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Role of MRI in evaluation of traumatic knee injuries

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Abstract
Traumatic injuries to the knee have not only remained a diagnostic but a therapeutic challenge. The effective tool for the definition, characterization, and evaluation of the pathology of knee injuries has been the magnetic resonance imaging. This study takes into account the systematic approach for the establishment of anatomical and pathoanatomical correlations and the role of MRI in the course of evaluation of knee injuries. Imaging was carried out at the KVG Medical College hospital Sullia by application of the permanent magnet system and a combination of the solenoidal surface coils as well as the thin-section techniques under high resolutions. Images from the results show the structural anatomy and spatial characteristics of the knees that are in the right correlation with those that are in correspondence with the cadaveric cryosections. The analysis was determined on 105 patients who were imaged for the preoperative diagnoses of meniscal tears, anterior and posterior cruciate ligament tears as well as those who had fractures in the plateau of the tibia. Results indicate that MRI has a sensitivity of 95%, a sensitivity of 80% a specificity of 89%, and an accuracy of 80%. The imaging method showed a positive predictive value of more than 90%, which proved that the adoption of the MRI is vital in the evaluation of traumatic knee injury at the KVG Medical College Hospital, Sullia.

Keywords: injuries, traumatic knee, evaluation

Introduction
Traumatic knee injuries can make the life unbearable for patients. Notably, traumatic knee pains leave the surgeon with doubts about the exact lesion causing pain in the knee (Helito *et al*., 2014) [3]. Therefore, maximum treatment is affected. Therefore, a technology such as noninvasive imaging that will clearly show the underlying cause of the pain without causing significant discomfort to the patient is vital (Yusuf *et al*., 2010) [12]. This research was thus done to evaluate the effectiveness of using Magnetic Resonance Imaging (MRI) to identify the underlying source of traumatic knee pain among patients in a hospital setup. The main objective of the research was to determine the common imaging findings in the setting of the study.

Materials and Methods
The inclusion criteria were based on selecting patients between the age of 20 years and above with acute and chronic pain being included in the research. The history of the traumatic pain was registered but sufficient information could not be collected from the patient because of their painful condition. All the patients that did not corporate for MRI examination were excluded from the study. Also, patients who had undergone previous surgical procedures and has metallic implants were excluded from the study because could bring contradictions s for MRI assessment. Methodology: the study employed 1.5Tesla High Gradient Magnetic Resonance Imaging scanner for analyzing105 hospitalized individuals who visited the hospital with traumatic pain as the main complaint. The current study followed research ethical considerations in which patient consent was sought first before they were involved in the study. In addition, before the research commenced, the researchers ensured that the Institutional Ethical and Research Cell has permitted it to go ahead.

Results
The analysis of the patient revealed that of the 105 patients who participated in the research, 78 were males and the remaining 27 were males. The findings could be attributed to the fact that females are less active than males. As a result, their knees were less subjected to wear and tear leading to traumatic pain. Furthermore, because of the hard jobs they do, they are more prone to injury, unlike women. The following table indicated the demographic distribution of the research participants according to age. The mean age of the patient was found to be 38.7. The highest number of the patient was seen to be in the age bracket of 40-50 years.

Table 1: Age distribution of the patients

Age in years	No. Patients	%
20-30	22	20.9%
30-40	25	23.8%
40-50	33	31.4%
50-60	19	18.09%
Above 60	6	0.057%
Total	105	100%

In all the cases, MRI adequately identified the exact nature of the knee harm in all the patients. Notably, the most injured

part of the knee in among the majority of the patients was the anterior cruciate ligament. It was also observed that injuries were more common on the right side than the left side. Finally, tibial attachments were most intricate than the femoral attachment.

Table 2: MRI findings of ACL involvement

Results	No. of patients	Percentage
Side		
Left side	45	42.9%
Right side	60	57.14%
Anterior Cruciate Ligament (ACL)		
Complete	46	43.8%
Partial	59	56.19%
Location of the ACL tear		
Tibial attachment	61	58.09%
Femoral Attachment	17	16.19%
Midsubstance	27	25.7%

MRI was able to satisfactorily see the involvement of medial and lateral meniscus in the cause of the pain. The summary of meniscus involvement from the findings is shown in the table below. The results found that the medial meniscus had more involvement than the lateral meniscus and this was according to the images produced by the MRI. Moreover, the posterior horn had more involvement than the anterior horn among the patients imaged.

Table 3: The findings of Meniscal involvement on MRI

Results	Medial Meniscus	Lateral meniscus
	Number of patients and %	Number of patients and %
Anterior Horn	35(33.3%)	32(30.5%)
Posterior Horn	65(61.9%)	55(52.4%)

In the analysis, the association of the posterior cruciate ligament was also adequately revealed by the MRI. The results can be summarized in the table below

Table 4: The results of the Meniscal association on MRI

Results	Number of patients	%
Complete tear	20	19.04%
Partial tear	45	42.8%
Buckling	50	47.6%

Discussions

From the study, it is clear that plethora of pathologies can present as traumatic knee pain that can be very difficult for a surgeon to exactly determine the cause of the main. Imaging is one of the technologies that can be used in hospitals to clinically confirm the pathologies that are suspected to be causing the pain and their extent and gravity (Chaudhuri *et al*., 2013) [2]. Clinical assessments in most of the cases indicate the interior disorder. Therefore, there is the need for the accurate diagnosis to avoid disturbing processes such as Arthroscopy that cause more discomfort for the patients. The plethora of imaging technique is evident for examination of joint of the knee (Potter *et al*., 2012) [6, 7]. Notably, plain radiographs clearly show the bone pathology although the soft tissue and injuries can be hardly demonstrated. Only a bulk of soft tissues may be noted instead (Chaudhuri *et al*., 2013) [2]. Furthermore, computerized tomography may indicate the injuries but the real matter causing traumatic pain may not be indicated which further complicated medication (Abbasi *et al*., 2012). In all the above procedures, MRI has the biggest advantage because it demonstrates the whole wound in many sections to enhance right diagnosis and treatment plans (McCarthy & McNally, 2004; Sellam, & Berenbaum, 2010) [9]. Many scholars have studied the MRI appearance of soft tissue lesions and recorded the results of their findings. While using the MRI technology, the ACL and PCL sections are viewed as hypointense bands on T1W, T2W, and Short Tau Inversion Recovery Images (Chaudhuri *et al*., 2013) [2]. Therefore, any injuries appearing on them are manifested as a hyperintense form on T2W, as well as Short Tau Inversion Recovery images.

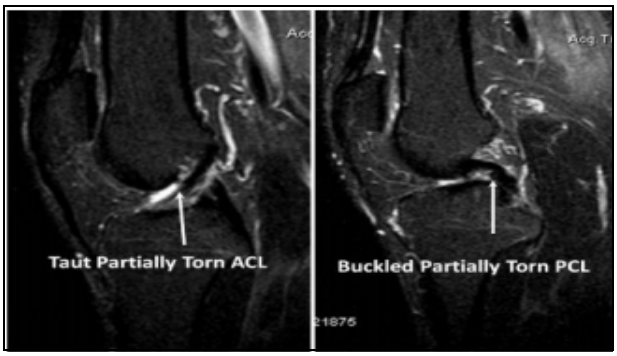

Fig 1: Shows STIR sagittal Images showing Pathologies of ACL and PCL

In a similar manner, the meniscus of the knee is observed as a hypointense structure in T1W, TW2, and Short Tau Inversion Recovery images. Also, injuries to the meniscuses are seen as a hyperintense characteristic on T2W and Short Tau Inversion Recovery images. The above type of lesson may show itself as incomplete or compete for the tear of the knee features (Sellam, & Berenbaum, 2010) [9]. Therefore, the MRI is employed in hospitals to collect the sections of the injured regions of the knee in multiple planes. The common MRI planes used in hospitals include the axial, coronal, and sagittal planes.

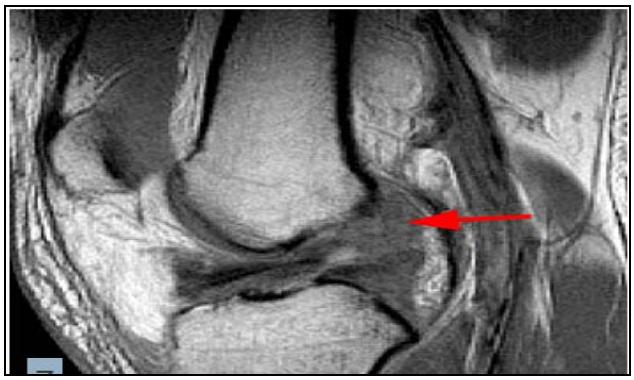

Fig 2: A T1-weighted sagittal image shows a complete disruption of the ACL

In many patients, the distraction of the knee tendons is the common pathology in patients with the symptoms of post-

traumatic knee discomfort. Therefore, it is critical to developing a method of linking the imaging findings with their anatomic relevance for correct medication and treatments strategy (Murakami *et al*., 2012) [6]. Most often, knee pains that relate to osteoarthritis have the poor relationship with the radiographs (Yadav, & Kachewar, 2014) [11]. In addition, it has bee found that there is no treatment or surgery that can alleviate knee pain or guarantee necessary improvements. Therefore, appropriate clinical evaluation of knee and correct Magnetic Resonance Imaging assessment can enhance correct patient management. People of all ages present traumatic knee pains. Therefore, the adoption and the use of MRI technology can help in the identification of the exact cause of the pain and inform proper treatment plans (Roemer *et al*., 2011) [8]. In the recent, Magnetic Resonance Imaging has enhanced diagnosis of the knee injury because the technology permeates for the examination of the important details of the knee soft tissues with multiple planes imaging ability that offer correct assessments of the interior and the exterior structure of the knee (Theologis *et al*., 2011) [10]. MRI is the best in-invasive technology for examing the knee structures and other soft tissues concerning the knee. MRI is capable of imaging the meniscal tear and classify them into various types of avoiding wrong arthroscopic examination. It is the best's modality for investigating or diagnosing complete ACL (Yadav, & Kachewar, 2014) [11]. Emerging IT technologies have enhanced MRI and reduced the costs of MRI knee studies.

Conclusion

There are many causes of traumatic knee pain in patients of all ages. Correct treatment can only result from a proper diagnosis of the exact ligament or cause of the pain. Therefore, MRI has emerged as the best diagnostic technology that can provide an accurate diagnosis. This has led to the intensive use of MRI technology and the use of imaging assessment of traumatic knee injuries.

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