repair. Conservative (non-operative) treatment should be instituted first. If one year has passed and the patient has not fully recovered, then surgery is an important option.

Plantar Fasciitis

The most common cause of heel pain is plantar fasciitis. It affects many people who seek medical care and is one of the most common complaints in podiatric practice.[2] It is characterized by pain and tenderness along the plantar aponeurosis along the medial arch of the heel. It may be unilateral or bilateral and is often seen in overuse syndrome of athletes and runners. Females are affected more than males. There is no correlation between plantar fasciitis and heel spurs. There is an association with flat foot deformity and plantar fasciitis, but it is not a cause and effect relationship. Plantar fasciitis is usually self-limiting. With time, most of the causes will go away. It may take a year to eighteen months, but the majority of patients will get better. There is strong

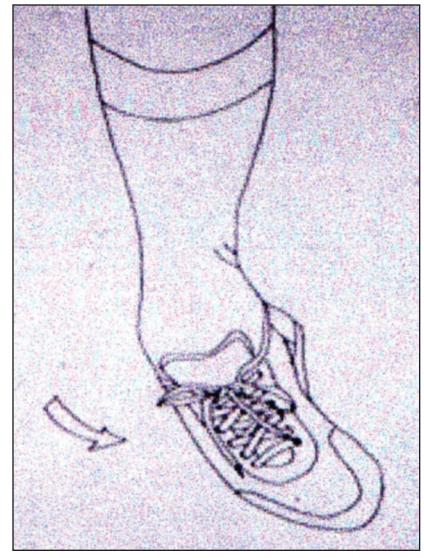

Figure 1: Inversion Sprain

evidence that micro-tears in the fascia is the main etiology, and when we look at sagittal MRI scans of the ankle there will be signal abnormality suggesting an ongoing inflammatory process.

There are a lot of algorithms out there in both the orthopedic and podiatric literature for treatment of plantar fasciitis; the answer, however, remains elusive. Treatment can be grouped into three levels.

Level One

In level one with mild symptoms, treatments include rest and cold packs, anti-inflammatory medications, and stretching exercises to increase dorsiflexion. Stretching the toes dorsally, which stretches the plantar fascia, and rolling a small can under the feet are examples. These exercises should be done morning and evening 30 times each daily. Patience and discipline are required as it usually takes six to eight months for the symptoms to completely resolve. Shoe modifications and avoiding walking barefoot can help.

Level Two

For more chronic and debilitating symptoms (level two), cortisone and platelet-rich plasma injections are other treatment modalities. As yet, there are no evidence-based studies that either treatment is better than the other or that either treatment works. They are, however, part of the armamentarium that is presently being looked at.

Level Three

For patients who have failed all sorts of therapy and who have symptoms of longer duration than nine months (level three), a couple of options are worth knowing. One is the use of extracorporeal shock wave therapy (ESWT), a non-invasive treatment whose validity is still being examined.[3] The outcome can vary from fifty to ninety percent in the literature.

The other option is operative release of the plantar fascia which should be the last resort. The variability in success has a lot to do with co-morbidities and the differential diagnosis of concomitant heel pain (stress fractures of calcaneus, tarsal tunnel syndrome, infection, fat pad atrophy, etc.).

The clinical picture is pain when taking the first few steps in the morning, and after walking a while, it goes away. A stress fracture of the calcaneus might be considered for patients with pain all day long. Numbness in the foot can be explained as peripheral neuropathy. If the patient has back pain, then the patient might have radiculopathy from a herniated disc that is causing referred pain to the foot. Other things to exclude are rheumatologic and neuropathic conditions that might contribute to the heel pain. These include tarsal tunnel syndrome, seronegative arthritis (Reiter's syndrome, psoriatic arthritis), thrombophlebitis, and intrinsic heel pad pathology.

Achilles' Tendon Injuries

Acute rupture of the Achilles tendon is an injury that has been recognized since the time of Hippocrates and can be easily missed in the initial examination by an unaware clinician. The diagnosis is often indicated by the patient's history. The classic history might include a middle-aged male who is playing tennis or racquetball. He feels sudden pain in his calf, associated with an audible snap; this is followed by difficulty in stepping off on the foot. Frequently, the patient

Continued on page 177

reports that the pain immediately after the injury was minimal or absent leading him to believe that the injury was trivial. Only later, when he failed to improve, does he seek medical attention. Physical examination of a fresh rupture can reveal swelling of the calf as well as a palpable defect in the tendon. In examining the Achilles tendon, it is usually best to have the patient lie on the stomach while you perform a Thompson's test.

With the patient lying prone on the table with feet extended beyond the end of the table, the examiner squeezes the calf. A normal non-injured response to the maneuver is slight plantar-flexion of the ankle. Lack of ankle movement is a positive test and can indicate a rupture of the Achilles tendon. Often, a palpable defect in the tendon can be felt for either a complete rupture or a partial tear. Retrocalcaneal bursitis can lead to a partial tendon tear and should be considered.

Rheumatologic Causes

It is also important to consider possible rheumatologic causes of Achilles tendon injuries (seronegative spondylopathy, Reiter's syndrome, psoriatic arthropathy) which involve the site of attachment of tendon and ligament to bone. Achilles tendon injuries can also be caused by too-old running shoes. In younger individuals, Achilles tendon injuries are often due to improper training. The cause of the inflammation is important to identify. If the patient is a runner, heel lifts might be an option. Medical literature is not entirely clear on whether surgery should be done or not.[5]

Non-Operative Care

There is a lot of literature and data supporting non-operative care for acute Achilles tendon tears. For acute ruptures, non-surgical repairs include a non-weight bearing cast for four weeks, then four weeks more of walking casts. Non-operative technique avoids the risks of anesthesia and infection.

Surgical Intervention

Operative intervention ensures a more secure repair and less danger of re-ruptures.[6] For Achilles tendonitis and inflammation of the tendon sheaths, treatment generally involves heel lifts, stretching exercises, NSAIDs, and modification of running and sports activity.

Posterior Tibial Tendon Dysfunction

Many people do not realize that a single flat foot deformity can be caused by a posterior tibial tendon tear. The tendon courses posterior and medial to the ankle. The patient usually presents with medial ankle pain and swelling. This occurs only with people who develop either gradually or suddenly a flat foot deformity.[7] The posterior tibial tendon is very important because it stabilizes the foot in mid-stance gait and supports the arch. The problem is in the blood supply that occurs a few centimeters from the distal medial malleolus. There is an area of relative hypovascularity in this region that may contribute to tendon attrition. Usually, patients present with medial ankle swelling, the forefoot is abducted, and the patient complains of weakness in the forefoot.[8]

The treatment initially would be orthotics, custom-molded with medial arch support and medial longitudinal and rear support of the calcaneus. Physical therapy can also be helpful. Surgery can also be done usually with tendon transfers. In serious cases of flat foot, the patient cannot walk and often develops ulcers on the side of the foot and may develop pain.

Peroneal Tendon Problems

The peroneus brevis and longus tendons course along the lateral aspect of the ankle. Sometimes with severe foot eversion sprains, these tendons can tear, but they rarely rupture completely. During examination, there is resisted eversion of the foot when the ankle is dorsiflexed. Examiners may occasionally sublux the ankle and get a "popping" sound inside the ankle. This is called peroneal tendon instability, and very often a patient will develop a tear in the tendon.

If these tears are not surgically repaired, the patient ultimately develops swelling and difficult walking on uneven surfaces with this type of injury.[9] Evaluation is necessary for associated ankle pathology, mainly osteochondritis of the talus and arthroscopic microfractures.[10-12]

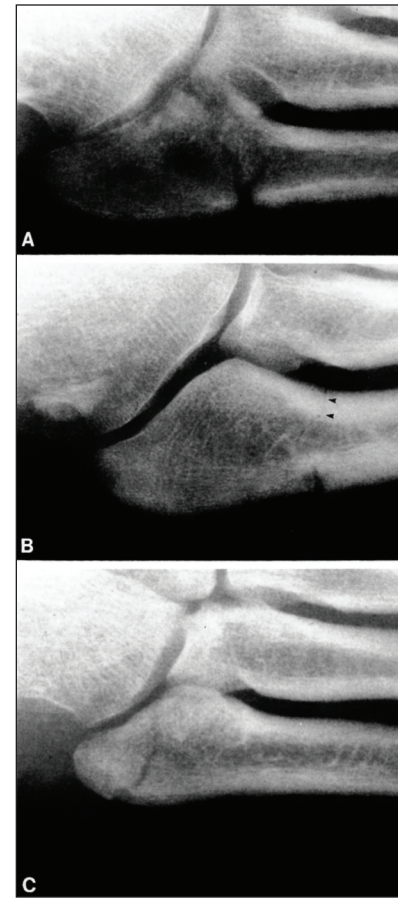

Figure 2: X-rays of the three fracture types of the proximal fifth metatarsal: A) metaphyseal-diaphyseal (Jones fracture), B) diaphyseal stress fracture, C) proximal avulsion fracture.[14]

Lisfranc Injuries

Injuries to the tarsometatarsal (Lisfranc) joint include a broad spectrum of soft tissue and bone injuries. The Lisfranc ligament courses from the medial cuneiform to the base of the second metatarsal. Generally, the base of the second metatarsal is released and the injury is often characterized by a fleck of bone at the base of the metatarsal and by displacement of the metatarsal. Physical examination will show midfoot pain on palpation and ecchymosis. X-ray studies will show loss of alignment of the medial border of the middle cuneiform and base of the second metatarsal and a widening between the first and second tarsometatarsal joint. Treatment often includes immobilization and physical therapy with oral NSAIDs. For unstable injuries, surgical repair with open reduction and internal fixation and immobilization are required.

Metatarsalgia

A problem often seen in athletes and non-athletes is forefoot pain, collectively referred to as metatarsalgia. It is important to know several diagnoses because metatarsalgia has a variety of known causes. The following are the most common:

1) Hallux rigidus or arthritis of the big

Continued on page 178

toe. Not only does it cause pain in the big toe, but can also cause the patient to walk on the outer border of the feet to avoid walking on the big toe, which would lead to more pain.

2) Synovitis or inflammation of the metatarsal phalangeal joint presents with pain, and very often the etiology is an enigma, although trauma and systemic disorder can be implicated.[13]

3) Tendonitis may often present on the top of the foot as well. It may not be associated with swelling as is often seen in synovitis and will not cause pain with every step. It is more of an activity-related problem.

4) Interdigital neuromas are another cause of metatarsalgia. A lot of people do not know that this is the most common nerve entrapment syndrome in the body beyond the carpel tunnel syndrome. Usually the patient presents with altered sensation of the bottom of the foot characterized by burning pain, mainly between the second and third metatarsal heads and sometimes the third and fourth. Patients will often talk of wanting to take their shoes off immediately. In severe cases an audible "click" (Mulder's click) can be induced by palpating with the neuroma moving in and out. Treatment is generally non-operative with metatarsal pads and cortisone injections, and by widening the front of the shoe. Surgical removal is generally done when conservative measures are disappointing. These can be done with impunity because they are not motor nerves and therefore do not interfere with the motion of the forefoot.

Fractures

The fifth metatarsal on the proximal end is a common fracture site and confusion abounds in the classification. There are three types: diaphyseal, metaphyseal-diaphyseal (Jones fracture), and proximal (Figure 2) For the proximal and diaphyseal, which heal well regardless of treatment method, rigid sole shoes and cast walkers are recommended. For the Jones fracture, which is associated with a high non-union rate because of inadequate blood supply, cast and non-weight-bearing along with surgical open reduction and internal fixation are the treatment of choice.[15]

When compared to other injuries of the foot and ankle, fractures and dislocation of the tarsometatarsal region in general are not common. Nevertheless, they present to the emergency room with sufficient frequency to warrant discussion. They are worrisome injuries because a small percentage are either misdiagnosed or overlooked altogether. Foot injuries are often missed or neglected in the poly-traumatic population when other injuries take precedent and consume the time and energy of trauma surgeons. Because of this, healed patients of major injuries and fractures often have neglected foot injuries. These patients are often seen later with difficulty walking because of pain. Patients with tarsometatarsal fractures dislocation do not do well and often require shoe modification, orthotics, and mid-foot surgery.

Turf Toe

Pain, swelling, and stiffness are often seen in athletic activity. Many times this is the result of hyperdorsiflexion injury of the big toe. In severe cases, the tendon will be torn off the sesamoid bone. Fracture must be excluded. First-line treatment is usually conservative, with rest and ice and NSAIDs to relieve the inflammation. Gentle range of motion exercises should be utilized to get the motion back in the big toe so that the patient can return to sports or running activities.

Stress fractures may not be seen initially on x-ray but must be considered. After four weeks, bone callus may form and can be seen on plain films. Gout should always be in the differential diagnosis, and uric acid levels should be determined or joint fluid should be aspirated from the joint if no trauma is involved.

Conclusion

In summary, foot and ankle injuries are frequently seen in podiatric practice and can be characterized by multiple symptoms that can affect a patent's quality of life. Physicians play an important role in the evaluation and treatment of patents who seek relief from their injuries. A variety of treatment options are available but not all of them have been studied adequately. Emerging new therapies might hold promise for the treatments of a wide variety of injuries, but their modalities must be individualized and they are not limited to surgery alone. Remember that guidelines are the beginning but by no means the end of wisdom. Always reserve surgical intervention for a select group of patients. **PM**

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[15] IBID

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SEE ANSWER SHEET ON PAGE 181.

1) The Following are true statements about ankle sprains EXCEPT:
- A) They are the most common sports injury.
- B) Most heal without surgery.
- C) Inversion injury is the most common.
- D) MRI is the most important device as an imaging modality.

2) In the author's grading of ankle sprains, a grade one sprain is a ____.
- A) Ligament stretch injury.
- B) Partial tearing of ligament injury.
- C) Complete tearing of ligament injury.
- D) High ankle sprain injury.

3) Patients with eversion ankle sprains that affect the syndesmosis ligaments will take ____ times longer to heal their inversion sprains if there are no breaks in the bones.
- A) 2 to 3.
- B) 3 to 5.
- C) 5 to 10.
- D) greater than 10.

4) The clinical picture of most patients with plantar fasciitis is ____.
- A) Sharp heel pain in the first couple of steps in the morning and after a while with walking the pain goes away.
- B) A stabbing shooting pain behind the plantar first metatarsophalangeal joint.
- C) Numbness, burning, and tingling pain in the plantar foot and toes.
- D) Cramping leg and ankle pain after standing all day.

5) Indications for extracorporal shock wave therapy include:
- A) Heel spurs.
- B) Plantar fasciitis.
- C) Achilles tendon ruptures.
- D) Flat foot deformity.

6) Level one treatment for plantar fasciitis includes:
- A) Rest and cold packs.
- B) Anti-inflammatory medications.
- C) Stretching exercise to increase dorsiflexion.
- D) All of the above.

7) Reiter's syndrome and other seronegative arthropathy as well as stress fractures, radiculopathy, tarsal tunnel syndrome, and thrombophlebitis must all be considered when diagnosing:
- A) High ankle sprains.
- B) Plantar fasciitis.
- C) Ruptured Achilles tendon.
- D) Metatarsalgia.

8) A positive Thompson test is indicated for which of the following injuries?
- A) Achilles tendon ruptures.
- B) High and low ankle sprains.
- C) Posterior tibial tendon dysfunction.
- D) Lisfranc injuries.

9) Indications for surgical repair of Achilles tendon ruptures include:
- A) A more secure repair with less chance of re-rupture.
- B) Younger, more active athletic patients.
- C) Failed attempts with a non-weight-bearing cast for four weeks and four more weeks of walking casts.
- D) All of the above.

10) Achilles tendon tears can be caused by which of the following?
- A) Improper training in running.
- B) Worn-out running shoes.
- C) Rheumatologic disease.
- D) All of the above.

11) A unilateral flatfoot deformity can be caused by:
- A) Achilles tendon rupture.
- B) Posterior tibial tendon tears.
- C) Peroneal tendon problems.
- D) Lisfranc injuries.

12) Ice, compression, and elevation are important for treatment of :
- A) Intermittent claudication.
- B) Achilles' tendon ruptures.
- C) Ligament injuries.
- D) Interdigital neuromas.

13) Re: Lisfranc injuries, which of the following statements are true?
- A) Physical exam will show midfoot pain on palpation and ecchymosis with early onset injury.
- B) The Lisfranc ligament courses from the medial cuneiform to the base of the second metatarsal.
- C) Treatment often includes immobilization, physical therapy, and oral NSAIDs.
- D) All of the above.

14) Metatarsalgia can be caused by all of the following except:
- A) Hallux rigidus.
- B) Synovitis.
- C) Interdigital neuroma.
- D) Ischemic rest pain.

Continued on page 180

Continuing Medical Education

CME EXAMINATION

15) Interdigital neuromas are generally found between the:
- A) First and second metatarsal heads.
- B) Second and third metatarsal heads.
- C) Third and fourth metatarsal heads.
- D) Fourth and fifth metatarsal heads.

16) "Mulder's Click" describes the presentation of which diagnosis?
- A) Turf Toe.
- B) Stress fractures.
- C) Plantar fasciitis.
- D) Interdigital neuroma.

17) Tendonitis is often seen on the top of the foot and may be associated with swelling. It can often be confused with which of the following?
- A) Synovitis.
- B) Interdigital neuromas.
- C) Stress fractures.
- D) Lisfranc Injuries.

18) The proximal end of the fifth metatarsal is a common fracture site and there is a lot of confusion in the classification. Which of the following is the Jones fracture?
- A) Diaphyseal.
- B) Metaphyseal-diaphyseal.
- C) Proximal base.
- D) Distal head.

19) Gout should always be in the differential diagnosis of which of the following:
- A) Achilles tendonitis.
- B) Proximal fifth metatarsal fractures.
- C) Lisfranc injuries.
- D) Turf toe injury.

20) The following are true statements about turf toe EXCEPT:
- A) It is common in golf.
- B) It is a hyper-dorsiflexion injury of the first metatarsal phalangeal joint.
- C) Gout should be in the differential diagnosis as well as a check on uric acid levels.
- D) All of the above

See answer sheet on page 181.

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State License(s)_____ Is this a new address? Yes_____ No_____

Check one: _____ I am currently enrolled. (If faxing or phoning in your answer form please note that $2.50 will be charged to your credit card.)

_____ I am not enrolled. Enclosed is my credit card information. Please charge my credit card $20.00 for each exam submitted. (plus $2.50 for each exam if submitting by fax or phone).

_____ I am not enrolled and I wish to enroll for 10 courses at $139.00 (thus saving me $61 over the cost of 10 individual exam fees). I understand there will be an additional fee of $2.50 for any exam I wish to submit via fax or phone.

Continuing Medical Education

ENROLLMENT FORM & ANSWER SHEET *(continued)*

EXAM #1/12
Assessment and Management of Distal Lower Extremity Injuries (Vannucchi)

Circle:

1.	A	B	C	D	11.	A	B	C	D
2.	A	B	C	D	12.	A	B	C	D
3.	A	B	C	D	13.	A	B	C	D
4.	A	B	C	D	14.	A	B	C	D
5.	A	B	C	D	15.	A	B	C	D
6.	A	B	C	D	16.	A	B	C	D
7.	A	B	C	D	17.	A	B	C	D
8.	A	B	C	D	18.	A	B	C	D
9.	A	B	C	D	19.	A	B	C	D
10.	A	B	C	D	20.	A	B	C	D

LESSON EVALUATION

Please indicate the date you completed this exam

_____

How much time did it take you to complete the lesson?

_____ hours _____minutes

How well did this lesson achieve its educational objectives?

_____Very well _____Well

_____Somewhat _____Not at all

What overall grade would you assign this lesson?

A B C D

Degree_____

Additional comments and suggestions for future exams:

_____

_____

_____

_____

_____

_____