



Correlation Of Magnetic Resonance Imaging (MRI) And Surgical Findings In Diagnosing Ankle Joint Ligament Injuries

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Abstract

Background: Ankle injury is one of the commonest joints injured, especially in sports, which contribute to significant morbidity and time loss from work. Early and accurate diagnosis is vital to prevent long-term uninviting sequelae. The study was conducted to study correlation of magnetic resonance imaging and surgical findings in diagnosing ankle joint ligament injuries.

Methods: The present cross-sectional study was carried among patients with ankle injury booked at hospital or referred during May 2022 to October 2022. A total sample size of 32 patients satisfying inclusion and exclusion criteria were selected. The collected data were analyzed with proper statistical methods using MS excel 2016.

Results: The mean age among patients was 32.48± 14.03 years. The majority of cases involved injury of Anterior talofibular ligament (ATFL) (53.13%). The sensitivity, specificity and accuracy of MRI in diagnosing ATFL tear are 100%, 83.33%, and 90.62% respectively.

Conclusions: MRI delivers high sensitivity, accuracy, and excellent correlation with ATFL, CFL, and deltoid injury.

Key Words: Correlation, MRI, Surgical, ankle joint

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Introduction:

Ankle sprains are the most common sports-related injury among athletes aged 15 to 35 years.^[1] Athletes are most likely to suffer from this type of injury. As a result of socioeconomic disparities, the reported prevalence of ankle ligament injuries varies. In high-risk sports, the incidence is between 2 and 6 per 100 participants per season.^[2] Ankle ligament injuries make up between 15 and 56 percent of all sports-related injuries, according to a recent study.^[3] Researchers estimate that between 20% and 25% of all sporting time is lost due to ankle injuries.^[2,3]

The high incidence of ankle injuries in the general population could have a negative impact on the country's economy and the performance of professional athletes.^[4,5]

As a standard diagnostic tool, magnetic resonance imaging (MRI) has long been used to

accurately assess ligaments, tendons, occult fractures, and osteochondral injuries, especially in athletes. Arthroscopy offers diagnostic and therapeutic options in addition to clinical examination and imaging.^[5]

There are a variety of ligament injuries that can affect the ankle, and it is important to distinguish between them. Disrupted, thickened, heterogeneous or attenuated signal intensity and abnormally shaped ligaments can be seen on magnetic resonance imaging (MRI).^[6]

The purpose of the present study was to study correlation of magnetic resonance imaging and surgical findings in diagnosing ankle joint ligament injuries

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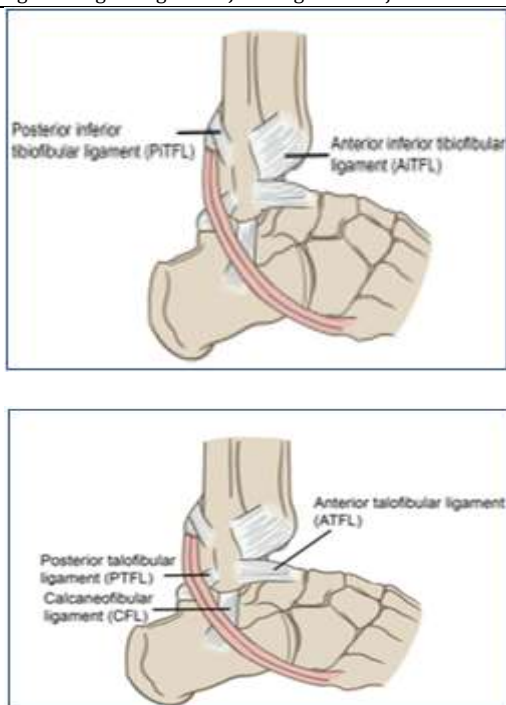


Figure 1 : General Presentation of Ankle Ligaments

Objectives:

- To study the clinical profile of ankle joint ligament injuries
- To study correlation of magnetic resonance imaging and surgical findings in diagnosing ankle joint ligament injuries

Methodology:

The present cross-sectional study was carried among patients with ankle injury. The study was carried out at Department of Radiodiagnosis of tertiary care centre during May 2022 to October 2022. The study was conducted after obtaining clearance from the Ethical Committee of the institute. A total sample size of 70 patients satisfying inclusion and exclusion criteria were selected. The study population consisted of all patients who attended the orthopaedic outpatient clinic with an ankle injury. Patients aged above 15 years male and female, with an ankle injury, chronic ankle pain which need arthroscopy/or surgical treatment were included in the study. The exclusion criteria were concomitant ankle disease such as infection, inflammatory arthritis (osteoarthritis and rheumatoid arthritis), malignancy of the bone, or possible bony metastasis. The data were collected using proforma, which covered all information on the demography, clinical, MRI, and surgery findings. MRI machine were used, a

Siemens Symphony 1.5 Tesla. The collected data were analyzed with proper statistical methods using MS excel 2016. Data was summarized in percentages and proportions.

Results:

Table 1) Demographic variables among patients:

Variables	No. of Patients (n=70)	Percentage	
Age group (years)	≤20	15	21.87
	21-30	28	40.63
	31-40	9	12.5
	41-50	9	12.5
	51-60	5	6.25
	>60	4	6.25
Gender	Male	39	56.25
	Female	31	43.75

The table no. 1 describes demographic profile of the patients. Among 70 patients, majority were in age group 21-30 years (40.63%) with mean age of 32.48± 14.03 years. Majority of the patients were males (56.25%) followed by females. (43.75%)

Table 2): Mode of injury for among patients:

Mode of injury	No. of patients	Percentage
Sports	63	90.63
Road traffic accident	7	9.37
Total	70	100

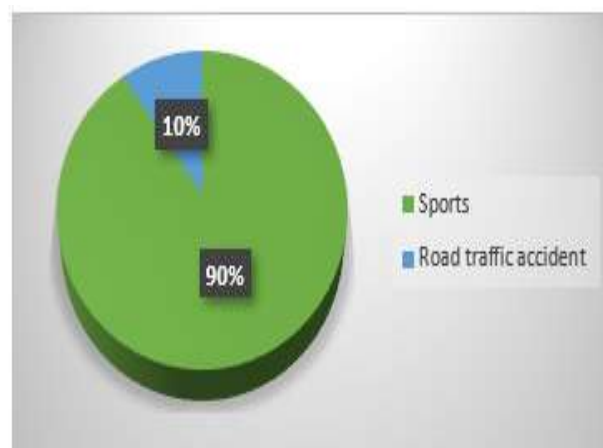


Figure 2: Pie chart showing mode of Delivery among the patients

The majority of cases had history of sports injury (90.63%) followed by road traffic accident. (9.37%)



Table 3): Type of ligament injured for among patients:

Ligaments	No. of patients (n=70)	Percentage
Anterior talofibular ligament (ATFL)	37	53.13
Calcaneofibular ligament (CFL)	22	31.25
Deltoid ligament	24	34.37
Posterior talofibular ligament (PTFL)	0	0

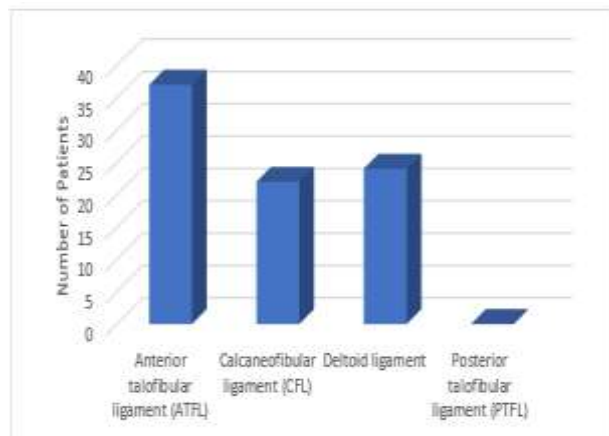


Figure 3: Distribution of Ligaments involved in the injury among patients

The majority of cases involved injury of Anterior talofibular ligament (ATFL) (53.13%) followed by Deltoid ligament (34.37%) and Calcaneofibular ligament (CFL) (31.25%) No patient has Posterior talofibular ligament (PTFL) injury.

Table 4): Type of ATFL ligament tear (surgery) among patients:

Type of tear	No. of patients	Percentage
Complete	9	24.32
Partial	21	56.76
No tear	7	18.92
Total	37	100

The majority of cases had partial tear of ATFL (56.76%) followed by complete tear (24.32%)

Table 5): Correlation of MRI and surgery findings in detecting different types of ligament injury:

Ligament injury	MRI findings	Surgery findings	Sensitivity	Specificity	Accuracy
Anterior talofibular ligament (ATFL)	37	33	100%	83.33%	90.62%
Calcaneofibular ligament (CFL)	19	18	100%	91.67%	93.75%
Deltoid ligament	24	15	85.71%	96%	93.75%

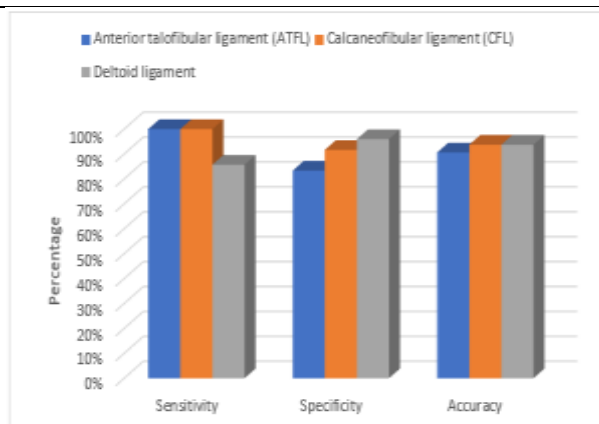


Figure 4: Diagnostic Distribution comparison between MRI findings and Surgery Findings

The above table shows, out of these patients, 17 patients had ATFL tear detected on MRI and 15 patients had ATFL tear detected by surgery. The sensitivity, specificity and accuracy of MRI in diagnosing ATFL tear are 100%, 83.33%, and 90.62% respectively. For CFL injury, sensitivity, specificity and accuracy of MRI in diagnosing CFL tear are 100%, 91.67%, and 93.75% respectively. For deltoid injury, MRI, with only 07 patients reported to have deltoid injury on surgery with accuracy of 93.75%

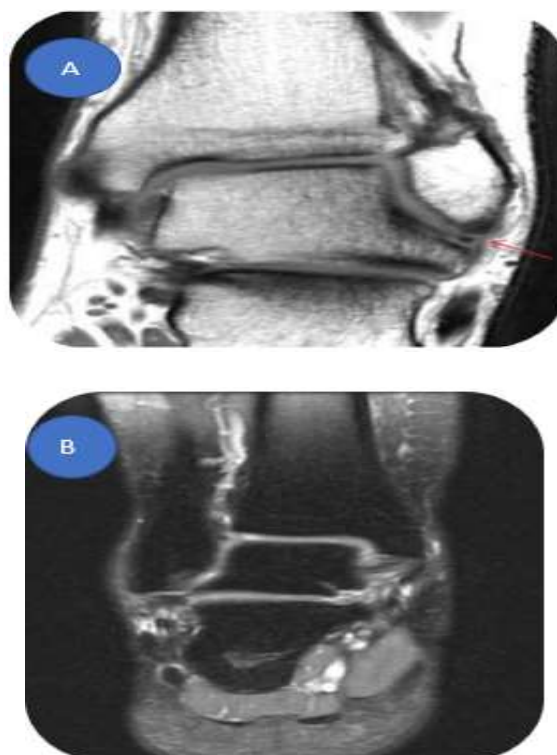


Figure 5 : A - Coronal T1-weighted MR image showing an ATFL tear, B - Deltoid Partial Tear of the patients having age of 34 years

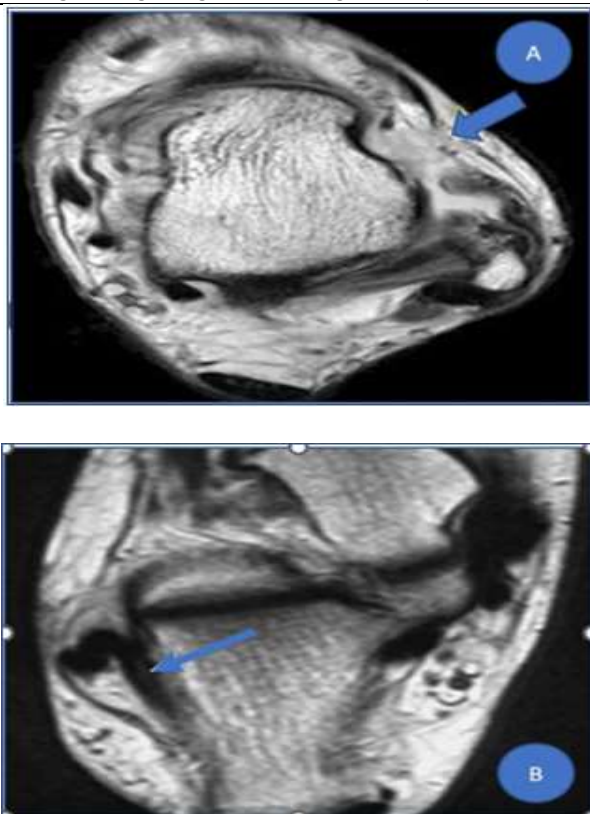


Figure 3 : A – Grade 3 Injury of ATFL in patients with the age of 38 years, B – The calcaneofibular ligament (arrow) is also apparent as it courses deep to the peroneal tendons on this T2-weighted axial view.

Discussion:

The present cross-sectional study carried out at Tertiary care hospital to study correlation of magnetic resonance imaging and surgical findings in diagnosing ankle joint ligament injuries. The study was conducted in the Department of Radiology of tertiary care centre. All cases of with an ankle injury was included in the study.

The present study show, among 32 patients, majority were in age group 21-30 years (40.63%) with mean age of 32.48 ± 14.03 years. Majority of the patients were males (56.25%) followed by females. (43.75%)

Similar findings were seen in study by Azni et al [7] with mean age of 35.9 years among patients with ankle injury. Adolescents and young adults are relatively more active in sports, which explains the higher prevalence of ankle injury in adults younger than 35 years of age, particularly those between 15– 19 years old. [8]

The majority of cases had history of sports injury (90.63%) followed by road traffic accident. (9.37%)

The majority of cases involved injury of Anterior talofibular ligament (ATFL) (53.13%) followed by Deltoid ligament (34.37%) and Calcaneofibular ligament (CFL) (31.25%) No patient has Posterior talofibular ligament (PTFL) injury. The majority of cases had partial tear of ATFL (56.76%) followed by complete tear (24.32%) A retrospective review by Crim et al. [9] described that the most frequent ligament involved in ankle injury was the anterior talofibular ligament (ATFL; 100%), followed by a calcaneofibular ligament (91%), and deltoid ligament (72%). Injury to the posterior talofibular ligament (PTFL) was less common with 49% incidence. The results of our study are consistent with previous reports. [9,10] It was reported that ATFL is the weakest ligament and most prone to injury because it has a low value of maximum load. [11,12] In addition, most ankle injury mechanisms result from an ankle inversion, where ATFL is anatomically located parallel to the direction of ankle inversion. [10] Chun et al. [10] also reported that most of the ankle injury involved lateral ligament injury, which is consistent with our current study.

In the present study, out of these patients, 37 patients had ATFL tear detected on MRI and 33 patients had ATFL tear detected by surgery. The sensitivity, specificity and accuracy of MRI in diagnosing ATFL tear are 100%, 83.33%, and 90.62% respectively. For CFL injury, sensitivity, specificity and accuracy of MRI in diagnosing CFL tear are 100%, 91.67%, and 93.75% respectively. For deltoid injury, MRI, with only 15 patients reported to have deltoid injury on surgery with accuracy of 93.75%.

Similar findings were seen in study by Azni et al [7] were sensitivity, specificity and accuracy of MRI in diagnosing ATFL tear are 100%, 50%, and 88.9% respectively. This finding was in accordance to present study. Park et al [13] in a study shows MRI findings of ATFL injury showed a sensitivity of detection of complete tears of 75% and specificity of 86%. The sensitivity of detection of partial tears was 75% and the specificity was 78%. The sensitivity of detection of sprains was 44% and the specificity was 88%. MRI is still considered as a reliable tool. Because injury to the medial ligament (deltoid) is less frequent, they are not routinely observed at arthroscopy/surgery, which explains the inadequacy of data for the calculation of

specificity. Overall, MRI is generally accurate in detecting injury to ATFL and CFL but not so in ruling out the disease. This is partly because we had a small sample size. There is a delay in time between MRI and surgery in some cases. Thus, injuries found on MRI may not be present at the time of surgery. This is also one of the limitations of present study.

Conclusion:

MRI delivers high sensitivity, accuracy, and excellent correlation with ATFL, CFL, and deltoid injury but with moderate specificity. It is recommended that MRI interpretation should be made with caution and to be correlated with clinical findings to increase diagnostic accuracy.

References:

- Freeman MA. Treatment of ruptures of the lateral ligament of the ankle. *J Bone Joint Surg Br* 1965; 47:661-668.
- Evans DL. Recurrent instability of the ankle; a method of surgical treatment. *Proc R Soc Med* 1953; 46:343-344.
- Snook GA, Chrisman OD, Wilson TC. Long-term results of the Chrisman-Snook operation for reconstruction of the lateral ligaments of the ankle. *J Bone Joint Surg Am* 1985; 67:1-7.
- Van den Bekerom, M. P. J., Kerkhoffs, G. M. M. J., McCollum, G. A., Calder, J. D. F., & van Dijk, C. N. Management of acute lateral ankle ligament injury in the athlete. *Knee Surgery, Sports Traumatology, Arthroscopy*. 2013; 21(6), 1390-1395.
- Nazarenko, A., Beltran, L. S., & Bencardino, J. T. Imaging evaluation of traumatic ligamentous injuries of the ankle and foot, *Radiologic clinics of North America*. 2013; 51(3), 455- 478.
- Fang, J. J., Chen, L., Hu, B. B., Xia, J. B., & Sun, W. MRI diagnosis of osteochondral lesions in the talus and the dynamic follow up analysis after osteochondral transplantation. *China Journal of Orthopaedics and Traumatology*. 2016; 29(9), 814-819.
- Azni KK, Saini SM, Nasir N, Bahari N. Correlation of clinical examination, magnetic resonance imaging and surgical findings in diagnosing ankle joint ligament injuries. *European Journal of Molecular & Clinical Medicine*. 2020;7(2):2020.
- Fong, D. T.-P., Hong, Y., Chan, L.-K., Yung, P. S.-H., & Chan, K.-M. A systematic review on ankle injury and ankle sprain in sports. *Sports Medicine*. 2007; 37(1), 73-94.
- Crim, J. R., Beals, T. C., Nickisch, F., Schannen, A., & Saltzman, C. L. Deltoid Ligament Abnormalities in Chronic Lateral Ankle Instability. *Foot& Ankle International*. 2011; 32(9), 873-878.
- Chun, K. Y., Choi, Y. S., Lee, S. H., Kim, J. S., Young, K. W., Jeong, M. S., & Kim, D. J. Deltoid ligament and tibiofibular syndesmosis injury in chronic lateral ankle instability: Magnetic resonance imaging evaluation at 3t and comparison with arthroscopy. *Korean Journal of Radiology*. 2015; 16(5), 1096-1103.
- Frank, R. M., Hsu, A. R., Gross, C. E., Walton, D. M., & Lee, S. Open and Arthroscopic Surgical Anatomy of the Ankle. *Anatomy Research International*. 2013; 1-9.
- Hertel, J. Functional anatomy, pathomechanics, and pathophysiology of lateral ankle instability. *Journal of Athletic Training*. 2002; 37(4), 364-375.
- Park HJ, Cha SD, Kim SS, Rho MH, Kwag HJ, Park NH, Lee SY. Accuracy of MRI findings in chronic lateral ankle ligament injury: comparison with surgical findings. *Clinical radiology*. 2012 Apr 1;67(4):313-8.

