Comparison between MRI and arthroscopy in detecting lesions following unresolved pain in severe ankle sprains

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Received 01 August 2012
Accepted 22 September 2012

Egyptian Orthopedic Journal 2015, 50:158–161

Background
Ankle sprains are a very common form of sports injury, and a large number of such injuries result in significant unresolved ankle problems. Capitalizing on the recent advances in ankle arthroscopy techniques, we have compared the results of evaluation of patients with these complaints using MRI scans versus what is seen and treated using ankle arthroscopy.

Patients and methods
Between 2009 and 2011 we have treated 25 cases of unresolved pain following severe ankle sprains. The mean age of the patients was 36.2 years. There were 17 male and eight female patients; all of them had residual ankle pain at least 6 months following a severe ankle sprain. Patients were subjected to MRI scan, following which they all underwent an ankle arthroscopy procedure as a treatment modality for their symptoms. The ankle arthroscopy findings were compared with the preoperative MRI findings.

Results
Seventeen of our patients had meniscoid lesions and anterior tibiofibular ligament injuries during arthroscopy, of which only 12 were seen on preoperative MRI (70.5%). Fourteen patients had chondral lesions, of which only 11 were seen on MRI (78.5%). Lateral collateral ligament calcification seen in three cases could only be detected by means of preoperative MRI in one case (33.3%), and there was one case of a loose body, which was not detected on MRI (0%).

Conclusion
MRI scan is not an alternative to ankle arthroscopy in treating patients with residual symptoms following severe ankle sprains. Increasing the strength of MRI magnet and a learning curve in reading these scans may help in increasing its sensitivity.

Keywords:
ankle arthroscopy, ankle MRI, chondral lesions, tibiofibular ligament

Egypt Orthop J 50:158–161

1110-1148

Introduction

Ankle sprains constitute up to 15% of all sports injuries [1,2]. Recently, arthroscopy has become a standard procedure for the diagnosis and treatment of disorders of the ankle [3]. As mentioned by Kannus and Renstrom [4], most cases of severe ligament injuries of the ankle resolve well after adequate immobilization for 3 weeks or more; however, around 40% of patients [5,6] have persistent symptoms, which vary from recurrent swelling, instability and/or pain during normal weight bearing and exercise [7]. We have set out to compare the MRI and the arthroscopic findings of those patients to determine the value of MRI scan in these cases and whether or not it is a reliable diagnostic tool to determine the need for further management.

Patients and methods

Between 2009 and 2011 we have treated 25 patients with residual ankle pain following a severe incident of ankle sprain using ankle arthroscopy at our facility [8]. All patients included in this study have had a residual symptom for more than 6 months following the initial injury. Patients who had a diagnosis of a displaced or undisplaced fracture of the ankle were excluded from the study, even though some of them were still treated with arthroscopic debridement for relief of their symptoms. The mean age of our patients was 36.2 (range = between 21 and 45 years). There were 17 male and eight female patients. The most common complaint in our cases was pain in 22 cases, instability and recurrent giving way in 15 cases, and recurrent swelling in 12 cases. Patients underwent an MRI scan before the arthroscopy. All scans were reviewed by the same radiologist. The decision to perform an ankle arthroscopy was made based on the clinical findings regardless of the presence or absence of lesions seen on the MRI scan. This study approved by the Ethical committee of Cairo University.

MRI scans were performed for 20 of our patients using a 0.5-T (Gyroscan intera; Philips, Zürich, Schweiz)

scanning machine, and in the remaining five patients using a 1.5-T whole-body imager (Magnetom Avanto; Siemens) using eight-channel foot/ankle coil and 1-T open high-field system (panorama; Philips), using head coil. The study protocol included axial T2 (TR 4000, TE 80), axial T1 (TR 500, TE 15), sagittal T2W (TR 4000, TE 90), sagittal T1W (TR 600, TE 12), sagittal proton density (TR 3000, TE 30), sagittal STIR (TR 3000, TE 30), coronal STIR (TR 3000, TE 30), and coronal GRE (TR 350, TE 10). The criteria of ligament injury and abnormalities included loss of signal, altered signal of the ligament and/or discontinuity either complete or partial, which is seen in T2WI and STIR as a hyperintense signal within the ligament or irregular outlines and wavy contour of the ligament [9].

Arthroscopy of the ankle was performed under general anesthesia in all of our cases. Patients were placed in the supine position, and a tourniquet was placed around the middle portion of the thigh. The lower half of the operative table was removed to allow the legs to dangle down. No traction accessory was used around the ankle, and manual traction was applied whenever necessary. Removal of the lower portion of the operative table also allowed for the free use of fluoroscopy whenever required. The ankle was first inflated with saline injected at the anteromedial corner of the ankle. Thereafter, a small incision was made for the anteromedial portal through the skin only and dissection was carried out slowly with a hemostat until the joint. We used a 3.5 mm camera and sheath, and after the initial inspection the anterolateral portal was made in the same way using the light guidance of the scope to avoid injury of any important structure. The ankle joint was first examined looking particularly at the anterior tibiofibular attachment and ligaments, the lateral collateral ligament complex, the deltoid ligament, and the anteromedial corner of the tibia. The cartilage was also carefully inspected for any cartilage defects, and finally the whole joint inspected for any loose bodies and hypertrophic synovium or adhesions.

The relevant pathology was then handled accordingly. Anterior tibiofibular ligament injuries and meniscoid lesions were managed by first shaving the meniscoid lesion, and then the ligament was examined while the ankle was subjected to internal and external rotation. In three cases, the joint was judged to be completely unstable and a percutaneous syndesmotic screw was placed under image intensification [10].

Lateral collateral ligament calcifications were shaved, and cases with clinical instability were further managed with open reconstruction of the lateral collateral ligament. Chondral lesions were graded using the Outerbridge grading system [11]; superficial cartilage lesions of grade I and grade II that include cartilage with softening and swelling, or a partial-thickness defect with fissures on the surface that do not reach the subchondral bone, or exceed 1.5 cm in diameter were left alone or shaved superficially. However, deeper lesions of grade III with fissuring to the level of the subchondral bone in an area with a diameter more than 1.5 cm, and grade IV, exposed subchondral bone, were both shaved and microfracture was performed in the subchondral bone with the chondro-Poke (Arthrex Inc.). In one case a lose body was removed from the ankle joint.

Postoperatively, the arthroscopic findings were compared with the MRI findings in the study group. Cases with evident collateral ligament injury easily seen on MRI scan were excluded, as these required open repair and joint inspection.

Results

In our series of 25 cases, 17 patients (68%) had anterior tibiofibular ligament abnormalities and/or meniscoid lesions at arthroscopy; of them only 11 cases were seen by the radiologists on the preoperative MRI scans (70.5%). All of the missed six cases of the meniscoid lesions had their MRI performed on the 0.5-T machine. Fourteen cases (56%) were found at arthroscopy to have varying chondral lesions, of which, again, only 11 lesions (78.5%) were seen on the preoperative MRI. All of them were conducted using the 0.5-T MRI scanner. Lateral collateral ligament calcifications, fraying, or partial tears were seen in only three cases (12%), of which only one was initially predicted with the MRI (33.3%). Finally, there was one case with a loose body (4%), which could not be seen on the MRI scan performed preoperatively. The overall results are demonstrated in Table 1.

In the case of the anterior tibiofibular ligament injuries, a meniscoid lump and swelling was seen in 10 cases (40%), whereas fraying was seen in four cases (16%), and in three cases the ligament was judged to be completely torn with syndesmotic instability requiring the insertion of a syndesmotic screw (12%).

The 14 cases with chondral lesions included 11 cases (27.5%) with Outerbridge grade III and VI requiring

Table 1 List of lesions seen at arthroscopy and MRI scan

Lesions	Arthroscopy	Magnetic resonance
Anterior tibiofibular ligament	17	11
Chondral lesions	14	11
Lateral collateral ligament	3	1
Loose body	1	0

shaving and microfracture; these included all of the cases seen preoperatively on the MRI.

However, only three cases had superficial cartilage lesions of grade I and II requiring no management or superficial shaving.

Discussion

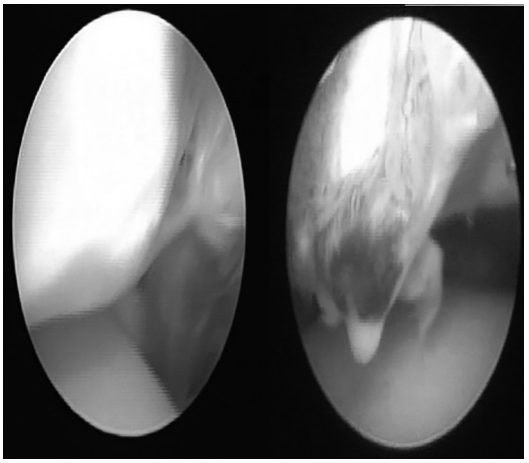
Several studies in the literature recommend that ankle arthroscopy be performed in cases with residual pain following severe sprains of the ankle joint [12]. Patients presenting with pain on normal weight bearing or after exercise, recurrent swelling, or giving way are recommended to undergo an arthroscopy procedure, because there are lesions that are associated with these sprains that are commonly overlooked during examination and the literature studies document a significant improvement in the symptoms of these patients following management of these problems [13,14]. On the other hand, the value of the MRI scan in detecting subtle lesions in the ankle joint has been a matter of a bigger debate, and whether the MRI is comparable in its diagnostic value to arthroscopy in the ankle joint is a question that still remains unanswered. Several studies in the literature have attempted to compare the outcome of MRI evaluation with the arthroscopic findings in this group of patients with unresolved ankle symptoms [5,15,16]. In another study in 2009, O'Neil *et al.* [17] suggested that MRI scan was not the ideal tool for diagnosing subtle ankle lesions and they went further to suggest that surgeons should review the MRI before the surgery, because according to their conclusion there was an evident discrepancy between the radiologists and the attending surgeon in detecting lesions on preoperative MRI. Some of these differences, particularly with the less common diagnoses, may result from the clinician's advantage in being able to take a history and perform an examination, which can guide scrutiny of the MRI.

In our study, we have attempted to compare the results of arthroscopic findings with those of the preoperative MRI scans with regard to four independent lesions: the syndesmotic complex, chondral lesions, lateral collateral complex, and intra-articular loose bodies. The results demonstrated MRI scan to be more valuable in diagnosing chondral lesions (78.5%), and to a lesser extent in diagnosing lesions of the syndesmotic complex (70.5%). However, its value was limited in detecting lesions of the lateral ligament complex and loose bodies. The results of O'Neil and colleagues were inferior as their cases were conducted by a wide variety of MRI machines and also interpreted by radiologists in referral centers. The results of Takao and colleagues in MRI evaluation in comparison with arthroscopy only involved lesions of the syndesmotic complex, and they were markedly superior to ours. In their results, the sensitivity of the MRI scan was almost 100%; however, all their cases were studied on a 1.5-T machine. In their study, MRI sensitivity was far more superior in comparison with mortise views in detecting lesions of the syndesmotic complex. With regard to the value of MRI in detecting chondral lesions several studies have tackled this issue in the knee joint [18,19], but very few in the ankle joint [20]. Tan and colleagues conducted a study in cadavers and focused on suggesting radiological techniques to improve visualization of cartilage in the ankle joint on MRI scan images. Our study demonstrates a relatively valuable role of MRI scanning in diagnosing chondral lesions of the talus and lower tibia in patients with unresolved pain following severe ankle injuries. We have also seen in our study that most of the failures of the MRI to view lesions of the syndesmotic complex and chondral lesions were found in the cases that were performed on the 0.5-T machine. Although fewer in number, the cases performed on the 1.5-T machines demonstrated no failures. O'Neil and colleagues posted the same conclusion that MRI sensitivity in the ankle may be affected by the power of the machine, type of sequence, and ankle positioning, and they suggested conducting ankle MRI scans on more powerful machines. A learning curve in radiological determination of the most suitable sequence and the proper ankle positioning, we believe, is crucial in improving MRI sensitivity in the ankle joint (Figs. 1–4).

Conclusion

We conclude that MRI scan is of significant value in evaluating cases of unresolved pain following severe

Figure 1

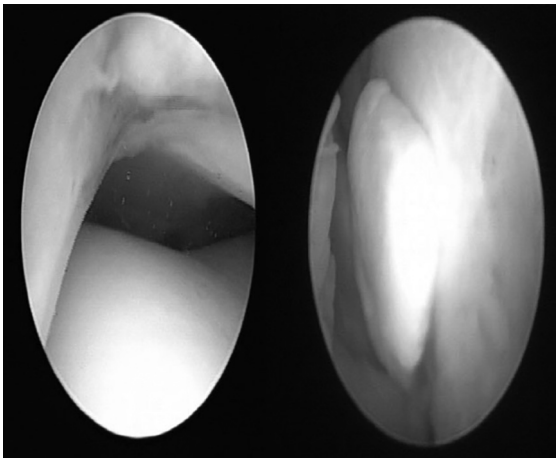


Normal anterior tibiofibular ligament and a meniscoid lesion.

Figure 2

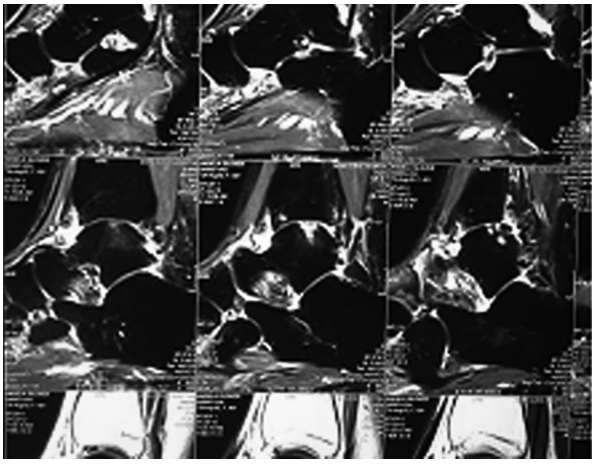
A photograph showing normal anterior inferior tibiofibular ligament.

Figure 3



Anteromedial corner of the tibia showing evidence of a cartilage lesion and scarring, and another showing a loose cartilage fragment and an ulcer on the medial aspect of the talus.

Figure 4



An MRI of an evident osteochondral lesion of the talus.

twisting injuries of the ankle joint, particularly in diagnosing chondral lesions. The value of the MRI can be significantly increased by using stronger machines. However, arthroscopy still remains the most sensitive tools for resolving cases with persistent symptoms.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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