

Ankle Ligaments on MRI: Appearance of Normal and Injured Ligaments

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Abstract

Ankle joint is a complex synovial joint affected in many traumatic and non traumatic conditions resulting in many problems. And ankle ligaments are encountered in multiple situations leading to be investigated well for detecting the accurate management. In our study, we analyze the reliability and validity of magnetic resonance imaging (MRI) for the detection of ankle ligaments injuries. Thirty patients who are clinically suspected to have ligament injury are examined by MRI and results are analyzed.

Introduction

The ankle ligaments stabilize the bones of the hindfoot during motion, guide and constrain the complex movement of these bones with respect to the leg and midfoot bones, and transmit motion from one hindfoot bone to another. Bones and ligaments, together with the joint capsule, are functionally linked to form the hindfoot joint complex (Guillo et al., 2013). The most common clinical presentation of patients with

ankle and foot pathology is pain and swelling followed by pain alone who attends the musculoskeletal clinic or orthopedic department. This leads to disability in performing regular normal activities (Baeet al., 2017).

MRI has revolutionized imaging of the entire musculoskeletal system. It plays a great role in ankle joint for depiction of soft tissue pathologies, such as ligament tears and chondral lesions (Roemer et al., 2014).

Results

Our study included 30 patients; 12 males and 18 females, with age ranges from 20 years to 51 years (mean age 35.5 years), suspecting to have ligamentous injury. All our patients complained from ankle pain associated with other symptoms like limitation of movement (in 17 cases), swelling (in 10 cases) and tingling and numbness (in 3 cases). History of trauma encountered in 18 patient and the others are non-traumatic. The patients were submitted to clinical examination and MRI examinations.

The affected ligament	Frequency	Percentage
Anterior talo- fibular ligament	9	30 %
Posterior talo-fibular ligament	7	23.3 %
Calcaneo-fibular ligament	2	6.7 %
Deltoid ligament	7	23.3%
Anterior tibio-fibular ligament	4	13.3 %
Posterior tibio-fibular ligament	1	3.3 %

Table (1): Frequency and percentage of ligamentous injuries.

This table shows that the anterior talo-fibular ligament is the most commonly affected ligament noted in 7 cases, the posterior talo-fibular ligament pathology was found in 6 cases, the calceneo-fibular ligament pathology was found in 2 cases, the deltoid ligament pathology was found in 6 cases, the anterior tibio-fibular ligament pathology was found in 3 cases and the posterior tibio-fibular ligament pathology was found only in 1 case.

ligament pathological Entities	Frequency	Percentage(%)
ATFL sprain	7	23.3
ATFL tear	2	6.7
PTFL sprain	5	16.7
PTFL tear	2	6.7
CFL sprain	1	3.3
CFL tear	1	3.3
Deltoid sprain	6	20
Deltoid tear	1	3.3
A.Tib.F.L sprain	3	10
A.Tib.F.L tear	1	3.3
P.Tib.F.L sprain	1	3.3
P.Tib.F.L tear	0	0

Table (2): Frequency and percentage of different ligamentous pathological entities:

This table shows that ATFL sprain was the most common pathology seen in 11 cases while ATFL tear was found in 3 cases. Regarding the PTFL pathological entities, PTFL sprain was the most common pathology seen in 8 cases while PTFL tear was found in 1 case. Calceneo-fibular ligament tear was found in 1 case. Deltoid ligament sprain was found in 3 cases while deltoid ligament tear was found only in 1 case. Anterior tibio-fibular ligament sprain was found in 1 case. Posterior tibio-fibular ligament sprain was found in 1 case.

Type of impingement	Frequency	Percentage to total cases
Posterior impingement	6	20 %
Postero-medial impingement	2	6.7 %
Anterior impingement	1	3.3 %

Table (3) : Frequency and percentage of impingement syndromes.

This table shows that the posterior impingement being the most common type (found in 6 cases), the postero-medial impingement was found in 2 cases and the anterior impingement was the least common type seen only 1 case.

The Etiology	Frequency	Percentage to posterior impingement cases
Ostrigonumsyndrome	2	33.3 %
Steida process	4	66.7 %

Table (4): Frequency and percentage of etiology of posterior impingement syndrome.

This table shows that posterior impingement cases were due to prominent steida process (seen in 4 cases) and ostrigonum syndrome (seen in 2 cases).

The lesion	Frequency	Percentage to the total cases
Sinus Tarsi syndrome	5	16.7 %
Bone Marrow edema	17	56.7 %
Bursitis	7	23.3 %
Joint Effusion	16	53.3 %
Ganglion Cyst	2	6.7%
Haglund Syndrome	1	3.3 %

Table (5) : Frequency and percentage of other pathologies that could be also detected.

This table shows associated findings seen on MRI examination. Bone marrow edema was found to be the most common findings in our patient as it appeared in 17 cases followed by joint effusion which appeared in 16 patients. Bursitis was seen in 7 patients and sinus Tarsi syndrome was found in 5 patients. The least findings were ganglion cyst and haglund syndrome which found on 2 patients and a single patient respectively.

Discussion

The ankle is commonly affected in trauma as well as overuse disorders and inflammatory conditions. Various imaging techniques may be used to assess the ankle, including CT, MRI, and sonography. Imaging plays a crucial role in the evaluation of ankle tendons and ligaments (Alvarez et al., 2018).

MRI has been proven to provide excellent evaluation of ligaments and tendons around the ankle, with the ability to show various types of soft tissue and bony abnormalities (Alvarez et al., 2018).

Our study included twelve males patients represented 40% and eighteen female patients represented

60%, with their age ranged from 20 to 51 years (mean age was 35.5 years), the right side was affected in 17 patients(57%) of all cases while the left side was affected in (43 %). This agreed with the study of (El-Liethy and Kamal,2016) which was performed on 35 patients with males represented 29 % and females represented 71% with the age of cases ranged from 18-60 years (mean age was 37 years) with the right side was affected in 54.3 % and the left side was affected in 45.7 %.The study of El-Liethy and Kamal, 2016 reported that the

traumatic insult was the most common etiology of ligament injury

noticed in 67% of their cases. This is agreed with our study in which most of our cases are presented by traumatic insult (noticed in 18/30 cases representing 60%) while the other patients were non-traumatic.

Margetic et al., 2009 reported that ankle pain is the most common presentation in patients with ligament injury noticed in 66% of his cases. This is agreed with our study, in which all patients complained of ankle pain and associated with other symptoms, as limitation of movement which noticed in 17/30 cases (57%) swelling in 10/30 patients (33%) as well as tingling and numbness shown in 3/30 cases (10%).

Regarding ligament pathology, **Grossterlinden et al., 2016** stated that the anterior talo-fibular ligament was the most commonly affected ankle ligament injury in his study noticed in 34% of his cases. This is agreed with our study which revealed also that the anterior talo-fibular ligament being the most commonly affected ligament (noted in 9/30 cases) representing 30 % of all cases, this is followed by posterior talo-fibular ligament (noted in 7/30 cases) representing 23.3%.

Cremaetal., 2018 stated that, visualization of an intact ATFL virtually excludes rupture of any of the lateral collateral ligaments and also stated that CFL and PTFL ruptures are not found in the presence of an intact ATFL. This is also agreed with our study which revealed that CFL tear and PTFL tear were always associated with ATFL tear.

Again **Grossterlinden et al., 2016** stated that the deltoid ligament is the strongest ankle ligament and least to be injured. He mentioned that 5.7% of his patients showed deltoid ligament tear. This is also noticed in our study, as deltoid ligament tear was found in only 1/30 case (3.3%).

Cremaetal., 2018 stated in his study that ligament sprain was more

common than ligament tear. He mentioned that 63% of all patients in his study showed different sprained ligaments. This In our study, ligament sprain was more common than ligament tear with the frequency of ATFL sprain was about 7/30 cases (23.3%) and the frequency of deltoid sprain was about 6/30 cases (20%).

Margetic et al., 2009 compared between ultrasound results and MRI results and stated that both ultrasound and MRI have the same ability to detect ATFL and CFL tears yielded a sensitivity of 100%. This is agreed with our study, in which correlation between the ability of ultrasonography compared to MRI in detection of ATFL and CFL tears showed a sensitivity of 100%.

Yasui et al., 2016 who stated that prominent steida process is the main osseous cause of the posterior ankle impingement. This is agreed with our study, in which posterior impingement was the most common impingement syndrome noticed in 6/30 cases (20%) with prominent steida process being the commonest etiological factor.

Yasui et al., 2016 who stated the most common associated finding with ligament injury was bone marrow edema. This is agree with our study which we encountered other associated pathologies noticed in the MRI examination and found that bone marrow edema was seen in most cases 17/30 cases (56.7 %). Other associated findings are synovial effusion which seen in 16/30 cases (53.3 %), bursitis was seen in 7/30 cases (23.3%), sinus tarsi syndrome seen in 5/30 cases (16.7 %), ganglion cyst was seen in 2/30 cases (6.7%) and haglund syndrome was seen in 1/30 case (3.3 %).

Conclusion

MRI examination clearly demonstrates the soft tissue abnormalities and can also detect bony

abnormalities like marrow edema, osteochondritis desiccans, bone tumors, impingement syndromes and entrapment neuropathy. The aim of this study is to evaluate the role of MRI in diagnosis of ligament injury. This study included thirty patients; 12 males and 18 females with age ranged from 20 to 51 years (mean age 35.5 years). All patients were subjected to clinical evaluation including full history taking and thorough clinical evaluation as well as radiological evaluation by MRI examination.

From our study, we conclude that MRI has a superior sensitivity and specificity in evaluation of ankle various ligaments injuries (including sprain, partial tear and complete tear) as well as impingement syndromes and bony abnormalities.

References

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