Original Research Article

MRI Findings of the Knee Anterior Cruciate & Meniscus Ligaments' Tears

Abstract:

Objective: To assess the incidence of the associated meniscal ligament (ML) with the anterior cruciate ligament (ACL) tears in hospital A in Medina-KSA. And to see the effect of sports activities in comparison between males and females. **Materials and methods:** In a retrospective study, ninety-nine patients' knee magnetic resonance imaging (MRI) records were selected conveniently from the (A) hospital's picture archiving and communication system (PACS). Patients with suspected anterior cruciate & meniscal ligament' tears were included. While patients with posterior cruciate ligament (PCL) tear, medial collateral ligament (MCL) or lateral collateral ligament (LCL) injury, and previously operated index knees were excluded. All patients were scanned by a 1.5T MRI machine using standard MRI knee scanning protocol. The categorical and continuous variables were presented as percentages, frequencies, and descriptive statistics. The cross-tabulations and chi-square test were applied to obtain the statistical associations between the study variables. A statistical association was considered significant if the P-value was < 0.05. **Results:** 72 males and 27 females were included, with a mean age of 33 ± 2.43. 42.4% of the knee tears were ML tears, followed by associated (ACL with ML) tears, noted in 31.3%, and 26.3% were ACL tears. The tears were more frequent in the age group (31-40), reported in 35.3% (out of 99). There was no statistical association between the tears and the participants' age, gender, or sports activities; P value = 0.3, 0.5, and 0.9, respectively. **Conclusion:** The study concluded that the isolated ML tears were more frequent than the associated (ACL with ML) tears—moreover, there was no significant statistical association between the participants' age, gender, or sports activities.

Keywords: Anterior, cruciate, meniscus, ligaments, tears, Saudi Arabia.

Introduction:

The anterior cruciate ligament (ACL) and the meniscus ligament (ML) act as astatic stabilizers of the knee joint [1]. Meniscus injuries are associated with 77% of persistent ACL injuries [2]. Medial meniscal tears were more commonly associated with ACL tears [3]. Feucht MJ et al [4]. concluded that 56% of the ACL tears were isolated, and 44% were associated with meniscal tears. ACL injuries were associated with severe negative long-term consequences, such as lower extremity dysfunction, low levels of physical activity, poor quality of life, and early development of knee osteoarthritis [5]. Magnetic resonance imaging (MRI) has good sensitivity and specificity for diagnosing and classifying ACL and meniscal tears [6]. The combination of clinical tests and MRI images will give a precise diagnosis as well as surgical indication for meniscus injury in patients with anterior cruciate ligament tear [7].

This current retrospective study aimed to assess the incidence of ACL and associated tears in hospital (A) in Medina – (KSA) and to see the effect of sports activities on this incidence. Also, to see if there is an association between age/gender and the occurrence of the associated ACL & ML tears.

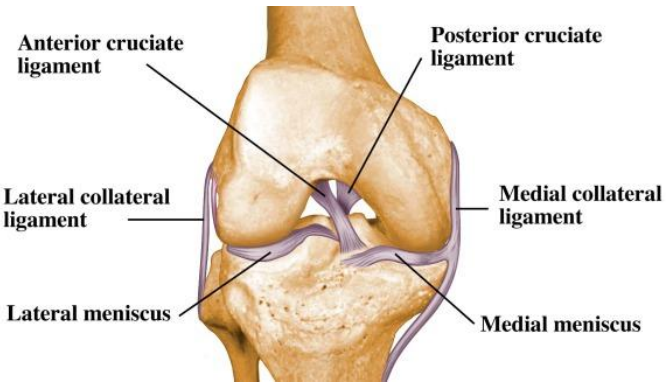

Figure 1: The knee joint's ligaments. [8]

Material and methods:

In a retrospective study, ninety-nine patients' knee MRI records were selected conveniently from (A) the hospital's picture archiving and communication system (PACS). The period of this search was from May 2023 to August 2023. All patients were scanned by 1.5T MRI machine using standard MRI knee scanning protocol; axial, coronal, and sagittal imaging planes were applied with a combination of fluid-sensitive sequences, either T2-weighted (T2W) fat-saturated (FS) or proton density-weighted (PDW) FS sequences. The inclusion criteria include patients with suspected anterior cruciate & meniscal ligament' tears. Patients with posterior cruciate ligament (PCL) tear, medial collateral ligament (MCL) or lateral collateral ligament (LCL) injury, and previously operated index knees were excluded. The participants were divided into age groups (21-30, 31-40, 41- 50, and ≥ 51 years old). A structured data form was used to organize the study variables, which include the demographic information (age & gender), the sports activity, the site of the tear (Rt. /Lt Knee), the injured ligament (anterior cruciate / meniscus), the type of the tear, and the degree of the tear. An expert radiologist interpreted the MRI images.

Data analysis

The study data were arranged and analyzed using Microsoft Excel (2021) and the statistical package for the social sciences (SPSS) program version 26 (IBM, Armonk, New York, USA). The categorical and continuous variables were presented as percentages, frequencies, and descriptive statistics. The cross-tabulations and chi-square test were applied to obtain the

statistical associations between the study variables. A statistical association was considered significant if the P-value was < 0.05.

Ethical considerations: The confidentiality of the participants' information was guaranteed by de-identifying the study data; the researchers did not show any personal data about the participants' names, phone numbers, photos, or unique IDs.

Results:

The study included ninety-nine patients, 72 males and 27 females, with a mean age of 33 ± 2.43. The participants were categorized into four age groups; 35% were within the age group 31-40; Figure 2.

Table 1& Figure 3 summarize the frequency of tears and a cross-tabulation of the types of tears with the participants' age groups; the knee tear was more frequent in the ML 42.4% (out of 99). 31.3% were associated tears (ACL with ML), and 26.3% were ACL tears. 35.3% of the tears were found in the age group (31-40). The Pearson Chi-square test indicated no statistical association between age and the occurrence of tear P = 0.3.

Table 2 summarizes a cross-tabulation between the types of tears and the degree of tears; partial tears were typical, had a frequency of 62.6%, and were more frequent in meniscal ligaments. Complete tears were found at 37.4%.

Table 3 summarizes the cross-tabulation between the participants' gender and the types of tears. However, 72.7 % of the tears were found in the males; the statistical analysis indicated that no statistical association was found between the participants' gender and the affected ligaments or the occurrence of the tears P = 0.5.

Table 4 shows a cross-tabulation between the participants' sports activities and the occurrence of tears; most tears (79.8 %) were found in those who had no sports activities. In addition, the Chi-square test showed no statistical association between sports activities and the occurrence of ACL or ML tears P = 0.92.

Table 1: Participants' age groups andthe types of tears cross-tabulation				
	The types of tears			**Total**
Age Groups	Isolated ACL tears	Isolated ML tears	Associated MLwithACL tears	
21-30	12	8	11	31
31-40	7	19	9	35
41-50	3	6	4	13
≥ 51	4	9	7	20
Total	**26**	**42**	**31**	**99**

Table 3: Cross-tabulation between the degree of tearsand the types of tears				
	The types of tears			
The degree of tears	Isolated ACL tears	Isolated ML tears	Associated ML withACL tears	**Total**
Complete	9	18	10	37
Partial	17	24	21	62
Total	**26**	**42**	**31**	**99**

Table 2: Participants' genderand the types of tears cross-tabulation				
	The types of tears			
Gender	Isolated ACL tears	IsolatedML tears	Associated ML withACL tears	**Total**
Female	5	13	9	27
Male	21	29	22	72
Total	**26**	**42**	**31**	**99**

Table 4: Participants' sports activitiesandthe types of tears cross-tabulation				
	The types of tears			
Sports activities	ACL tears	ML tears	Associated ML withACL tears	**Total**
No	21	34	24	79
Yes	5	8	7	20
Total	**26**	**42**	**31**	**99**

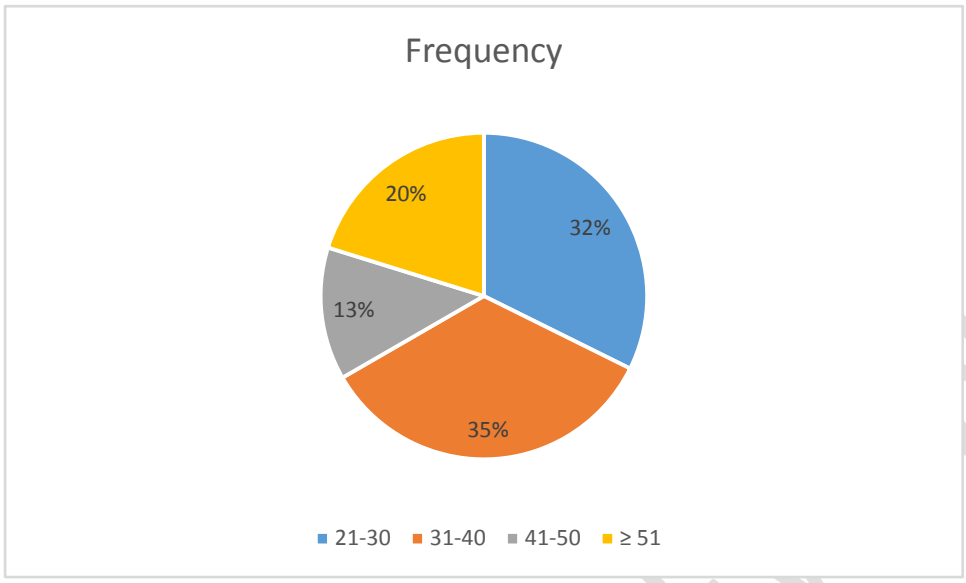

Figure 2: The frequency of the study participants' age groups.

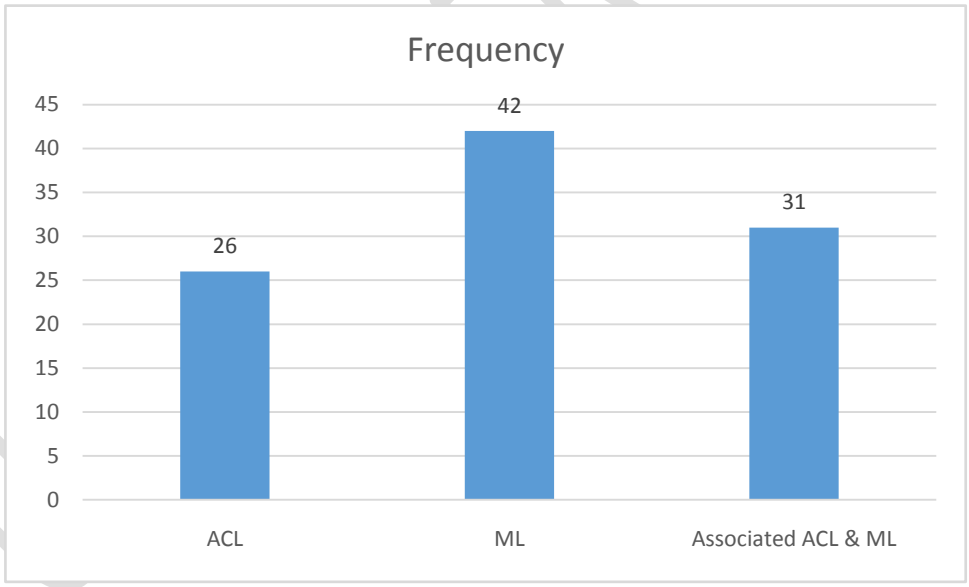

Figure 3: The frequency of thetypes of tears.

Discussion:

This study aimed to assess the incidence of the associated ML with ACL tears in hospital A and to see the effect of sports activities in comparison between males and females.

The current study indicated that the isolated ML tears were the more frequent knee joint tears; they occurred in 42.4% (out of 99), followed by the associated (ACL with ML) tears noted in 31.3% of the participants. The isolated ACL tears were found in 26.3% of the participants; See Table 1. These findings aligned with Hagmeijer MH et al. [9], who showed that secondary meniscal tears were noted among 33% of patients with delayed ACL injury reconstruction. Roman MD et al. [10] have a different result; they proposed that ML tears, associated with ACL injuries, have an incidence of (55–80%). The conclusion of other studies indicated a variety of opinions regarding this incidence; Venkataraman S et al. [2]suggested that ML tears were associated with 77% of ACL injuries, while Feucht MJ et al.[4] concluded that ML tears were associated with 44% of the ACL tears. Great attention should be taken during the arthroscopic assessment of ACL-injured patients. Kim SH et al.[11] indicated that the MRI could be a diagnostic tool for meniscus tears, but their classification of the type and location has limited accuracy. Machagge H et al. [12]also concluded that clinical examination is more accurate than MRI in diagnosing ACL and meniscal tears. Thus, patients may be scheduled for diagnostic and interventional arthroscopy if the clinical assessment reveals meniscal and ACL injuries.

Regarding the association of tears occurring with age, the study results indicated that tears were more frequent in ages 31-40; see Table 1. These results strongly agree with Michael Khadavi et al.[13], who showed that ACL tears are most common between the ages of 15 and 45.

Regarding the degree of tears, the current study proposed that partial tears were the most common type (62.6%), and they were more frequent in meniscal ligaments; See Table 2.

Seyma Torgutalp S et al.[14] have a different opinion; they suggested no significant differences between partial and complete tear groups regarding incidence rates of injuries accompanying the ACL tear. At the same time, Gupta R et al. [15]indicated that partial ACL injuries present less risk of acquiring isolated meniscus tears than complete ACL injuries.

Regarding the association between gender and the occurrence of tears, the study showed no statistical association, but tears were more frequent in males; see Table 3. These findings did not agree with Astur DC et al.[16], who concluded that women presented a higher risk of developing ACL and meniscal injuries.

Regarding the association between sports activities and the occurrence of tears, the study concluded that 79.8 % were noted in participants who had no sports activities. At the same time, no statistical association between sports activities and the occurrence of tears was found; See Table 4. These findings disagree with Khadavi M [1], who proposed that sports injuries are the most common cause of ACL tears. The community culture may affect the frequency of sports activities; very few people have sports activities here in the KSA. Also, the majority of those who have sports activities were male. From this study, among the females, only 33% (out of 27) have sports activities, while the rest, 66.6% (out of 27) have no sports activities.

Limitations: The limitations of this current study include the small sample size, the retrospective nature of the survey, and some data regarding the participant's body mass index (BMI) or other possible comorbidity illnesses.

Conclusion:

The study concluded that the isolated ML tears were more frequent thanthe associated (ACL with ML) tears. No significant statistical association between theparticipants' age, gender, or sport activities were noted. Great attention should be paid during the use of the MRI in diagnosing ACL & ML tears and during the arthroscopic assessment ofACL-injured patients.

Further prospective studies in the KSA with an extensive enough sample size regarding this issue were recommended.

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