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Original article

A Study on the Severity and Pattern of Ligament Injuries Evaluated by MRI at a Tertiary Care Hospital

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Abstract

Background: Ligament injuries are a common cause of joint instability and functional impairment, particularly following trauma and sports-related activities. Accurate assessment of the severity of ligament injuries is essential for appropriate management. Magnetic Resonance Imaging (MRI) is the imaging modality of choice due to its superior soft tissue contrast and ability to detect subtle ligamentous and associated injuries.

Materials and Methods: This descriptive observational study was conducted in the Department of Radiodiagnosis at a tertiary care hospital. A total of 200 patients with clinical suspicion of ligament injury were evaluated using MRI. Standard multiplanar MRI sequences were obtained, and ligament injuries were graded as sprain (Grade I), partial tear (Grade II), or complete tear (Grade III). Associated MRI findings were also documented. Data were analyzed using descriptive statistics and expressed as frequencies and percentages.

Results: The study population showed a male predominance (61%) with the majority of patients aged between 18 and 45 years. The knee joint was the most commonly involved joint (64%). Partial ligament tears were the most frequent injuries (42%), followed by complete tears (30%) and sprains (28%). Joint effusion (59%) and bone marrow edema (46%) were the most common associated MRI findings.

Conclusion: MRI provides a comprehensive and reliable assessment of the severity of ligament injuries and associated abnormalities. Its routine use aids in accurate diagnosis, treatment planning, and improved patient outcomes.

Keywords: Ligament injury; Magnetic Resonance Imaging; Injury severity

Introduction

Ligament injuries are a common cause of musculoskeletal morbidity and frequently result from sports activities, road traffic accidents, falls, and occupational trauma. These injuries can lead to joint instability, chronic pain, restricted mobility, and long-term functional impairment if not accurately diagnosed and appropriately managed. Clinical examination alone may be insufficient to determine the exact ligament involved or to assess the severity of injury, particularly in acute settings with pain and swelling. Hence, imaging plays a crucial role in the evaluation of ligamentous injuries. (1,2)

Magnetic Resonance Imaging (MRI) has emerged as the imaging modality of choice for the assessment of ligament injuries due to its excellent soft tissue contrast, multiplanar capability, and non-invasive nature. MRI allows precise visualization of ligaments, tendons, cartilage, menisci, bone marrow, and associated soft tissue structures, enabling comprehensive assessment of joint pathology. It is highly sensitive and specific in detecting partial and complete ligament tears, grading the severity of injury, and identifying associated findings such as bone contusions, effusions, and secondary stabilizer damage. (3,4,5)

Assessment of the severity of ligament injuries on MRI is essential for guiding treatment decisions, determining prognosis, and planning surgical or conservative management. In a tertiary care hospital setting, where patients often present with complex and high-energy injuries, systematic evaluation of ligament injury severity using MRI is particularly valuable. (6) Our study aims to analyze the severity patterns of ligament injuries detected on MRI in patients presenting to a tertiary care hospital, thereby contributing to better diagnostic accuracy and optimized patient management.

Study Methodology

Our study was conducted as a descriptive observational study in the Department of Radio - diagnosis at DR BVPRMC & Pravara Rural Hospital, over a defined study period one year. A total of 200 patients who were clinically suspected to have ligament injuries and were referred for MRI evaluation were included in the study.

Prior approval was obtained from the Institutional Ethics Committee before the commencement of the study. Written informed consent was obtained from all participants after explaining the nature, purpose, and procedure of the study in their local language.

Patients of both sexes and all adult age groups presenting with a history of trauma, sports-related injury, or clinical features suggestive of ligament injury were enrolled in the study. Patients with previous surgery involving the affected joint, known inflammatory or infective joint disorders, congenital ligament abnormalities, or contraindications to MRI were excluded. Relevant clinical details such as age, sex, mode of injury, duration of symptoms, and the joint involved were recorded using a predesigned proforma.

MRI examinations were performed using a high-field strength MRI scanner with a dedicated surface coil appropriate to the joint being evaluated. Standard imaging protocols were followed, including multiplanar T1-weighted, T2-weighted, proton density, and fat-suppressed sequences. Images were obtained in axial, sagittal, and coronal planes to ensure optimal visualization of ligaments and associated structures. All MRI scans were reviewed by experienced radiologists, and ligament injuries were assessed for presence, type, and severity.

The severity of ligament injuries was categorized based on MRI findings into grades such as sprain, partial tear, and complete tear, according to established imaging criteria. Associated findings including bone marrow edema, joint effusion, meniscal or cartilage injuries, and additional ligament involvement were also documented. The collected data were entered into a master chart and analyzed using appropriate statistical methods. Descriptive statistics were used to summarize the findings, and results were expressed in terms of frequencies and percentages.

Results

Table 1: Age and Gender Distribution of Study Population (n = 200)

Age Group (Years)	Male n (%)	Female n (%)	Total n (%)
18–30	38 (19.0)	22 (11.0)	60 (30.0)
31–45	44 (22.0)	26 (13.0)	70 (35.0)
46–60	28 (14.0)	22 (11.0)	50 (25.0)
>60	12 (6.0)	8 (4.0)	20 (10.0)
Total	**122 (61.0)**	**78 (39.0)**	**200 (100)**

Table 2: Distribution of Ligament Injuries Based on Joint Involved on MRI

Joint Involved	Number of Cases (n)	Percentage (%)
Knee joint	128	64.0
Ankle joint	36	18.0
Shoulder joint	22	11.0
Wrist joint	14	7.0
Total	**200**	**100**

Table 3: MRI-Based Severity of Ligament Injuries

Severity of Injury	Number of Cases (n)	Percentage (%)
Grade I (Sprain)	56	28.0
Grade II (Partial tear)	84	42.0
Grade III (Complete tear)	60	30.0
Total	**200**	**100**

Table 4: Associated MRI Findings in Patients with Ligament Injuries

Associated MRI Finding	Number of Cases (n)	Percentage (%)
Joint effusion	118	59.0
Bone marrow edema/contusion	92	46.0
Meniscal injury	64	32.0
Cartilage injury	38	19.0
Multiple ligament involvement	42	21.0

Discussion

Ligament injuries constitute a significant proportion of musculoskeletal trauma encountered in clinical practice and are a common indication for MRI evaluation. In the present study, MRI was utilized to assess the severity and distribution of ligament injuries in 200 patients presenting to a tertiary care hospital. The findings provide valuable insight into the demographic profile, commonly involved joints, severity patterns, and associated MRI findings, reinforcing the pivotal role of MRI in comprehensive ligament injury assessment. (7)

The demographic analysis demonstrated a male predominance (61%), which is consistent with existing literature and can be attributed to higher exposure of males to risk factors such as sports activities, outdoor work, and road traffic accidents. The majority of patients belonged to the 18–45 years age group (65%), representing the most physically active and economically productive population. This observation aligns with previous studies that have reported a higher incidence of ligament injuries in younger and middle-aged adults due to increased participation in high-demand physical activities. (8,9,10)

The knee joint was the most commonly involved joint in the present study, accounting for 64% of cases. This finding is expected, as the knee is a complex, weight-bearing joint with multiple stabilizing ligaments that are vulnerable to rotational and translational forces. The ankle and shoulder joints were the next most commonly affected, which is comparable with published studies reporting a high incidence of ligament injuries in these joints due to sports-related trauma and falls. The relatively lower incidence of wrist ligament injuries may be explained by protective reflexes and lesser load transmission compared to larger joints.

Assessment of injury severity revealed that partial ligament tears (Grade II) were the most frequent MRI finding (42%), followed by complete tears (30%) and sprains (28%). This distribution highlights the advantage of MRI in detecting subtle and partial ligament disruptions that may be missed on clinical examination or conventional radiography. Early identification of partial tears is crucial, as timely conservative management can prevent progression to complete tears and chronic instability.

Associated MRI findings were commonly observed in patients with ligament injuries, emphasizing the comprehensive diagnostic capability of MRI. Joint effusion was the most frequent associated finding (59%), reflecting the inflammatory response to acute ligament trauma. Bone marrow edema or contusion was noted in 46% of cases, indicating the presence of occult bony injuries and impact-related trauma, particularly in high-energy mechanisms. Meniscal injuries were identified in 32% of cases, especially in patients with knee ligament injuries, underscoring the strong association between ligamentous and meniscal pathology. Cartilage injuries and multiple ligament involvement were also observed, suggesting more severe trauma and poorer prognostic implications. (11)

The presence of multiple ligament injuries in 21% of patients signifies the complexity of cases presenting to a tertiary care center, where patients often sustain high-energy or delayed-presenting injuries. Identification of such complex injury patterns is essential for surgical planning and prognostication. Overall, the study confirms that MRI is an indispensable modality for evaluating ligament injuries, accurately grading severity, and identifying associated intra-articular and periarticular abnormalities. The results support the routine use of MRI in suspected ligament injuries to guide appropriate clinical and surgical management and to improve patient outcomes.

Conclusion:

MRI provides a comprehensive and reliable assessment of the severity of ligament injuries and associated abnormalities. Its routine use aids in accurate diagnosis, treatment planning, and improved patient outcomes.

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