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Evaluation the Causes of Knee Joint Pain using MRI (Magnetic Resonance Imaging)

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Abstract | **Original Research Article**

This was retrospective study done in Saudi Arabia in the period from 2017-2019, the main aim to evaluate the causes of knee joint pain using MRI, the sampling includes 151 patients suffering from knee joint pain with positive finding any patients with normal MRI and with surgery or implant excluded, the data collected from PACS system. The study revealed that knee joint pain affecting male more than female 79.5% , more common in age group ranged 28-37 years, the left side affecting more than right one 58.9%, the most common affecting structures is bursa 60.9% followed by meniscus 57% then bone ,ligament and cartilage ,concerning bursa effusion was more common 48.3% due to synovial reaction which occurs as results of inflammation or other pathology, degenerative changes is most pathology affecting meniscus 23.8% followed by posterior horn of medial meniscus tear 18.5%, ACL tear is more common pathology affecting ligament 35.8% and concerning bony structure the presenting pathology in most cases is osteoarthritis changes 32.4%.

Keywords: MRI, Knee joint, Pain, T1, T2, PD.

INTRODUCTION

Knee pain has been determined 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]. The potential for MRI to be more senstive to earlier disease, detecting change, and the ability of this technology to visualize joint structural changes beyond gross changes in bone and in the joint space, has resulted in great interest in use of MRI for diagnostic status assessment, disease severity and monitoring progression. MRI visualizes most components of the joints, including articular cartilage, menisci, intra-articular ligaments, synovium, bone marrow, subchondral cysts, and other periarticular and intra-articular lesions that are not detectable by radiography [2]. MRI visualizes most components of the joint, including articular cartilage, menisci, intra-articular ligaments, bony structure abnormalities, which are not detectable by radiography [3].

OBJECTIVE

To evaluate the causes of knee joint pain using MRI (Magnetic Resonance Imaging).

MATERIALS AND METHODS

A total of 151 patients with knee joint pain with knee joint MRI were included in the study all of them with abnormality detected in MRI report, any patients with normal MRI, knee joint deformity and previous surgery with implantation of metal hardware were excluded, verbal consent was taken from department of MRI in areas of the study. Patients demographic data and final finding in MRI report analyzed by statistical package for social sciences version 16 , frequency and percentage was taken then cross tabulation to correlate between different variables done P value significant if less than 0.05

RESULTS AND DISCUSSION

The study found that the knee joint pain common in age group 28-37 and 38-47 years, 35.8% and 24.5% respectively, the mean age was 37.48 years.

To (Neha B ,Navkiran K, Kuldeep SS 2018) whom stated that mean age was 35.6 year[4].

Table-1: Frequency distribution of age

Age\years	Frequency	Percent	Valid Percent	Cumulative Percent
18-27	29	19.2	19.2	19.2
28-37	54	35.8	35.8	55.0
38-47	37	24.5	24.5	79.5
48-57	22	14.6	14.6	94.0
58-67	9	6.0	6.0	100.0
Total	151	100.0	100.0	
Minimum = 18, maximum = 67 ,means =37.48±11.59 years				

To (Neha B ,Navkiran K, Kuldeep SS 2018) whom stated that males were more affected 65%.[4], To Sohil K et al 2015 whom stated that left knee affected by pathology more than right 53.3. (3). Stated that the left side injury was more than right (Table 2 & 3).

Table-2: Frequency distribution of gender

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Female	31	20.5	20.5	20.5
Male	120	79.5	79.5	100.0
Total	151	100.0	100.0	

Table-3: Frequency distribution of side

Side	Frequency	Percent	Valid Percent	Cumulative Percent
Left	89	58.9	58.9	58.9
Right	62	41.1	41.1	100.0
Total	151	100.0	100.0	

The study found that the most structure evolving by pathologic condition affecting patients with knee joint pain is bursa and menisci 60.9% and 57% respectively then bony structure 49% ligament 47.7% and the least structure of knee affecting by pathologies is cartilage 15.2% Figure-1.

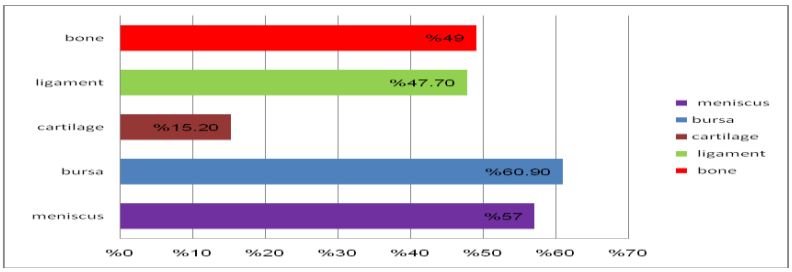

Fig-1: Structure evolving by knee joint pathology

The most common pathology in meniscus is meniscus degenerative changes and posterior horn of medial meniscus tear 23.8% and 18.5% respectively, the most presenting pathology of bone is osteoarthritis changes 15.9% followed by bone marrow edema 9.3%. The most pathology involving bursa is effusion and backer cyst 48.3% versus 7.3%, the anterior curciate ligament tears is most pathology involving ligament 35.8% and in cartilage chondromalacia patellae is the most pathological condition 14.6% (Figure-2, Table 4-7).

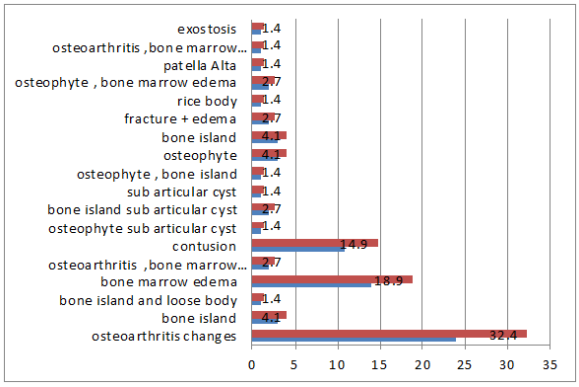

Fig-2: Shows bony abnormalities detected in knee joint MRI

Table-4: Abnormalities detected in bursa

Bursa abnormalities	Frequency	Percent	Valid Percent	Cumulative Percent
backer cyst	11	7.3	12.0	12.0
joint effusion	73	48.3	79.3	91.3
backer cyst + effusion	4	2.6	4.3	95.7
bursitis	1	.7	1.1	96.7
effusion+ synovial cyst	2	1.3	2.2	98.9
cyst	1	.7	1.1	100.0
Total	92	60.9	100.0	

Table-5: Abnormalities detected in ligaments

Ligaments abnormalities	Frequency	Percent	Valid Percent	Cumulative Percent
ACL tear	54	35.8	75.0	75.0
PCL Tear	1	.7	1.4	76.4
MCL strains	2	1.3	2.8	79.2
ACL, LCL tears	3	2.0	4.2	83.3
ACL degenerative changes	3	2.0	4.2	87.5
PCL strain	1	.7	1.4	88.9
ACL sprain	1	.7	1.4	90.3
ACL , MCL tear	1	.7	1.4	91.7
ACL strain	2	1.3	2.8	94.4
MCL tears	1	.7	1.4	95.8
ACL ,PCL tears	1	.7	1.4	97.2
ACL trauma	1	.7	1.4	98.6
LCL tear	1	.7	1.4	100.0
Total	72	47.7	100.0	

Table-6: Abnormalities detected in cartilage

Finding in cartilage	Frequency	Percent	Valid Percent	Cumulative Percent
chondromalacia patellae	22	14.6	95.7	95.7
chondromalacia& chondral defect in articular cartilage	1	.7	4.3	100.0
Total	23	15.2	100.0	

Table-7: Abnormalities detected in meniscus

Abnormalities and location in meniscus	Frequency	Percent	Valid Percent	Cumulative Percent
posterior horn of medial meniscus tears	28	18.5	32.6	32.6
posterior horn of lateral meniscus tear	3	2.0	3.5	36.0
posterior horn of medial meniscus tear + parameniscal cyst	2	1.3	2.3	38.4
posterior horn of lateral meniscal tears+ parameniscal cyst	1	.7	1.2	39.5
menisci degenerative changes	36	23.8	41.9	81.4
poterior horn of both meniscus tears	6	4.0	7.0	88.4
meniscal fragment	1	.7	1.2	89.5
posterior and anterior lateral meniscus tear	2	1.3	2.3	91.9
flip posterior horn of lateral meniscus	1	.7	1.2	93.0
anterior horn of med meniscus tear + parameniscal cyst	1	.7	1.2	94.2
posterior and anterior horn of medial meniscus tear	1	.7	1.2	95.3
anterior medial pocket handle + degenerative changes	1	.7	1.2	96.5
posterior of medial degenerative changes + anterior lateral tear	2	1.3	2.3	98.8
anterior horn of lateral meniscus tear	1	.7	1.2	100.0
Total	86	57.0	100.0	

Significant association found between pathologic condition in meniscus and MRI signal intensity as tears, degeneration, cyst, effusion appear as hyper-intense in T1, T2 and PD except menisci fragment appears as hypo-intense $p < 0.05$ (Table-8).

Table-8: Cross tabulation intensity in MRI of knee and meniscal abnormalities

Menisci abnormalities	T1, T2 ,PD		Total
	Hyper	hypo	
posterior horn of medial meniscus tears	25	0	25
posterior horn of lateral meniscus tear	3	0	3
posterior horn of medial meniscus tear + parameniscal cyst	2	0	2
posterior horn of lateral meniscal tears+ parameniscal cyst	1	0	1
menisci degenerative changes	35	0	35
poterior horn of both meniscus tears	5	0	5
meniscal fragment	0	1	1
posterior and anterior lateral meniscus tear	2	0	2
anteror horn of med meniscus tear + parameniscal cyst	1	0	1
posterior and anterior horn of medial meniscus tear	1	0	1
anterior medial pocket handle + degenerative changes	1	0	1
posterior of medial degenerative changes + anterior lateral tear	2	0	2
anterior horn of lateral meniscus tear	1	0	1
Total	79	1	80
P =0.000			

The study revealed that there was significant association between bony abnormalities and bursal abnormalities as most of changes involve bone affect bursa and cause bursal effusion p <0.001 (Table-9).

Table-9: Cross tabulation bony abnormalities detected and bursal abnormalities detected in MRI

Bony abnormalities	Bursa abnormalities				Total
	backer cyst	joint effusion	backer cyst + effusion	cyst	
osteoarthritis changes	4	12	2	0	18
bone island	0	2	0	0	2
bone marrow edema	2	5	1	0	8
osteoarthritis ,bone marrow reconversion	1	1	0	0	2
contusion	0	9	0	0	9
bone island sub articular cyst	0	2	0	0	2
sub articular cyst	0	1	0	0	1
osteophyte , bone island	0	1	0	0	1
osteophyte	0	2	0	0	2
bone island	0	1	0	0	1
fracture + edema	0	2	0	0	2
osteophyte , bone marrow edema	0	2	0	0	2
patella Alta	0	0	0	1	1
exostosis	0	1	0	0	1
Total	7	41	3	1	52
P =0.007					

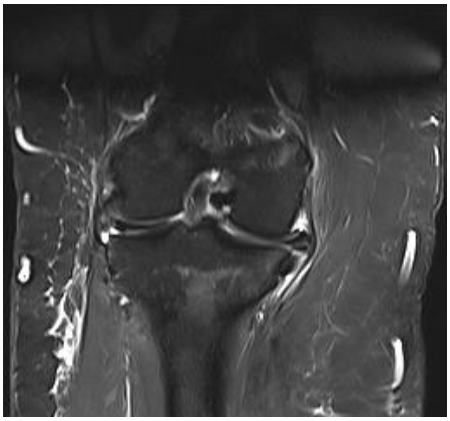

Image-1: Coronal T1 tirm. Right knee for male patient (38Y) (TR: 3200, TE:78.0), showing osteoarthritis changes

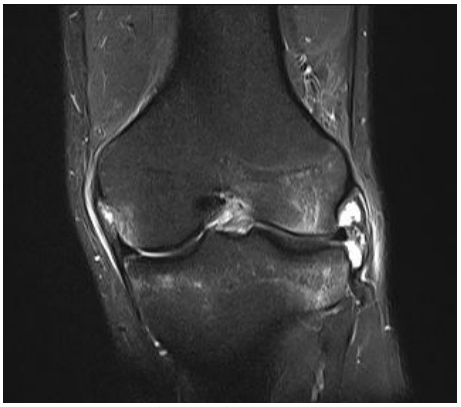

Image-2: Coronal T1 Left knee for male patient (25Y) (TR: 3200, TE:78.0), showing lateral collateral ligament tear

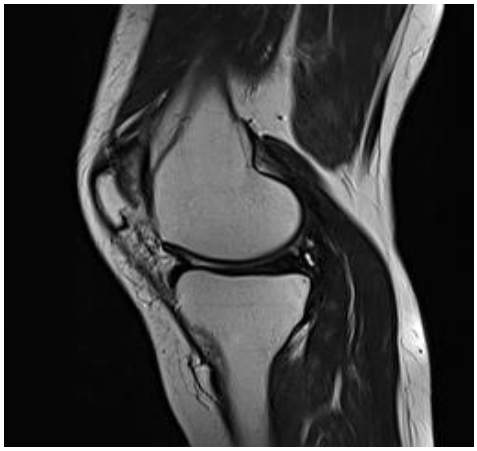

Image-3: Sagittal T2 Left knee for Female patient (67Y) (TR: 5780, TE: 76.0) showing posterior horn of medial meniscus tear and para-meniscal cyst

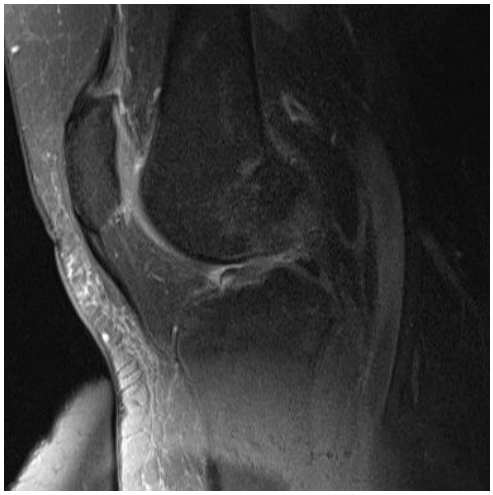

Image-4: Sagittal T1 tirm. Right knee for male patient (32Y)(TR:3770 , TE:23.0). Showing lateral femoral condyle bone marrow contusions

CONCLUSION

The study concluded that MRI is good modalities for evaluation the knee joint in patients with knee joint pain, it can determine the structural abnormalities in all compartments of knee joints, the most common pathologic condition affecting knee joint was bursal abnormalities which occurs accompany to boney structural abnormalities in most cases such as osteoarthritic changes, the most common menisci pathology in patients with pain is degenerative changes. Posterior horn of medial meniscus and ACL involve mainly by tears.

RECOMMENDATION

For future further studies should be done adding normal MRI finding in patients presenting with knee joint pain, to determine the prevalence of pathology then to determine most pathological changes

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