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ORIGINAL ARTICLE

Evaluation of Knee Joint Injuries with Magnetic Resonance Imaging (MRI) and Correlation with Arthroscopy

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ABSTRACT

One of the most frequent issues humans have had to deal with from the beginning of time is a knee injury. Knee injuries caused by a variety of diseases, from acute to degenerative, can affect the articular cartilage. The trauma, infection, or inflammation caused this injury. In these circumstances, a full clinical examination is not possible since the patients are in too much pain to cooperate. Then non-invasive multiplanar imaging and MRI come into play. The objective of the current study was to assess knee joint injuries using MRI and correlate those findings with arthroscopy. A total number of 225 participants were involved in this study, among them, 175 had issues with a knee injury. The patients referred with a history of knee injury were imaged with a 1.5 Tesla MRI machine. Most patients were between the ages of 35-40 years**.** The most frequent injuries found in the study were bone contusions, joint effusions, anterior cruciate ligament tears, and tears of the posterior horn of the medial meniscus. The accuracy percentage of ACL, PCL, LCL and MCL were 93, 100, 94.02 and 91.34%, respectively. Due to its great soft tissue contrast resolution and multiplanar imaging capabilities, magnetic resonance imaging (MRI) is a superior non-invasive investigative method for knee injuries. This allows for the most thorough evaluation of a variety of soft tissue knee joint problems.

Keywords: Knee joint injury; Magnetic resonance imaging; Arthroscopy;

INTRODUCTION

One of the most frequent issues people experience is knee discomfort. About 19% of people report having knee pain regularly. With age, the incidence rises progressively. Knee injuries can be brought on by a variety of diseases, from acute to degenerative, that affect the articular cartilage. Since it is impossible to determine clinically how much articular cartilage is involved in the many disorders that cause knee injury, diagnostic radiography is of utmost relevance (Sneag et al., 2015; Ihara and Kawano, 2017; Naraoka et al., 2017).

One of our bodies' most important functions is walking, and the knee joint is essential to its proper operation. Meniscal and cruciate ligament injuries in the knee joints are among the most common issues that an orthopaedic surgeon encounters because of their anatomical makeup and functional requirements. The failure of the knee joint's regular activities, such as stability and body weight bearing, can result from an injury involving these components. It will have an impact on one's physical well-being and disturb everyday activities, which will harm the sufferer both physically and financially (Shah et al., 2014; Sneag et al., 2015; Park et al., 2015; Kosy et al., 2017; van der List et al., 2017; Culvenor et al., 2019). Therefore, it is crucial to determine whether the meniscus, cruciate ligament, or both have been injured. Due to the large number of patients complaining of knee joints injuries, magnetic resonance imaging (MRI) of the knee is extremely valuable in identifying the many diseases causing knee joints injuries (Bansal et al, 2011; Rana et al., 2021; Abdelhameed et al., 2021; Mohabey et al., 2020).

Conventional radiographs of the knee only provide limited information, and CT scans only provide limited data on bone pathology and the ligaments and synovium. The menisci, cartilage, ligaments, or bone may sustain damage as a result. Acute knee injuries can be challenging to physically examine, and imaging scans are frequently needed to help diagnose these injuries. Although arthroscopy is an invasive technique and involves risks, it has a diagnostic accuracy of 64 to 94%. Anterior cruciate ligament (ACL) injuries are common in the knee and are typically linked to meniscal injuries (Yusuf et al., 2011; Yadav and Kachewar, 2014; Adelani et al., 2016). In both clinical and scientific settings, magnetic resonance imaging (MRI) has emerged as the most significant technique for evaluating pathologic alterations in knee cartilage in recent years. The capability of MRI to manipulate contrast to highlight various tissue types is one of its main benefits. MRI is better than more traditional methods for evaluating knee injuries because of its superior soft-tissue contrast, lack of ionizing radiation, and multiplanar capabilities. Patients with knee injuries might improve function and reduce pain with the surgical treatment known as knee arthroscopy (KA). The current study was conducted to evaluate knee joint injuries with Magnetic Resonance Imaging (MRI) and correlation with arthroscopy.

METHODOLOGY

Study area: A prospective study was carried out on 225 patients in the Department of Orthopedic and Spine Surgery at Khyber Teaching Hospital, Peshawar, Pakistan from March 2019 to April 2022.

Participants and data recording: The study included patients with knee discomfort caused by injury from all age categories, including both men and women. In addition to the laboratory tests, a thorough clinical history, physical exam, and systemic examination findings were recorded. All patients underwent an AP and lateral knee radiograph.

The instrument used to examine MRI: The Siemens 1.5 Tesla MAGNETOM Avanto equipment was used to perform the MRI. It was done with an eight-channel knee coil. The knee was examined using MRI in the axial, coronal, and sagittal planes. The axial, sagittal, and coronal planes were used to create T2-weighted fast spin echo contrast pictures. The socio-demographic data of each patient was recorded through a face-to-face interview.

Image interpretation: Radiologists reported all images, and in cases where the diagnosis was in doubt, two radiologists provided a consensus diagnosis.

Arthroscopy and analysis: An operation method that enables the optimal treatment of components inside the knee joint is called arthroscopy. The most typical setting for it is brief general anaesthesia. Through two tiny incisions, a fibre-optic tool called an arthroscope is inserted into the knee joint. An arthroscope is fitted with a camera, and a TV monitor displays the image. The arthroscope enables a thorough assessment of the patella, cartilage surfaces, meniscus, ligaments, and joint lining throughout the knee joint. Data was examined, confirmed, and processed after collection to minimize error. Then a computer was used to analyze it.

RESULTS AND DISCUSSION

The current study was conducted to determine knee injuries in patients of fewer study areas. People complaining of knee joint pain are reported to the doctor in greater numbers every day. The knee joint, which has a complicated articulation and a presence of ligamentous and meniscal tissues, is a crucial joint in the human body. The knee joint is largely responsible for the stability and movement of the human body. Knee discomfort can afflict people of any age. Several authors observed that knee joint pain was very common (Saraswathi, 2009).

Due to its intricate structure, imaging of the knee poses a unique challenge. Currently, a range of imaging methods is employed to assess knee problems. Standard radiography, scintigraphy, computed tomography, MRI, and arthrography are some of these modalities. A total of 225 participants were involved in this study. Among the total 53.77 and 46.22% were male and female, respectively. The majority of the patients belonged to farming followed by traders and teachers (Table 1). Among the total, 175 patients were affected with a knee injury. Most patients were between the age of 35-40 years. The study findings are almost similar to the study of Rajan and Mohamed (2017) who conducted a study in India. Sex-wise distribution of knee injury in patients is shown in figure 1.

Table 1: Knee injuries in patients of the study area.

Type of tear	Number of patients	%
Joint effusion	55	31.42
Fracture	61	34.85
A posterior cruciate ligament (PCL)	5	2.85
Lateral collateral ligament (LCL)	10	5.71
An anterior cruciate ligament (ACL)	26	14.85
Medial collateral ligament (MCL)	18	10.28

Table 2: Socio-demographic characteristics of participants in the study area.

Variables	Frequency	Percentage
Sex		
Male	121	53.77
Female	104	46.22
Total	225	100
Age of patients		
1-10 year	12	5.33
11-20 year	19	8.44
21-30 year	22	9.77
31-40 year	29	12.88
41-50 year	35	15.55
51-60 year	47	20.88
> 60 year	61	27.11
Total	225	100
Marital status		
Single	97	43.11
Married	128	56.88
Total	225	100
Location		
Urban	100	44.44
Rural	125	55.55
Total	225	100
Occupation		
Farmer	119	52.88
Teacher	70	31.11
Trader	36	16
Total	225	100
Education		
Illiterate	80	35.55
Primary	69	30.66
Middle	37	16.44
Matric	20	8.88
FSC	11	4.88
University	8	3.55
Total	225	100

Table 3: Sex and affected side-wise distribution of patients.

Male			Female	
Injury site	Number	%age	Number	%age
Injury in the right knee	56	59.57	52	64.19
Injury in the left knee	38	40.42	29	35.8
Total	94	77.68%	81	77.88%

Injury-wise data showed that 31.42% of patients had joint effusion, and 34.85% had a fracture. 14.85 % ACL, 5.71% LCL, 2.85% PCL and 10.28% MCL had found in patients. It was noted that a maximum number of patients had fracture injuries followed by joint effusion, ACL, MCL, LCL and PCL injuries (table 2). Orthopaedic surgeons identify the type of tear and then choose between conservative treatment and arthroscopic reconstruction for a permanent repair. Pasupuleti et al. (2015) investigated similar findings. An illustration of MRI findings of ACL involvement and MRI finding distributed on the involvement of joint effusion is shown in figure 3.

It was recorded that females were more highly affected than males in the study area. Knee osteoarthritis is a serious public health problem that results in persistent pain and impairment. It is one of the primary causes of mortality, disabling conditions, and job loss in various countries and rural populations than urban communities. Our current study findings are different from the findings of Haq et al. (2008) who studied in Bangladesh.

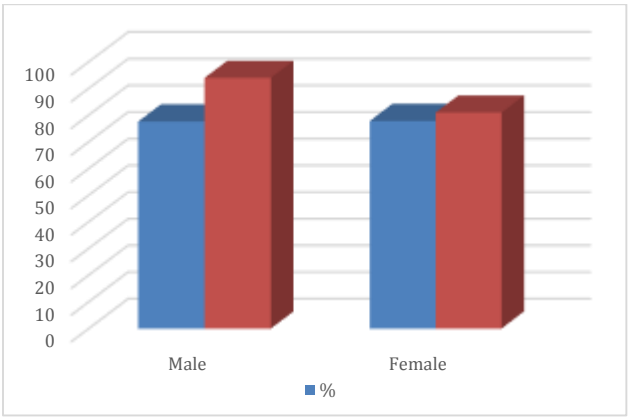

Figure 1: Sex-wise percentage of injury in patients

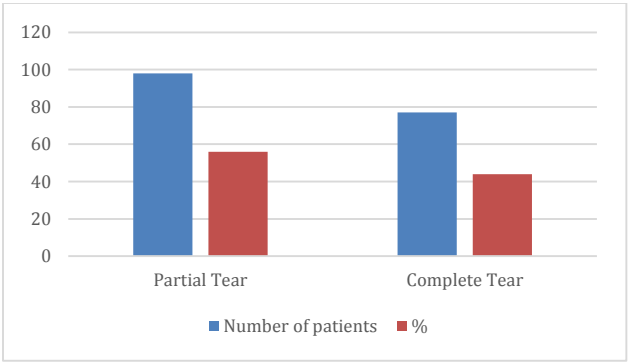

Figure 2: Illustration of MRI finding of ACL involvement

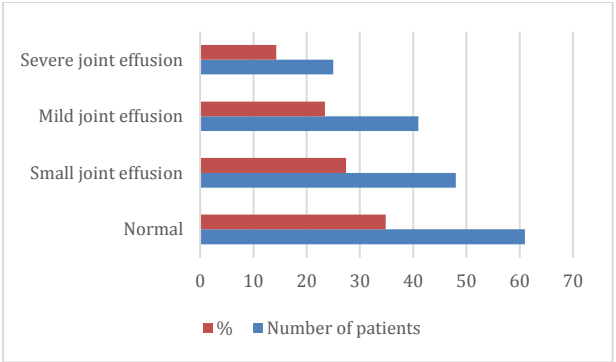

Figure 3: MRI finding distributed on the involvement of joint effusion

Table 3: Pathological findings in patients.

Pathology	Number of patients	%
Synovial osteochondromatosis	7	4
Osteoarthritis	38	21.71
Chondromalacia	4	2.28
Bone marrow contusion	52	29.71
Medial meniscus injury (MMI)	41	23.42
Baker cyst	3	1.71
Lateral meniscus injury (LMI)	30	17.14
Total infected patients	175	77.77

Table 3 shows the pathological characteristics of patients. It was seen that Bone marrow contusion was the most common pathology (29.71%) followed by Medial meniscus injury (23.42%), osteoarthritis (21.71%), lateral meniscus injury (17.145), synovial osteochondromatosis (4.00%), chondromalacia (2.28%) and baker cyst (1.71%). According to the investigation of Rana et al. (2021) and Yaqoob et al. (2015), joint effusion was the most common pathology 59.74% followed by MMI 53.24 %. In the current study, bone marrow contusion was 29.71% while previous workers reported 22.07% (Bansal et al., 2018), which is in agreement with the current findings (Singh et al., 2004; Yadav and Kachewar, 2013; Sohai et al., 2015; Mansour et al., 2015; Gimhavanekar et al., 2016). The accuracy of MRI findings is shown in figure 4. Table 4 shows the bone contusion distribution in patients. The tibia and lateral femoral condyle were the most often affected bones in the patients' one-third of who suffered bone contusions (Table 4). Our findings are almost similar to the many other researchers who conducted studies in various countries (Umap et al., 2018; Milewski et al., 2011; Bari et al., 2014; Rajan and Mohamed, 2017).

Table 4: Bone contusion distribution in patients

Bone contusion	Number of patients	%
Fibula	10	22.22
Tibia	15	33.33
Femur	12	26.66
Patella	8	17.77
Total	45	100

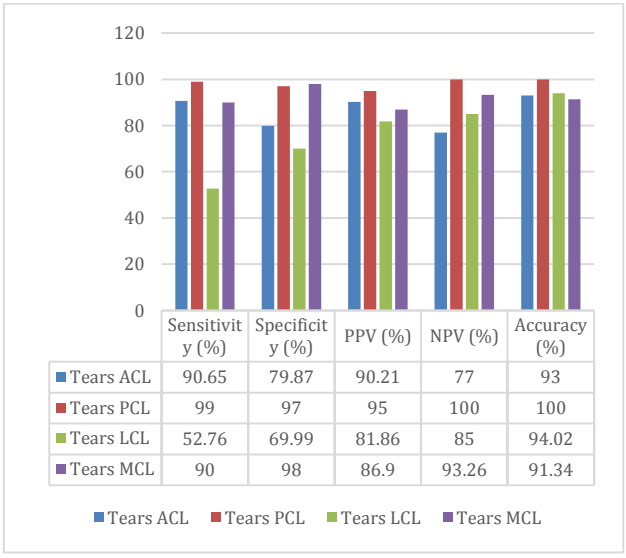

Figure 4: Accuracy of MRI findings using arthroscopic findings.

CONCLUSION

Due to its superior contrast resolution and multiplanar imaging capabilities, magnetic resonance imaging of the knee is an ideal non-invasive investigative method for knee injuries and offers the most thorough assessment in situations of different soft tissue injuries to the knee joint. Clinical signs may point to a soft tissue injury, but an MRI is required for a full examination. The capacity of MRI to assess ligaments, menisci, articular cartilage, articular capsule, and bone marrow makes it special. Even though technical artefacts and anatomical variations can make an MRI look like a tear, it is still regarded as the best imaging tool for showing the internal derangement of a knee injury. MRI offers a quantitative and semi-quantitative evaluation of cartilage matrix composition and articular cartilage morphology. Cartilage volume and flaws have shown sufficient validity, accuracy, dependability, and change sensitivity. They are linked to clinical outcomes including pain and joint replacement as well as radiological alterations.

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