DOI: https://doi.org/10.54393/pbmj.v4i2.117

PAKISTAN BIOMEDICAL JOURNAL
https://www.pakistanbmj.com/journal/index.php/pbmj/index
Volume 4, Issue 2 (July-Dec 2021)

Original Article

Magnetic Resonance Imaging Evaluation of Knee Injuries in Footballers

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ARTICLE INFO

Keywords:
Knee injuries, sports injuries, ligamentoust ears, football injuries and MRI

How to Cite:
Bisma Haq, S., Ali, N., Zakir, M., Yousaf Farooq, S. M., Fatima, A., Niaz, A., Murtaza, Z., Chughtai, Z. G., Asif, R., Khan, S. H., & Khaliq, F. (2021). The Role of MRI in diagnosis of knee injuries in footballers: MRI diagnosis for knee injuries. *Pakistan BioMedical Journal*, *4*(2). https://doi.org/10.54393/pbmj.v4i2.117

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ABSTRACT

Magnetic Resonance Imaging (MRI) findings are essential to diagnose the severity of ligament tears in knee injuries in footballers. By using MRI we can accurately make diagnose and can determine the extent of damage to tissues and ligaments by grading them according to injuries. **Objective:** To determine the MRI findings in patients of knee injuries in football players **Methods:** A multicenter descriptive study conducted at The University of Lahore Teaching Hospital and National Hospital during 4 months period. All symptomatic football players of both genders and age ranging from 16-40 year are included in this study. Our calculated sample size is 80. MRI machine (1.5T) was used for scans. All images were Proton density and T2 weighted images **Results:** This study includes 80 footballers complaining knee pain. Mean age of all subjects was 31.4 +, - 5.7 year. Among 80 patients who had knee injuries, 56 patients (70%) had anterior cruciate ligament (ACL) injuries, 14 patients (17.5%) had posterior cruciate ligament (PCL) injuries, 14 patients (17.5%) had lateral cruciate ligament (LCL) injuries, 8 patients (10%) had medical collateral ligament injuries (MCL) injuries, 24 patients (30%) had lateral meniscal (LM) injuries, and 31 patients (38.8%) had medial meniscus (MM) injuries **Conclusions:** MRI is useful imaging modality for the detection of soft tissue injuries most commonly sports injuries. It gives more accurate and detailed information of ligaments and muscle tears than any other modalities. In our study, the most common injuries that are detected by MRI are ACL tear, bucket handle tear of medial meniscus and MCL injuries. PCL injuries are less common than ACL injuries

INTRODUCTION

Soccer is one of the far-flung sports in the world [1,2]. Incidence of injuries in soccer are highest and injuries are quite common in this game as compared to other sports [3]. In European countries 30-56% of injuries related to sports are due to football [3,4]. Knee is the weight bearing joint of human body that helps providing mobility and stability also helps balancing while standing [5]. Traumatic knee injuries are frequently encountered injuries commonly caused by sports and causing severe pain [6]. Consequences of these injuries are either short term or long term in short term players suffer from pain, inability to perform and taking breaks for recovery. Long term consequences include osteoarthritis and reoccurring injury [7].

MRI, because of its variability in soft tissue resolving power and multiplanar imaging provided benefits that are more important than other ways of thinking in examination of traumatic knee joint injuries [8]. An MRI has changed the diagnostic image of the knee. It offers soft tissue flexibility and you can check the soft tissues and bones in many image planes, which offers greater benefits than other assumptions. Strategies represents airtight and non-radioactive material, a process that provides access to a "real wound map" [9].

MRI is a useful modality for diagnosis of knee injuries and finding early osteoarthritis changes. Multiple MRI studies show that structural changes are more common in athletes as compared to controls [10]. A higher extent of young asymptomatic soccer players had at least one abnormal knee on MRI as compared to controls [11]. Early diagnosis of knee changes in important as it can help in early detection of osteoarthritic changes, which may help preventing the development of osteoarthritis with rehabilitation. Simple X-ray photography is the more widely present and less costly imaging technique, but it lacks the sensitivity needed to

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detect damage to the meniscus, cartilage, bone marrow, and ligaments. The use of arthrography and arthroscopy increases the certainty of the diagnosis, but they are both invasive and induce problems, and they also necessitate the reporting and interpretation of the results by a qualified individual. With its multi-arranging capacities and solid delicate tissue contrast, attractive reverberation imaging (MRI) has set up itself as a moderate mode for non-conclusion of sports knee injuries [12-14]. In this study, we developed a deep learning model to detect general abnormalities and specific diagnoses ACL tears, PCL and meniscal tears on knee MRI exams.

METHODS:

A multi-center descriptive study was conducted at The University of Lahore Teaching Hospital and National Hospital during 4 months period. All symptomatic football players of both genders and age ranging from 16-40 year are included in this study. Our calculated sample size is 80. All participants provided written informed consent. In our study, axial, sagittal and coronal planes are included. Proton density and T2 weighted images of 3.5 mm thickness acquired. T2 weighted images are produced by using long TR and TE times.

Scanning technique:

Patients were asked to take off jewelry and body piercing and change into a hospital gown. In case of contrast dye, an IV line was inserted. An MRI specialist asked to lie on back or side on a table with strings. Pillows were used to help support the knee during the procedure, and to help keep it in place. Patients were advised not to move during the scan so that the images are as clear as possible. Feet first supine, Knee is placed in suitable knee coil, Cushions were placed around knee to immobilize the knee, Laser beam localiser was centered over the lower border of patella.

RESULTS:

This study included 80 footballers complaining knee pain. Females patients were 18 (22.5%), while 62 patients (77.5%) were males. Mean age of all subjects was 31.4 ± 5.7 years (Table 1). Regarding clinical findings, numbness was present in 15 patients (18.8%) and swelling was present in 24 patients (30%) while pain was present in all (80%) patients. Among 80 patients who had knee injuries, 56 patients (70%) had ACL ligament injuries, 14 patients (17.5%) had PCL injuries. 14 patients (17.5%) had LCL injuries, 8 patients (10%) had MCL, 24 patients (30%) had LM injuries and 31 patients (38.8%) had MM injuries.

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Age	80	25.00	17.00	42.00	31.4750	5.71025

Table 1: Descriptive Statistics

Out of 80 patients, 24 (30%) patients appeared normal with no ACL injury while 55 (68.8%) patients had partial tear with ACL injury and one (1.3%) patient had complete tear with ACL injury. Sixty-six (82.5%) eighty patients appeared normal with no PCL injury while 14 (17.5%) patients had partial tear having PCL injury. 66 (82.5%) patients out of 80 appeared normal with no LCL injury while 13 (16.3%) patients had partial tear having PCL injury and 1 (1.3%) patient had complete tear with PCL injury. 72 (90.0%) patients appears normal with no MCL injury while 8 (10.0%) patients had partial tear having MCL injury. Among 80 patients, 49 (61.3%) patients appeared normal having no MM injury. 14 (17.5%) patients had Grade 1, 7 (8.8%) patients had Grade 2 and 10 (12.5%) patients had Grade 3 having MM injury. Fifty-six (70.0%) patients appears normal having no LM injury, 14 (17.5%) patients had Grade 1, 4 (5.0%) patients had Grade 2 and 6 (7.5%) patients had Grade 3 having MM injury (Table 2).

Type of Knee Injuries	Frequency (%)
ACL	56 patients, 70%
PCL	14 patients, 17.5%
MCL	8 patients, 10%
LCL	14 patients, 17.5%
LM	24 patients, 30%
MM	31 patients, 38.8%

Table 2: Percentage of Injuries

Numbness was clinical finding in 66.7%, 26.7%. 13.3%, 13.3%, 13.3% and 40% patients with ACL, PCL, MCL, LCL, LM and MM injuries respectively and Swelling in 75%, 25%,8.3%.16.7%.25% and 29.2% in ACL, PCL, MCL, LCL, LM and MM injuries respectively (Table 3).

Injuries	Clinical Findings	
	Numbness	Swelling
ACL	10 patients, 66.7%	18 patients, 75.0%
PCL	4 patients, 26.7%	6 patients, 25.0%
MCL	2 patients, 13.3%	2 patients, 8.3%
LCL	2 patients, 13.3%	4 patients, 16.7%
LM	2 patients, 13.3%	6 patients, 25.0%
MM	6 patients, 40.0%	7 patients, 29.2%

Table 3: Percentage of Clinical findings of footballers with knee injuries

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Figure 1: Appearance shows soft tissue edema and some fluid around the lateral femoral condyle along the iliotibial tract and femoral attachment of lateral collateral ligament

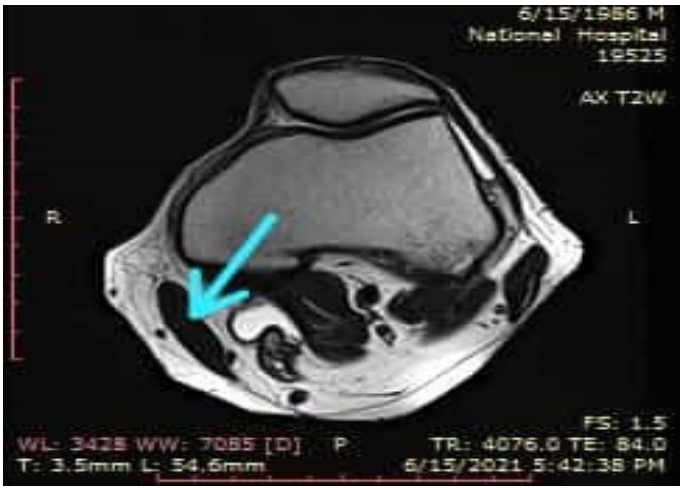

Figure 2: Appearance consistent with posteromedial corner injury with localized edema and fluid around this area. Partial ACL tear also seen.

DISCUSSION:

Magnetic resonance imaging has become a modality of choice for diagnosing knee injuries. Sensitivity and specificity of diagnosing menisci and cruciate ligaments is quite high, but this is not the case in patients with multiple tears/ injuries[15].In our study incidence of anterior cruciate ligament tear is highest (70%) as compared to other injuries. Study conducted by Waleed and Gamal also showed higher incidence of ACL injuries (60%) in total population [16]. Another study conducted on Australian footballers showed high incident of ACL injuries with high reoccurring rate. ACL injuries are sometime severe that athletes were not able to return to elite games[17,18].

In a study conducted by Zairul-Nizam *et al.* he concluded that MRI have a sensitivity in detecting ligament and menisci injuries [19]. Nikolaou *et al.* in his study stated that the diagnostic accuracy of MRI in detecting knee injuries is higher than physical exam[20]. In a study conducted by Mad husudhan *et al.* in UK stated that physical examination is better than MRI except in case of Meniscus tear [21]. In Behairy *et al.* study conducted on 70 subjects showed high diagnostic values of MRI and physical exam. In most cases there is a slight difference in between both exams as in our study incidence of clinical findings such as numbness and swelling is almost same as MRI findings. This conclusion also supported by study conducted by Thomas *et al*[22,23].

In our study,24 patients (30%) had lateral meniscal injuries, and 31 patients (38.8%) had medial meniscus injuries, which had better visualization on MRI. A prospective and retrospective study of ACL injury and its diagnosis on MRI was studied. 154 patients were diagnosed with ACL injury. The accuracy of MRI was seventy-five% for MM tears, sixty-nine percentage for LM tears and ninety-eight% for ACL tears. The accuracy of clinical exam was 82% for MM tears, 76 percent for LM tears and 99% for complete tears of the ACL [24]. In this study 80 patients diagnosed with ligamentous injuries 70% had ACL, 17.5 % had PCL, 10 % had MCL, 17.5% had LCL, 30% LM and 38.8% had MM. Main reason of uncertainty of results depends upon the different levels of skills. Personnel with good experience of MRI interpretation, arthroscopy and clinical examination can give better diagnosis. MRI techniques involve in scanning are of great Importance. Multiple studies showed that if a skilled technician performs the examination, accuracy of results is higher[25].

CONCLUSIONS:

Knee related injuries are common in footballers, with a huge number of Anterior Cruciate Injury injuries, as well as other ligament injuries. Knowing the epidemiology, treatment, associated risks and prevention is important to players.MRI is useful imaging modality for the detection of soft tissue injuries most commonly sports injuries. It gives more accurate and detailed information of ligaments and muscle tears than any other modalities. In our study most common injuries that are detected by MRI are ACL tear, bucket handle tear of medial meniscus and MCL injuries. PCL injuries are less common than ACL injuries.

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