Anterior Ankle Impingement Syndrome

Here’s an update on the diagnosis and treatment of this disorder.

BY KYLE SCHOLNICK, DPM

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Following this article, an answer sheet and full set of instructions are provided (pg. 144).—Editor

Anterior ankle impingement syndromes are pathological conditions involving painful restriction of motion at the tibiotalar joint due to entrapment of hypertrophic soft tissue, torn ligaments, or osteophytes in the anterior, anteromedial, or anterolateral ankle.

**Anterior Ankle Impingement**

Anterior impingement of the ankle most commonly is caused by osteophyte formation at the anteromedial rim of the tibia and talus neck (Figure 1). Anterior tibiotalar osteophytes are caused by recurrent microtrauma to the joint capsule and anterior chondral margin of the tibiotalar joint, such as from kicking a soccer ball or forcible dorsiflexion.1 Repeated trauma causes microfrac-
Anterolateral Ankle Impingement

Anteromedial ankle impingement typically occurs from injury to the deltoid ligament complex from blunt trauma or an inversion sprain leading to scar formation, synovitis, or hypertrophic bone changes along the anteromedial joint line (Figure 2). The anterior tibiotalar ligament is most commonly involved, but tearing and entrapment of the anteromedial joint capsule is also possible. Following recurrent inversion ankle injuries, the anterior fibers of the deltoid thicken, which may become caught between the medial malleolus and talus during dorsiflexion. It is also common that an avulsive injury at the insertion of the anterior tibiotalar ligament or dystrophic ossification following prior ligamentous injury may cause anteromedial joint pain. Patients will present with limited ankle dorsiflexion and supination, with focal anteromedial tenderness and swelling, exacerbated by ankle dorsiflexion.

Ankle inversion sprains are another common cause of anteromedial ankle impingement.

Ankle inversion sprains are another common cause of anteromedial ankle impingement. Repetitive impaction between the medial malleolus and the medial facet of the talus may result in an osteochondral lesion, spur formation, inflammation, proliferation of the synovium, and scar tissue. In addition to arthroscopic debridement, lateral ankle ligament reconstruction may be indicated. Finally, a cavus foot may induce pressure on the anteromedial facet of the ankle joint, resulting in osteophyte formation.

Anterolateral Ankle Impingement

Anterolateral soft tissue impingement occurs in 3% of all ankle sprains. There are numerous types of soft tissue pathologies that may cause anterolateral ankle impingement. Most commonly, these lesions occur as a surgical complication or from poor management of an inversion ankle sprain, which damaged the anterior talofibular ligament (ATFL) or calcaneofibular ligament (CFL). These lesions include arthrofibrosis, localized synovial hypertrophy, meniscoïd lesions, and impingement of the distal fascicle of the anterior inferior tibiofibular ligament (AITFL).

Arthrofibrosis is capsular scar tissue caused by an influx of inflammatory cells and the initiation of the clotting cascade within the damaged tissue. Subsequent fibroblastic proliferation ensues with excessive collagen synthesis leading to fibrosis.

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Synovitis following an ankle sprain is caused by an influx of inflammation to the damaged lateral ankle ligaments, leading to progressive synovium enlargement (Figure 3). Hematoma may also occur from a capsular tear, leading to hemorrhagic synovitis. Synovitis becomes exacerbated once the hematoma is resorbed by the synovium. Synovial shelf lesions may also form, which are fibrous bands attached at two ends and extend over the anterior joint line. Early resection of impinging synovium will inhibit the cascade to chronic synovitis and scar tissue formation.9

Meniscoid lesions get their name from the resemblance to a torn meniscus in the knee. These lesions are hyalinized connective tissue arising from remnant fibrotic scar tissue of the ATFL and CFL. The forced plantarflexion and supination of an ankle sprain contact the lateral talar dome during ankle dorsiflexion. Contact may occur from an abnormal distal insertion of the fascicle, increased length or width, or from a lax and damaged ATFL causing abnormal anterior extrusion of the talus.11

Abnormal talar extrusion will cause repetitive friction between the talus and the fascicle, particularly during ankle dorsiflexion. Abrasion of the anterolateral talus dome articular surface may develop as a result of this friction. Syndesmotic ligament injuries may also lead to hypertrophic scar tissue and synovitis at the inferior margin of the ATITFL, possibly forming a meniscoid lesion and lead to impingement.

Bassett’s ligament is significantly thicker in abnormal cases, but sensitivity and specificity of magnetic resonance imaging (MRI) using the thickness of the ligament as a sign of abnormality, has been inconsistent and unreliable (Figure 6). Therefore, arthroscopy remains the best tool for this diagnosis. Indications for resection of Bassett’s ligament are contact between the AITFL and the talus in the beginning of plantarflexion of the ankle, increased contact between Bassett’s ligament and the talus throughout ankle range of motion, or if Bassett’s ligament inserts into the distal fibula.11

Studies have shown good to excellent results after arthroscopic resection of the impinging Bassett’s ligament. These cases have resulted in unobstructed ankle plantarflexion.

The final cause of anterolateral soft tissue impingement is entrapment of Bassett’s ligament, a thickened distal fascicle of the AITFL.
Anterior Ankle (from page 139)

ion and dorsiflexion in 89-100% of cases at an average follow-up of three years.14 A useful pearl during arthroscopic resection of Bassett’s ligament is not to use distraction of the ankle. Distraction relieves contact and impingement of the fascicle on the talus and may cause the surgeon to miss a pathological distal fascicle.14

Diagnosis

Patients will describe persistent pain and swelling in the anterior ankle, with limited dorsiflexion, which persists for many months. Pain is exacerbated by dorsiflexion, and clinical exam may reveal soft tissue swelling over the anterior ankle joint. Movement limitation may sometimes be overcome by excessive ankle pronation. A history of a recent traumatic event, such as an ankle sprain, is common. During maximum plantarflexion, osteophytes may be palpable just medial to the tibialis anterior tendon or along the anterior rim of the tibia. Liu, et al. described six clinical guidelines for diagnosing anterolateral ankle impingement, which demonstrated 94% sensitivity and 75% specificity.15

These guidelines included ankle joint tenderness, ankle joint effusion, pain with forced dorsiflexion and eversion, pain with a single-leg squat, pain with activity and absence of mechanical instability. One of the most accurate clinical tests to diagnose anterolateral ankle impingement is the impingement or Solan sign. This test is performed by applying thumb pressure over the lateral gutter of the ankle as the foot is moved from plantarflexion to dorsiflexion. If hypertrophic synovium is present, it will be forced into the joint by the examiner’s thumb and elicit pain by impinging the synovium between the talar neck and distal tibia.16 This test is reported to be 94.8% sensitive and 88% specific for synovial hypertrophy. Patients with impingement secondary to Bassett’s ligament may describe a popping or catching sensation during ankle dorsiflexion and eversion.

Magnetic resonance arthrography (MRA) has been found to be accurate in 97% of anterolateral impingement cases and is used to identify ligament tears in the ankle. MRI will be most useful for evaluating soft tissue impingement, synovitis, fibrosis, and capsular thickening, while ruling out osteochondral defects, marrow contusions, intra-articular loose bodies, peroneal tendinitis, synovial fluid, and sinus tarsi syndrome. T1-weighted imaging is optimal for detecting the low-signal synovial hypertrophy and scarring in the anterolateral or anteromedial ankle gutters.15

Since the synovial membrane is highly vascular, the increased vascularity from synovitis will be better appreciated if contrast is used. However, a mature meniscoid lesion will be avascular and will not be enhanced. A meniscoid lesion will appear as hypo-intense on both T1 and T2-weighted images.17 Thickening and nodularity of the ATFL and lateral gutter fullness is suggestive of anterolateral impingement and is most reliably seen on T1-weighted axial imaging. Liu, et al. found that MRI had only 39% sensitivity and 50% specificity for an anterolateral impingement lesion.13 Therefore, arthroscopy continues to be the gold standard of diagnosis.

Computed tomography (CT) scans can also be used to evaluate for osteophytes, osteochondral lesions, or arthritic changes. Ultrasound has been shown to correlate well with arthroscopic findings in its ability to detect soft tissue abnormalities, such as a synovial mass or capsular nodularity.19 Single photon emission computed tomography with lose-dose CT (SPECT/CT) is helpful for better localization of lesions and can be used when MRI and ultrasound are equivocal.

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Radiographs should be performed to rule out tibial or talar osteophytes, fractures, widening of the ankle mortise, and arthritic changes. Stress radiographs can be used to rule out ligament laxity. MRI will be most useful for evaluating soft tissue impingement, synovitis, fibrosis, and capsular thickening, while ruling out osteochondral defects, marrow contusions, intra-articular loose bodies, peroneal tendinitis, synovial fluid, and sinus tarsi syndrome. T1-weighted imaging is optimal for detecting the low-signal synovial hypertrophy and scarring in the anterolateral or anteromedial ankle gutters.15

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Anterior Ankle (from page 140)

Involves rest, ultrasound, electrical stimulation, range of motion exercises, strengthening and proprioceptive training, anti-inflammatory medication, orthotics, taping, ankle bracing, and intra-articular corticosteroid injections for diagnostic and therapeutic purposes. If symptoms continue after six months of conservative care, surgical arthroscopy may be undertaken to debride osseous spurs, scar tissue, entrapped ligaments, or hypertrophic synovitis.

The medial and lateral gutters should be excised of soft tissue until clear visualization of the sides of the talus and each malleolus are seen.

Arthroscopic debridement has been shown to have a shorter recovery period and faster return to function compared to arthrotomy. However, open arthrotomy for removing anterior osteophytes of the ankle has been reported to produce good outcomes. Arthroscopic debridement is performed by placing the patient in a supine position and injecting the ankle joint with 15-20 mL of local anesthetic or normal saline to distend the joint and ease entry. The anterolateral portal is created just lateral to peroneus tertius and the saphenous nerve and age to the superficial peroneal nerve, which is recommended to continue for three months. Other complications follow.

After a diagnosis is confirmed, conservative treatment is traditionally implemented for at least three to six months.

and the talus or fibula and soft tissue impingement from fibrosis in the lateral gutter, entrapment of the sural nerve, and compression of the peroneal tendons. In these cases, a calcaneal osteotomy, subtalar joint arthodesis or a subtalar joint bone-block distraction arthodesis is often needed to correct the hindfoot valgus and relieve the lateral hindfoot impingement.

Treatment

After a diagnosis is confirmed, conservative treatment is traditionally implemented for at least three to six months. Conservative treatment involves rest, ultrasound, electrical stimulation, range of motion exercises, strengthening and proprioceptive training, anti-inflammatory medication, orthotics, taping, ankle bracing, and intra-articular corticosteroid injections for diagnostic and therapeutic purposes. If symptoms continue after six months of conservative care, surgical arthroscopy may be undertaken to debride osseous spurs, scar tissue, entrapped ligaments, or hypertrophic synovitis.

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Anterior Ankle (from page 141)

Contraindications to arthroscopy include infection, severe degenerative joint disease with reduced joint space that won’t allow proper maneuvering of instruments, severe edema, and peripheral vascular disease which may cause wound healing complications.

The success of arthroscopic debridement for anterior ankle impingement is directly related to the staging of osteoarthritis in the ankle. The absence of pre-operative degenerative changes within the ankle joint is a more consistent indicator of treatment success. Patients with associated ankle joint degenerative changes are significantly more likely to have poor long-term results following surgical treatment. Excellent results are obtained with arthroscopic debridement if patients have no osteoarthritis, but success rates fall to 77% and 53% for grade I and grade II osteoarthritis, respectively.

Other studies showed 78-85% excellent to good results following arthroscopic treatment of anterior ankle impingement, but 96% of patients stated to have had some benefit from the surgery. Ferkel, et al. showed good results after arthroscopic treatment of ankle impingement in 26 out of 31 patients. Finally, a study by Murawski and Kennedy showed a 93% satisfaction rate following arthroscopic debridement of anteromedial ankle impingement in 43 patients. PM

References

Dr. Scholnick is a podiatric foot and ankle surgeon practicing in the podiatric supergroup, Foot and Ankle Specialists of the Mid-Atlantic. His offices are located in Kensington and Columbia, MD.
1) What pre-operative condition will most likely lead to poor success following arthroscopic treatment of anterior ankle impingement?
   A) DISH syndrome  
   B) Osteoarthritis  
   C) Extensor tendinitis  
   D) Rheumatoid arthritis

2) If performing arthroscopy with an ankle implant, what precaution should one follow?
   A) Excessive bone resection  
   B) Excessive synovial tissue debridement  
   C) Don’t use a shaver  
   D) Don’t remove osteophytes

3) What has shown to have the best success rates for removing anterior osteophytes of the ankle?
   A) Arthroscopy  
   B) Steroid injections  
   C) Open arthrotomy  
   D) Shockwave

4) Which condition will most likely lead to talocalcaneal impingement?
   A) Cavus foot  
   B) Equinus  
   C) Peroneal tendinitis  
   D) Malunion from calcaneal fracture

5) What is the best study to detect synovial hypertrophy in the anteromedial ankle gutter?
   A) CT Scan  
   B) T2 weighted MRI  
   C) T1 weighted MRI  
   D) PET Scan

6) How will a mature meniscoid lesion appear on MRI?
   A) Hyperintense on T1 and T2  
   B) Hypointense on T1 and T2  
   C) Hyperintense on T1 and Hypointense on T2  
   D) Hypointense on T1 and Hyperintense on T2

7) Which of the following is NOT part of Liu’s guidelines of diagnosing anterolateral ankle impingement?
   A) Single leg squat  
   B) Double leg squat  
   C) Absence of mechanical instability  
   D) Solan Sign

8) How is the foot manipulated during Solan’s Sign?
   A) Eversion to inversion  
   B) Inversion to dorsiflexion  
   C) Plantarflexion to dorsiflexion  
   D) Dorsiflexion to eversion

9) What is the most common cause of anterior ankle impingement?
   A) Synovitis  
   B) Meniscoid lesion  
   C) Loose body  
   D) Osteophyte

10) What is the most common ligament to be impinged in anteromedial ankle impingement?
    A) Anterior tibiotalar ligament  
    B) Anterior talofibular ligament  
    C) Anterior tibiofibular ligament  
    D) Bassett’s ligament

11) Bassett’s ligament is part of what ligament?
    A) Deltoid  
    B) Anterior inferior tibiofibular ligament  
    C) Anterior talofibular ligament  
    D) Calcaneofibular ligament

12) What % of ankles sprains lead to anterolateral soft tissue impingement?
    A) 3%  
    B) 9%  
    C) 15%  
    D) 32%

13) What is the best way to inhibit the cascade to chronic synovitis and scar tissue?
    A) Injections  
    B) Early resection of impinging synovium  
    C) PT  
    D) Immobilization

14) What will exacerbate impingement of Bassett’s ligament?
    A) Cavus foot  
    B) Flatfoot  
    C) Compression of syndesmosis  
    D) Talar extrusion

Continued on page 144
15) What is the best way to diagnosis Bassett’s ligament impingement?
   A) SPECT/CT  
   B) MRI  
   C) Clinical exam  
   D) Arthroscopy

16) What should NOT be done during arthroscopic resection of Bassett’s ligament?
   A) Distraction of the ankle  
   B) Radioablation  
   C) Tourniquet  
   D) Knee flexion

17) Which of the following is NOT a contraindication to arthroscopy?
   A) Diabetes  
   B) Osteoarthritis  
   C) Severe edema  
   D) PVD

18) What is the most common cause of osteophytes?
   A) Rheumatoid arthritis  
   B) Trauma  
   C) Flatfoot  
   D) Cavus foot

19) How will movement limitation be overcome by patients with anterior ankle impingement?
   A) Supination  
   B) Pronation  
   C) Equinus  
   D) Prolonged swing phase of gait

20) How is synovial tissue best imaged?
   A) MRI with contrast  
   B) MRI without contrast  
   C) CT scan  
   D) SPECT/CT

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EXAM #1/16
Anterior Ankle Impingement Syndrome
(Scholnick)

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