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Anterolateral Impingement of the Ankle: Effectiveness of MR Imaging[1]

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Abbreviation:
ATFL = anterior talofibular ligament

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PURPOSE: To determine the effectiveness of magnetic resonance (MR) imaging in the diagnosis of anterolateral impingement of the ankle.

MATERIALS AND METHODS: MR images were reviewed in 12 patients (12 ankles) with arthroscopically proved anterolateral impingement and in 19 control subjects (20 ankles) with diagnoses other than impingement. MR images were scored by means of consensus of two musculoskeletal radiologists and independently by a third radiologist. Patients underwent imaging at 1.5 T, with use of standard imaging sequences and a dedicated extremity coil.

RESULTS: For the consensus reading, the sensitivity, specificity, and accuracy of MR imaging for the diagnosis of impingement were 42%, 85%, and 69%, respectively. The frequency of lateral gutter fullness and anterior talofibular ligament thickening on MR images was higher in the 12 ankles with impingement (seven [58%] and seven [58%] ankles, respectively) than in the 20 control ankles (seven [35%] and five [25%] ankles, respectively), but these trends did not reach statistical significance. Interobserver agreement for anterior talofibular ligament thickening was high, whereas that for lateral gutter fullness was fair.

CONCLUSION: Conventional MR imaging of the ankle is insensitive for anterolateral impingement. Anterior talofibular ligament thickening and soft-tissue fullness in the lateral gutter may be suggestive of the diagnosis, but the reliability of the latter finding is questionable.

The common ankle sprain may cause scarring and synovitis, which are typically most severe within the anterolateral gutter of the ankle. This hypertrophic tissue can become entrapped in the joint at dorsiflexion of the ankle, thus aggravating the synovitis and creating painful anterolateral synovial impingement of the ankle. This entity may explain chronic ankle pain in patients with a history of remote or recurrent ankle sprains (1,2). The traumatic insult is usually sports related, and the most common mechanism of injury is an inversion sprain (3).

Arthroscopic débridement and partial synovectomy of the anterolateral gutter and anterior recess are highly effective for relieving symptoms and restoring function in patients with anterolateral impingement. The decision to perform arthroscopy is typically based only on the patient's history and physical examination findings (3–8). Preoperative radiographs are usually obtained to aid in detection of tibial or talar spurs, which can also aggravate anterior impingement. These osseous contributors to impingement can also be removed arthroscopically (9,10).

Magnetic resonance (MR) imaging is helpful for determination of potential causes of chronic posttraumatic ankle pain such as tendonopathy, osteochondral lesions, stress fracture, osteoarthritis, loose bodies, and sinus tarsi syndrome. However, the usefulness of MR imaging for the diagnosis of anterolateral impingement is more doubtful (2,5,8). Although most practitioners do not use MR imaging to evaluate suspected cases, some investigators (3,6,11) report that MR imaging demonstrates a characteristic increase in the fullness of the soft tissue of the lateral gutter of the ankle in patients with anterolateral impingement. The purpose of our study was to determine the reliability and usefulness of this finding, as well as the general effectiveness of routine MR imaging for the diagnosis of anterolateral impingement of the ankle.

MATERIALS AND METHODS

This study included 12 ankles in 12 patients (seven men, five women; mean age, 38 years; age range, 19–56 years) with arthroscopically proved anterolateral soft-tissue impingement, who underwent MR imaging before arthroscopy at our institution during a 6-year period (January 1991 to January 1997). Twenty ankles in 19 patients (11 men, eight women; mean age, 41 years; age range, 20–72 years) who also underwent MR imaging during this same period and who had surgically documented diagnoses other than soft-tissue impingement were selected as control subjects. Patients who underwent ankle surgery before MR imaging were excluded, including three additional patients with anterolateral impingement. Primary diagnoses determined at surgery for the control ankles included posterior tibial tendonopathy, spring ligament derangement, or both (n = 9); osteoarthritis (n = 3); loose body (n = 1); osteochondral lesion (n = 1); peroneal tendonopathy (n = 4); and lateral ligamentous instability (n = 2).

Patients underwent MR imaging in the supine position with a 1.5-T unit (Signa; GE Medical Systems, Milwaukee, Wis; or Magnetom Vision, Siemens Medical Systems, Iselin, NJ) equipped with a transmit-receive extremity coil. All studies included sagittal T1-weighted, spin-echo (500–650/11–20 [repetition time msec/echo time msec]) images obtained with 5-mm section thickness, a 16–20-cm field of view, and a 192 × 256 matrix. Axial spin-echo MR images were also obtained, including proton-density (1,500–2,000/15–20) and T2-weighted (1,500–2,000/70–90) images in 31 ankles and T1-weighted (600/15) images in the remaining ankle. All axial images were obtained with 3-mm section thickness, a 14-cm field of view, and a 192–256 × 256 matrix. Coronal images were also obtained in most patients, but they were not thought to be useful for the purpose of assessment of the MR imaging findings under study.

Retrospectively analyzed MR imaging findings included (*a*) status of the anterior talofibular ligament (ATFL), (*b*) thickening of the ATFL (Figs 1, 2), and (*c*) lateral gutter fullness (Figs 3, 4). With regard to *a*, the ATFL was scored as abnormal if it was disrupted, thickened, attenuated, or not visualized; otherwise, the ATFL was scored as normal. A separate assessment was performed for *b* because we speculated that thickening of the ATFL may represent periligamentous scarring, which could contribute to anterolateral impingement. With regard to *c*, lateral gutter fullness was deemed to be present if there was an increase in nonfatty tissue deep to the ATFL within or anterior to the lateral gutter. Finally, a global impression was obtained with regard to the presence of anterolateral impingement.

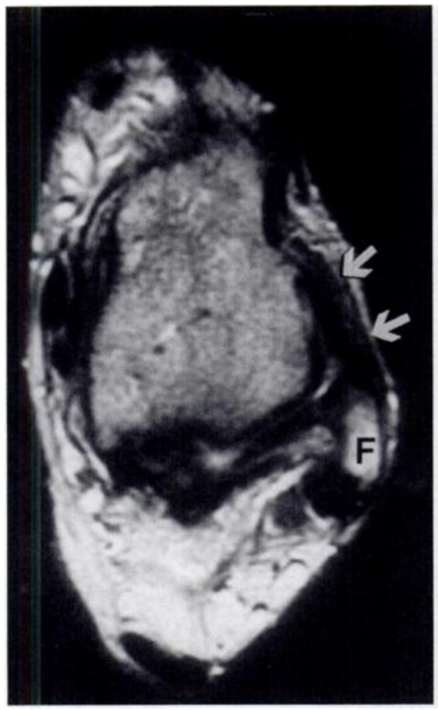

Figure 1. Arthroscopically proved anterolateral soft-tissue impingement in a 20-year-old female volleyball player. Axial proton-density spin-echo MR image (1,800/20) shows diffuse thickening of the ATFL (arrows), which has slightly ill-defined margins. *F* = distal portion of the fibula.

Figure 2. Anterolateral soft-tissue impingement in a 21-year-old female runner with a history of multiple ankle sprains. Axial proton-density spin-echo MR image (1,800/20) shows a deficiency or nearly complete absence of low-signal-intensity fibers (arrow) in the expected location of the ATFL. This finding was scored as an abnormal ATFL, without thickening.

Consensus interpretations were initially made by two experienced musculoskeletal radiologists, who were blinded to patient name and clinical diagnosis. MR images were retrospectively scored by using a standardized form. To assess interobserver variability, a third musculoskeletal radiologist (L.Y.), who was also blinded to patient name and clinical diagnosis, independently scored the MR images by using the same form.

Associations between the various MR imaging findings and the clinical diagnoses were examined by using the two-tailed Fisher exact test or the χ^2 statistic. A P value of less than .05 was regarded as indicative of a statistically significant difference. Interobserver agreement was measured by using the Cohen κ statistic.

RESULTS

Consensus Readings

Results of the consensus MR image readings are summarized in the Table. Tibiotalar joint effusions were present in 13 of 32 ankles and were nearly equally prevalent in ankles with impingement and in control ankles. Anterior tibial osteophyte formation was more common in ankles with impingement (seven of 12 [58%]) than in control ankles (four of 20 [20%]). This was the only MR imaging finding that was statistically significantly associated with the diagnosis of impingement (P = .05).

The frequencies of lateral gutter fullness, ATFL thickening, and abnormal ATFL were all higher in ankles with impingement than in control ankles (Table), but these differences were not statistically significant (P = .20, .13, and .14, respectively). If the 13 ankles with joint effusion are considered alone, lateral gutter fullness was also more common in ankles with impingement (three of five) than in control ankles (two of eight). Again, however, these differences were not statistically significant.

There was no association between either lateral gutter fullness or ATFL thickening and the presence of a joint effusion

Results of Consensus Readings

Result	Ankles with Impingement (n = 12)	Control Ankles (n = 20)
Tibiotalar joint effusion	5 (42)	8 (40)
Anterior tibial osteophytes*	7 (58)	4 (20)
Lateral gutter fullness	7 (58)	7 (35)
Abnormal ATFL	10 (83)	11 (55)
Thickened ATFL	7 (58)	5 (25)

Note.—Values in parentheses are percentages.

* Difference between ankles with impingement and control ankles was statistically significant (P = .05).

Figure 3. Chronic hindfoot pain secondary to posterior tibial tendonopathy in a 71-year-old woman. Axial spin-echo MR image (1,600/70) shows apparent attenuation of the ATFL. A slight prominence of soft tissue (curved arrow) in the lateral gutter was scored as fullness at one of the two readings. Note the area of hyperintensity (straight arrow) within the partially ruptured, posterior tibial tendon.

Figure 4. Long-term (>1 year) ankle pain secondary to anterolateral impingement in a 55-year-old man. Axial spin-echo MR image (1,500/70) obtained superior to an irregularly thickened ATFL (not shown) shows a prominence of soft tissue (curved arrow) with mixed signal intensity in the lateral gutter. Note the osteochondral lesion of the anterolateral talar dome (short straight arrow) and the posteriorly situated loose body (long straight arrow). *E* = extensor digitorum longus tendon.

(P = .62 and .61, respectively). Lateral gutter fullness was also not associated with ATFL thickening (P = .20).

With regard to the consensus reading, the sensitivity, specificity, and accuracy of MR imaging for the diagnosis of impingement were 42%, 85%, and 69%, respectively.

Independent Reading

Results of the second, independent reading by the third musculoskeletal radiologist were generally similar to those of the consensus reading. Again, the frequency of lateral gutter fullness, ATFL thickening, and abnormal ATFL were higher in the 12 ankles with impingement (seven [58%], five [42%], and 10 [83%] ankles, respectively) than in the 20 control ankles (five [25%], three [15%], and 11 [55%] ankles, respectively). None of these differences, however, were statistically significant (P = .13, .12, and .14).

For the second, independent reading, the sensitivity, specificity, and accuracy of MR imaging for the diagnosis of impingement were 50%, 75%, and 66%, respectively.

Interobserver Agreement

Interobserver agreement was fair for lateral gutter fullness (κ = 0.48). Interobserver agreement was excellent, however, for an ATFL abnormality (κ = 0.91) and substantial for ATFL thickening (κ = 0.71).

DISCUSSION

Ankle sprains are extremely common and may be the most frequently sustained injury in sports. Approximately 85%–90% of these sprains involve the lateral collateral ligament, because plantar flexion with inversion is the most common mechanism of injury (3). Trauma is the most common cause of nonspecific synovitis of the ankle, and solitary or recurrent ankle sprains can eventually result in anterolateral impingement syndrome (12). Patients with this syndrome may present with chronic pain, subjective instability, or weakness (2). At examination, they often have local tenderness over the lateral gutter and intermittent anterior ankle swelling. Occasionally, a click may be elicited with ankle dorsiflexion and eversion (6). The prevalence of anterolateral impingement is unclear, however, because there is no definitive test other than arthroscopy (3).

In histopathologic terms, the impingement lesion consists of a hypertrophic and inflamed synovium and fibrosis, most commonly along the lateral gutter. Even minor sprains can cause capsular or ligamentous tearing, with resultant formation of intraarticular hematoma. The ensuing periligamentous inflammation and synovitis can eventually fill the lateral gutter with hypertrophic soft tissue. Mechanical impingement of this tissue within the joint during activity then aggravates and promotes synovitis and may mold the tissue into a hyalinized, "meniscoid" lesion (1–3). An accessory, inferior fascicle of the anterior tibiofibular ligament can also contribute to soft-tissue impingement, particularly when the other anterolateral supporting structures are compromised (13).

Arthroscopy is indicated for anterolateral impingement when nonsurgical interventions have failed. Anterolateral impingement is effectively treated arthroscopically with partial synovectomy and débridement (5–8). Arthroscopy of the ankle is technically challenging and requires meticulous attention to neurovascular structures. Complications include neurologic deficits, infection, and hemarthrosis, and the complication rate may be as high as 15% (8).

Some investigators (3,6,11) have suggested that MR imaging may help detect abnormal soft tissue in the lateral gutter in patients with anterolateral impingement, but the specificity and reliability of this finding have not been established. In our study, we did find that the frequencies of lateral gutter fullness and of a thickened ATFL were higher in ankles with anterolateral impingement than in control ankles. A thickened appearance of the ATFL on MR images presumably represents scarring of the ligament or capsule. In our study, detection of this finding was highly reliable ($\kappa = 0.71$). Detection of lateral gutter fullness, however, was more subjective and was commonly found, to some degree, in control ankles. Accordingly, interobserver agreement for this finding was only fair ($\kappa = 0.48$). Possibly because of the small number of ankles we studied, neither of these findings was statistically significantly associated with impingement, despite the higher frequency of these MR imaging findings in ankles with impingement. The exception was the presence of anterior tibial osteophytes. The global accuracy and sensitivity of MR imaging for impingement were correspondingly poor.

A major limitation of our study was the small patient population and lack of a well-matched, well-characterized control group. The small study numbers reflect prevailing practice, however, in that MR imaging is not regularly used for evaluation of possible ankle impingement but is used to exclude other causes of chronic, posttraumatic ankle pain. The effectiveness of MR imaging for anterolateral impingement could potentially be improved by imaging the anterior recess and lateral gutter with higher spatial resolution or after arthrography. Our results are reflective of conventional, non–contrast material–enhanced sequences currently used for routine MR imaging assessment of ankle problems.

In summary, conventional ankle MR imaging is insensitive for the diagnosis of anterolateral impingement. The findings of a thickened ATFL and soft-tissue fullness in the lateral gutter may be suggestive of the diagnosis of anterolateral impingement of the ankle, but the reliability of the latter finding is questionable even among experienced musculoskeletal radiologists. In the evaluation of patients suspected of having impingement, MR imaging remains useful for the exclusion of other contributing or explanatory pathologic conditions. The decision to perform arthroscopy for anterolateral impingement of the ankle, however, should still be made primarily on the basis of clinical assessment results.

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