Evaluation of Knee Joint Injuries using MRI

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Abstract

This is a retrospective analytical study which was conducted at departments of magnetic resonance imaging scan at GAMMA hospital, Almana hospital, Mouwasat hospital and king fahad hospital from October to December 2017.

This study aimed to estimate the post traumatic knee joint injuries in both male and female, athletics, old age people and traumatic patients in eastern region of Saudi Arabia population and show if there is a relationship between knee joint injuries and age also to determine the most common ligaments injuries in relation to athletics. The problem of this study lack of published studies related to this topic in Saudi Arabia, as well as increasing the several risk factors related to knee joint traumas in other countries and the unawareness of importance of this issue.

The study used the tools of magnetic resonance imaging which is the best modality selected to image knee joint in 70 patient selected by data collection sheet containing all the variable.

The results of this study showed that the most affected group are athletics between age (20-30). Also showed that anterior cruciate ligament is the most effected compared to other ligament. Moreover , the result showed that proton density is the best MRI protocol used in hospitals of eastern region, Saudi Arabia. Finally it showed that the most post traumatic knee joint pathology is hematoma.

Also a good correlation was found between post traumatic knee joint injuries and age of the patient and degree of exercises. The study recommended estimating the prevalence of post traumatic knee joint injuries and causes of it with larger sample size and more variables to compare the finding for each.

Keywords: Knee Injuries, MRI, traumatic knee

Introduction:
Knee pain is one of the most common complaints of patients presenting to both primary care and orthopedic physicians. It has been found to be present in up to 20% of the adult general population and represents the primary physical symptom of up to 6% of patients presenting to an adult primary care clinic [1,2]. And knee injuries are among the most common injuries in the athletic population. In a study of 6.6 million knee injuries presenting to emergency departments

during a 10-year period, approximately 50% of injuries were related to sporting or recreational activities, with soft-tissue injuries accounting for the majority of knee injuries [3].

Determining the underlying etiology can sometimes be difficult, in part because of the extensive differential diagnosis. Thus, despite its prevalence, many clinicians continue to have difficulty evaluating knee pain and the indications for specific imaging modalities are often unclear. [4]. Hence optimum treatment is hampered. Therefore, noninvasive imaging which can demonstrate the underlying pathology without any significant discomfort to the patient is needed. [5].

The widespread availability of magnetic resonance imaging (MRI) has changed the diagnostic approach to many orthopedic conditions, including the knee. It has become an important diagnostic tool with both a high sensitivity and specificity with regard to detecting intra-articular pathology.[6,7].MRI detects bone contusions, marrow changes, and tibial plateau fractures. MRI has unique ability to evaluate internal structure as well as the surface of the ligaments. The most significant advances in knee imaging have been made in MRI, which has clearly emerged as a primary tool, to guide the management of knee pain. With the development of new sequences, improved signal to noise ratio, higher resolution, reduced artifacts, shorter imaging times, and improved accuracy, MRI has changed the traditional algorithm for workup of meniscal and cruciate ligamentous tears. MRI has made it possible to look into the injured knee noninvasively, thereby avoiding invasive procedures and further morbidity.

A complete examination of the knee must include evaluation of the menisci, ligaments, articular cartilage and bone marrow. A suggested approach for scanning the knee includes sagittal and coronal thin-section (3mm) T1 and T 2- weighted images. Fast spin echo technique is usually used for T-2-weighted exams and should be implemented with fat suppression. Sagittal images with the knee externally rotated 10 to 15 degrees (or angled to achieve these results) allow optimal depiction of the anteriorcruciate ligament (ACL).The 3D acquisition and axial scans should be reserved for situations in which the cartilage and patellofemoral joint, respectively, are specific clinical concern.

Many studies have shown that magnetic resonance imaging (MRI) is useful for diagnosis of knee injuries[8–11], while use of MRI to evaluate chronic PCL injuries has been described in only a few reports. Tewes et al [12] reported that many chronically injured PCLs showed continuous low intensity on MRI, and the functional status of chronic PCL-deficient knees could not be determined by MRI findings. Evaluation of the healed PCL may elucidate the mechanism for development of a firm endpoint, measured using the posterior drawer test (13). Physical examination findings, the degree of instability, and MRI findings have not been correlated with respect to PCL healing. Thus, the purpose of this study was to explore the healing process of the injured PCL by evaluating instability measurements and MRI findings.

Methodology:

This study was a retrospective analytical study deal with both male and female specifically with athletics, old patient, and people who undergo accidents to determine the most common injuries in knee ligaments using MRI scan, and done in GAMMA Hospital, Almana General Hospital, Mouwasat Hospital, and King Fahad Hospital. It commenced on October 2017 and end on December 2017.The sample size of this study was 70 patients. The data was collected from:

GAMMA Hospital, Almana General Hospital, Mouwasat Hospital, and King Fahad Hospital.

Technique and Protocol:
The patient lies in a supine position, feet first on scan table with knee is placed into knee phase array coil/extremity knee coil, center point on the inferior region of patella. Suggested protocol first, Axial/multiplanar coherent gradient echo T2 with medium slice gap. Second, sagittal coherent GRE T2* with thin slice gap. finally, coronal FSE PD/T2/Preaturation/ stir.

Results and Discussion:
The study was attempted to estimate the prevalence of post traumatic knee injuries in Eastern Region of Saudi Arabia. 70 patients aged over 20 years old, and people who have Knee pain, trauma, sport related injuries, and old age people were taken as a sample size from GAMMA Hospital, Almana General Hospital, Mouwasat Hospital, and King Fahad Hospital in Hufof, who underwent for knee joint MRI scan.

-Distribution of Age and genders among post traumatic knee injuries patients distributed were aged between (20-30) 22 male and 2 female (34%) and aged between (31-40) 21 male and 6 female (39%), aged between (41-50) 6 male and 3 female (13%), aged (51-60)5 male and 3 female (11%), (aged over 60), no male and just 2 female (3%).

The final result showing that male patients more than female patients and the most effected category was aged between (31-40) with percentage of (39%)

Table 4.1: Distribution of age an among post traumatic knee injuries male and female patient

Age	Male	Female	Total cases	%
20-30	22	2	24	34%
31-40	21	6	27	39%
41-50	6	3	9	13%
51-60	5	3	8	11%
>60	0	2	2	3%
total	54	16	70	100%

-The relationship between Age and knee ligament injuries among post traumatic knee injuries patients show that the category was aged between(31-40) have a more patients than another category and the ACL ligament is a most effected injures in all aged category and PL ligament is less effected.

Table 4.2:Distribution the most common knee ligament injuries

Age	ACL	PCL	PL	MCL	LCL	Normal
20-30	18	1	1	4	0	4
31-40	23	2	1	3	2	2
41-50	9	1	0	0	1	0
51-60	6	0	0	1	0	1
>60	2	0	0	0	0	0
Total	58	4	2	8	3	7

-The distribution of the most common knee ligament injuries among post traumatic knee injuries patients show that the 62 patients with ACL injuries with the highest percentage of (76%),8 patients with MCL (10%), 7patients with PCL (8%), 3 patients with LCL (4%) and 2 patients with PL (2%)

Table 4.3 The relationship between knee injuries and age

Age	ACL	PCL	PL	MCL	LCL	Normal
20-30	18	1	1	4	0	4
31-40	23	2	1	3	2	2
41-50	9	1	0	0	1	0
51-60	6	0	0	1	0	1
>60	2	0	0	0	0	0
Total	58	4	2	8	3	7

-The correlation of Age among the number of athletics patients came to MRI department show that patients aged between (20-30) total are 24 patients 21 of them are athletics, 27 patients agedbetween (31-40)18 are athletics, 9 patients aged between (41-50) 5 are athletics, 8 patients aged between (51-60) 2 are athletics, >60 years old is zero

The distribution of Tear of ligament types in athleticsPatients show that the complete torn in athletics patients with highest percentage of (70%), and partial torn of (30%)

Table 4.5:Distribution of disc level according to age

	Disc Level			
Age	Torn	complete cut	partial cut	Normal
20-30	9	2	11	2
31-40	3	15	6	3
41-50	1	5	3	0
51-60	0	4	2	2
>60	0	2	0	0
total	13	28	22	7

-The distribution of knee ligament injuries among athletics patients

show that athletics patients in all aged category are most effected in ACL knee ligamentwith highest percentage of (77%), The best MRI protocol that used for post traumatic knee injuries patients is PD.

Table 4.6: Correlation between Age VS. Patient athletics &Most common knee ligament injuries

Age	Patient athletics	ACL	PCL	PL	MCL	LCL
20-30	21	18	1	1	3	0
31-40	18	16	2	1	1	2
41-50	5	5	1	0	0	1
51-60	2	2	0	0	0	0
>60	0	0	0	0	0	0

-The distribution the of pathology of post traumatic knee injuries shows that the most pathology appears with knee injury is hematoma (54%), joint effusion (19%), fraction (21%), the least pathology appears is cyst (6%)

Conclusion:
The study attempted to estimate the prevalence of post traumatic knee injuries in Eastern Region of Saudi Arabia. The result of this study showed that male patients more than female patients and the most effected category was aged between (31-40) with percentage of (39%).The anterior cruciate ligament (ACL) is the most commonly injured of the major knee ligaments with the highest percentage of (76%). These injures plague both athletics and non-athletics the most are athletics with 46 patients out of the sample size (70 patients). The best MRI protocol used in Saudi Arabia hospitals is proton density (PD) 84%.The most common pathology associated with knee injuries was hematoma (54%).
Finally, MRI scan is accurate modality for post traumatic of knee injuries. The study hypothesis was the most athletics with sport related injuries will suffer ACL in Eastern Region of Saudi Arabia population on a specific sampling.

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