

Research Article

Evaluation of Traumatic Knee Joint Injuries of Magnetic Resonance Imaging

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Abstract: Background: Magnetic resonance imaging (MRI) plays a crucial role in diagnosing knee pain etiology, particularly in cases of suspected meniscus and cruciate ligament injuries. MRI is accurate, safe, non-invasive, and aids in avoiding unnecessary arthroscopies. It is noninvasive, does not involve ionizing radiation and has multiplanar capability with excellent soft tissue demonstration. Therefore, MRI has become the imaging modality of choice for the evaluation of the painful knee following injury. **Methods:** The descriptive cross-sectional study was carried out at Dept. of Radiology & Imaging, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh from July 2012 to June 2013. The study population consisted first 100 cases with suspected traumatic knee joint injuries and with supportive MRI findings. Hospital based study enrolled for study after obtaining an informed consent. Patients coming to BSMMU referred to the department of radio diagnosis with suspected traumatic knee joint injuries and with supportive MRI findings. **Results:** In this study of 100 patients, 75 patients were male while 25 patients were female. The most common age group affected was 15-25 years. In this study, the most common injury was anterior cruciate ligament (ACL) tear of which complete tear was more common. Posterior cruciate ligament tears (6.5%) were less common. Among the meniscal injuries medial meniscal tears were more common than lateral meniscal tear and horizontal tears were more common in both. Other abnormalities like discoid meniscus (1 patient), hemarthrosis (1 patients), joint effusions (81 patients), bony contusions and other myotendinous tears were accurately detected and characterized with the help of magnetic resonance imaging. **Conclusion:** MRI is an excellent, noninvasive, radiation free imaging modality with multiplanar capabilities and excellent soft tissue delineation. It can accurately detect, localize and characterize various internal derangements of the knee joint and help in arriving at a correct anatomical diagnosis thereby guiding further management of the patient. MRI has high accuracy for preoperative detection of meniscal tears. In addition, it allows accurate characterization of various tear patterns, which can be instrumental for patient counseling and surgical planning.

Keywords: Magnetic Resonance Imaging (MRI), Knee Joint, Meniscal Tear, Ligament Injury.

INTRODUCTION

Magnetic resonance imaging (MRI) plays a crucial role in diagnosing knee pain etiology, particularly in cases of suspected meniscus and cruciate ligament injuries. MRI is accurate, safe, non-invasive, and aids in avoiding unnecessary arthroscopies [1]. The knee joint, a crucial synovial joint in the body, is one of the most extensive and intricate parts [2,3]. Serving as a hinge and weight-bearing joint, it is vulnerable due to the high demands placed on it. Comprising various bones, cartilage, muscles, tendons, and ligaments, the knee joint performs a wide array of functions. Excessive forces beyond its normal range can lead to bony or soft tissue injuries, with approximately 25% of the adults experiencing knee pain [4]. Although radiography

remains the standard initial imaging modality to diagnose knee derangement, MRI improves the evaluation of the bones and soft tissues to a greater extent. Arthroscopy gives excellent visualization of the interior of the joint, but is invasive and can evaluate only the surface abnormalities. MRI has revolutionized musculoskeletal imaging since its introduction in the 1970s, with the knee being a commonly scanned joint. It is instrumental in evaluating meniscus and ligament injuries. Advanced MRI systems like 3 Tesla offer superior imaging quality and diagnostic accuracy, reducing scanning time. Studies have shown MRI to be highly reliable in evaluating knee conditions and guiding treatment decisions [5,6]. Advancement in diagnostic MRI tools for the joints is of increased clinical

importance as musculoskeletal imaging is a rapidly growing field in MRI applications. Magnetic resonance imaging (MRI) is used more commonly in the knee trauma compared to other joints and is an excellent diagnostic tool that helps clinicians in the evaluation of injuries to menisci and ligaments, osseous structures, articular surfaces and tendon and also helps in determining whether surgery is required or if conservative management will suffice [7]. MRI has supplanted diagnostic arthroscopy as the study of choice for diagnosing internal derangement of the knee and has proven to be cost effective as arthroscopy is invasive and can evaluate only the surface abnormalities.

MATERIALS AND METHODS

The descriptive cross-sectional study was carried out at Dept. of Radiology & Imaging, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh from July 2012 to June 2013. The study population consisted first 100 cases with suspected traumatic knee joint injuries and with supportive MRI findings. Hospital based study enrolled for study after obtaining an informed consent. Patients coming to

BSMMU referred to the department of radio diagnosis with suspected traumatic knee joint injuries and with supportive MRI findings.

Inclusion criteria

- All patients referred from clinicians to department of radio diagnosis with clinically suspected traumatic one or both knee joint injuries due to road traffic accident, fall from height, sports injuries, etc. with supportive magnetic resonance imaging findings.
- All patients irrespective of age group and sex who give consent/assent are taken up for the study.

Exclusion criteria:

- Patients with normal magnetic resonance imaging of knee joint.

Results

Out of 100 patients included in the study, 75 were males (75%) & 25 were females (25%).

Table 1: Distribution of patients according to age (N=100)

Age	No. of Patients	Percentage
<15	7	7%
15-25	27	27%
26-35	25	25%
36-45	15	15%
45-55	13	13%
>55	13	13%
Total	100	100%

In this study out of 100 patients, maximum number of patients were from the age group of 15 to 25 years age (27%) followed by age group of 26 to 35 year of age (25%). Least number of patients were in age group less than 15 years (7%) followed by age group greater than 55 years (13%).

Table 2: Spectrum of MRI injury (N=100)

MRI finding	Positive findings	Percentage
Joint effusion	81	81%
Meniscal injury	46	46%
MM injury (only MM + both MM and LM injury)	36	36%
LM injury (only LM+ both LM and MM injury)	18	18%
ACL injury	62	62%
PCL injury	6	6%
MCL injury	14	14%
LCL injury	6	6%
Osseous-osteochondral changes	33	33%
Cystic lesions	6	6%

Table 3: Number of patients with meniscus injury (N=46)

Type of meniscus injury	No. of patients	Percentage
Only medial meniscus (MM) injury	28	60.8%
Only lateral meniscus (LM) injury	10	21.8%
Both menisci injury	8	17.4%
Total	46	100%

In this study out of 100 patients, 46 patients had meniscus injury out of which 28 patients had only medial meniscus injury (60.8%), 10 patients had only lateral meniscus injury (21.8%) and 8 patients had both menisci injury (17.4%).

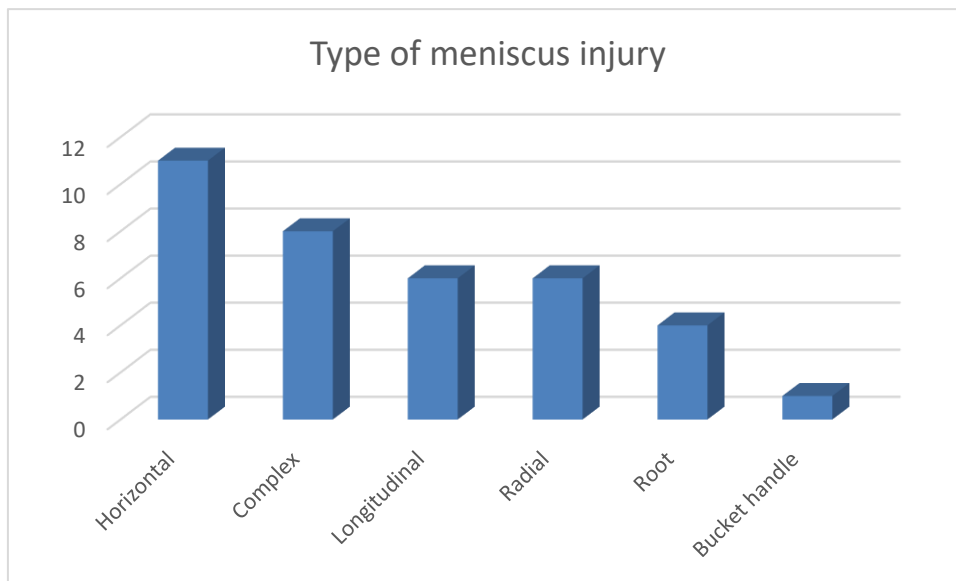


Figure 1: Number of patients with medial meniscus injury (N=36)

In this study of 100 patients, 36 patients had medial meniscus injury in which maximum number of patients had horizontal tear (30.5%) followed by complex tear (22.2%), while bucket handle tear was least common (1.4%).

Table 4: Number of patients with lateral meniscus injury (N=18)

Type of meniscus injury	No. of Patients	Percentage
Horizontal tear	5	27.7%
Complex tear	4	22.2%
Longitudinal tear	4	22.2%
Radial tear	2	11.1%
Root tear	2	11.1%
Bucket handle tear	1	5.5%
Total	18	100%

In this study out of 100 patients, 18 patients had lateral meniscus injury in which maximum number of patients had horizontal tear (27.7%) then complex tear (22.2%) while Radial and Root tear were less common (Each had 11.1% & 11.1% respectively) & Bucket handle tear was the least common (5.5%).

Table 5: Number of patients with anterior cruciate ligament injury

ACL Tear	No. of Patients	Percentage
Partial	28	45.2%
Complete	34	54.8%
Total	62	100%

In this study out of 100 patients, 62 patients (62%) had anterior cruciate ligament (ACL) injury out of which 28 patients had partial ACL tear (45.2%) while 34 patients had complete ACL tear (54.8%).

Table 6: Number of patients with medial collateral ligament injury (N=100)

Medial collateral ligament tear	No. of Patients	Percentage
Present	14	14%
Absent	86	86%
Total	100	100%

In this study out of 100 patients, 14 patients (14%) had medial collateral ligament injury.

In this study out of 100 patients, 6 patients (6%) had lateral collateral ligament injury.

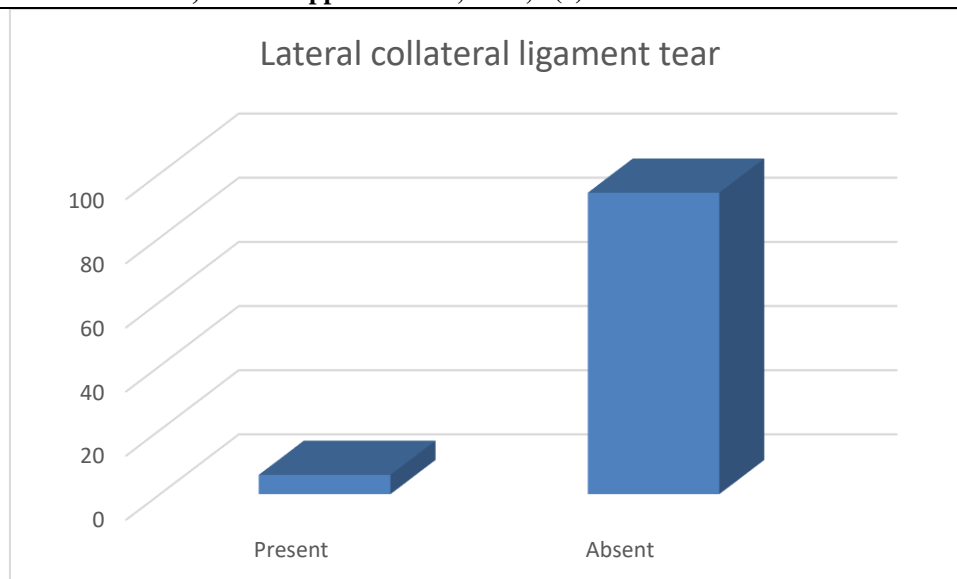


Figure 2: Number of patients with lateral collateral ligament injury (N=100)

DISCUSSION

Magnetic Resonance Imaging (MRI), with its multi-planar capabilities and excellent tissue contrast has established itself as the leading modality for evaluation of the sports related knee injuries. It is non-invasive and does not involve ionizing radiation. Imaging of the knee requires excellent contrast, high resolution and the ability to visualize minute structures, all of which are precisely provided by MRI. Magnetic resonance imaging has steadily increased and has become the first line investigation for most of the traumatic and non-traumatic lesions of knee [8,9]. Pre and post-operative evaluation of the joint can also be done. Complete evaluation of all the internal structures of the knee was not possible with other modalities like conventional radiography, arthrography, ultrasonography and computed tomography [10]. Even with arthroscopy lesions such as peripheral meniscal tears, inferior surface tears and osteochondritis desiccans without articular cartilage damage are most often not detected. Multiplanar MRI modality provides significant improvement in assessing these structures. The study included 100 patients with maximum number of patients in age group of 15 to 25 years which was estimated to be 27.5% followed by 26-35 years (25%). Male preponderance over female was found, male value estimated to be 57.5% while female was calculated to be 42.5% [11]. Our study was similar to the study performed which included 35 patients ranging in age between 22 to 59 amongst which male were 55.5% and female were 44.5% and all the patients were examined under MRI [12]. The meta-analysis of meniscal tears done by Shetty *et al.* [13] included a detailed assessment of MRI's diagnostic accuracy. They confirmed that MRI is a reliable diagnostic tool for meniscal tears, reporting good specificity and sensitivity for both medial and lateral tears. These MRI findings show that excellent diagnostic accuracy in detecting meniscal tears is crucial for creating successful treatment regimens. The present study findings were consistent with other studies [14,15].

The present study found a strong correlation between the individual's history of trauma and several MRI findings. People with a history of trauma are more likely to have injuries such as meniscus and ACL tears, collateral ligament damage, bone contusions, joint effusion, chondromalacia patella, and muscular edema. Conversely, people without a history of trauma were more likely to have infections, osteoarthritis, and neoplastic lesions [16]. These results highlight the importance of taking the history of trauma into account when diagnosing, evaluating, and treating knee injuries.

CONCLUSION

Magnetic resonance imaging is a great non-invasive radiation-free imaging modality with multifunctional and excellent soft tissue boundaries. Anatomical diagnosis. Additionally, it allows for accurate characterization of various tear patterns. This is critical to patient counseling and surgical planning. Being familiar with normal anatomy, common anatomical mutants and indirect secondary signs of meniscus cracks can help reduce interpretive errors.

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