ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 8, Issue, 12, pp. 22721-22725, December, 2017

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

ROLE OF MR IMAGING IN TRAUMATIC KNEE JOINT-A PROSPECTIVE STUDY

Siddesh M B., Jaison Thomas*., Subair Nangarath Mundachi and Jagadeesh K

Department of Radiodiagnosis, JJM Medical College, Davangere, Karnataka

DOI: http://dx.doi.org/10.24327/ijrsr.2017.0812.1324

ARTICLE INFO

Article History:

Received 15th September, 2017
Received in revised form 25th October, 2017
Accepted 28th November, 2017
Published online 28th December, 2017

Key Words:

MRI, Knee joint, Menisci, Ligament injuries.

ABSTRACT

Magnetic resonance imaging (MRI) is a well-accepted imaging modality in the diagnostic workup of patients with knee complaints and is capable of depicting soft tissue abnormalities, such as meniscal lesions, cruciate ligament and collateral ligament lesions, tendinous lesions and loose bodies. Objective of the study was to study the spectrum of MRI findings in traumatic knee i.e. menisci, ligament injuries and associated findings like bone marrow edema, occult fractures, dislocations, hemarthrosis, soft tissue lesions in traumatic knee. It was a prospective study consisting of 50 patients with traumatic knee joint referred from orthopaedic OPD of Bapuji Hospital and Chigateri District Hospital, Davangere from July 2016 to December 2017. Results obtained were; most common age group to be involved is between 15-30 years, most common injury was ACL tear were seen in 28 patients (56%),complete tears were common, Posterior cruciate ligament tears were less common and were seen only in 7 patients (14%), among the meniscal injuries medial meniscal tears were more common and were seen in 20 patients (46.5%) than lateral meniscus, grade III tears were common in both, Medial collateral ligament tears out numbered lateral collateral ligament tears and were seen in 19 patients (38%),grade I tears were more common in medial collateral ligament.MR imaging is the best modality for detecting knee injuries and hence this study is undertaken to determine the Role of MRI in traumatic knee joint.

INTRODUCTION

Due to its anatomical configuration and because of its being the biggest joint of the human body, the knee is frequently subjected to direct trauma that can result in injuries of variable gravity (Vaz CES *et al*, 2005). Magnetic resonance imaging (MRI) is a well-accepted imaging modality in the diagnostic workup of patients with knee complaints and has largely replaced diagnostic arthroscopy for this purpose. Whereas conventional radiographs may only reveal large osseous lesions, MRI is capable of depicting soft tissue abnormalities, such as meniscal lesions, cruciate ligament and collateral ligament lesions, tendinous lesions and loose bodies, which may lead to targeted therapeutic arthroscopy. In addition, subtle osseous abnormalities such as radiographically occult fractures, bone marrow edema and osteochondral lesions can be diagnosed with MRI (Edwin H.G *et al* 2007). Currently MR imaging is the best modality for detecting knee injuries and hence this study is undertaken to determine the Role of MRI in traumatic knee joint.

Aims and Objectives

To study the spectrum of MRI findings in traumatic knee i.e. menisci, ligament injuries and associated findings like bone marrow edema, occult fractures, dislocations, hemarthrosis, softtissue lesions in traumatic knee.

MATERIALS AND METHODS

Study design

A prospective study consisting of 50 patients with traumatic knee joint is undertaken to study the spectrum of MRI findings in all consecutive cases of knee trauma referred from orthopaedic OPD of Bapuji Hospital and Chigateri District Hospital, Davangere from July 2016 to December 2017.

Inclusion criteria

1. All the patients referred with knee injuries following trauma.
2. Cases of all age groups.

Exclusion criteria

1. Patient having history of claustrophobia.

Corresponding author:* **Jaison Thomas
Department of Radiodiagnosis, JJM Medical College, Davangere, Karnataka

2. Patient having history of cardiac pacemakers, metallic foreign body and cochlear implants insitu.

Imaging protocol

Technique-Imaging will be done with 1.5 Tesla Philips Achieva Machine using 8 channel SENSE knee coil.
Positioning - Imaging is done with full extension in neutral position. A small field of view (FOV) typically in the range 14-16 cm.

The following sequences will be selected as required.

1. T2W axial-TE (100 MS), TR (5400 MS), FOV (160), Slice thickness (1-3 mm).
2. PD fat sat sagittal-TE (30 MS), TR (2500 MS), FOV (155), Slice thickness (3 mm).
3. STIR coronal-TE (60 MS), TR (3547 MS), FOV (150), Slice thickness (3 mm).
4. mFFE sagittal-TE (9.2 MS), TR (934 MS), FOV (165), Slice thickness (1-3 mm).
5. T1W coronal-TE (7 MS), TR (500-700 MS), FOV (150) Slice thickness (1mm).

Following statistical methods were applied in the present study

1. Descriptive statistics
2. Cross tables (contingency table analysis).

RESULTS

Table 1 Sex distribution

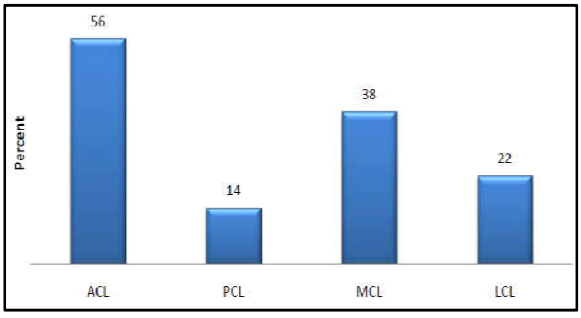
Sex	Number of cases	Percent
Male	42	84.0
Female	8	16.0
Total	50	100.0

Table 2 Age distribution

Age in years	Number of cases	Percent
15 – 30	24	48.0
31 – 45	16	32.0
Above 46	10	20.0
Total	50	100.0
Mean ± S.D	33.52 ± 11.57	

Table 3 Distribution of Ligamentous tears around knee joint

Tears	Present		Absent		Total	
	Number of cases	%	Number of cases	%	Number of cases	%
ACL	28	56	22	44	50.0	100
PCL	7	14	43	86	50.0	100
MCL	19	38	31	62	50.0	100
LCL	11	22	39	78	50.0	100



Graph 1 Distribution of Ligamentous tears

Table 4 Frequency of ACL tears

ACL tear	Number of cases	Percent
Complete	15	53.6
Partial	13	46.4
Total	28	100.0

Table 5 Distribution of meniscal tears

	Present	Percentage	Absent
Medial meniscus tear	20	46.5	30
Lateral meniscus tear	16	37.2	34
Both	7	16.3	43

Table 6 Other associated findings

Other associated findings	Number of cases	Percent
NORMAL	25	50.0
# Fibula (# FIB)	1	2.0
# Lateral tibial condyle (# LTC)	1	2.0
# Tibial plateau (#TP)	1	2.0
Ganglion cyst of - PCL (GC-PCL)	2	4.0
Lateral meniscus degeneration (LMD)	2	4.0
Lateral meniscus degeneration/popliteal cyst (LMD/PC)	1	2.0
Lipohaemarthrosis (LP/AAI)	1	2.0
Meniscal cyst (MC)	2	4.0
Medial meniscus degeneration (MMD)	4	8.0
Medical meniscus degeneration/popliteal cyst (MMD/PC)	1	2.0
Osteoarthritis (OA)	3	6.0
Osteoarthritis / medial meniscus degeneration (OA/MMD)	1	2.0
Osteoarthritis / popliteal lymphnodes (OA/PLN)	1	2.0
Popliteal cyst (PC)	1	2.0
Paramenisical cyst (PMC)	1	2.0
Patellar tendon injury (PTI)	1	2.0
Soft tissue edema (STE)	1	2.0
Total	50	100.0

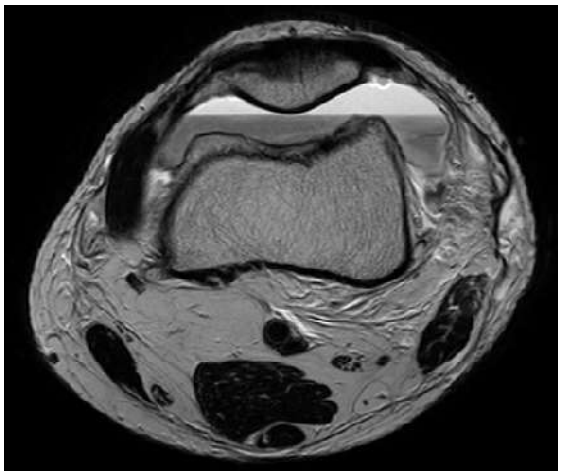
Case

Case 1 Complete ACL tear. PD Sagittal image showing complete ACL tear

Case 2 Partial PCL tear PD Sagittal image showing complete ACL tear PD FAT SAT sagittal image showing partial PCL tear and associated joint effusion

Case 3 Lateral meniscus tear D Sagittal image showing bucket handle tear ofthe lateral meniscus with displaced fragment seen in the posterior intercondylar region

Case 4 Medial meniscus tear.PD Sagittal image showing horizontal tear of the body and posterior horn of medial meniscus.



Case 5 Lipohaemarthrosis. Axial T2W Image showing lipohaemarthrosis

PD Sagittal image showing horizontal tear Axial T2W Image showing lipohaemarthrosis of the body and posterior horn of medial meniscus

DISCUSSION

Imaging of knee presents a special challenge because of its complex structure. A variety of imaging modalities are currently used to evaluate knee abnormalities. These modalities include standard radiography, scintigraphy, computed tomography, magnetic resonance imaging and arthrography.

MR imaging has revolutionized knee imaging. These studies validate the role of MR imaging in the clinical arena especially for the evaluation of ligamentous injuries. There are many advantages of MR imaging over other modalities.

This study included 50 patients who were clinically suspected as having some form of internal derangement of the knee following trauma. The subjects of this study belonged to the age group of 15 to 55 years with mean age of 33.52 years. Maximum were young patients in the age group of 15-30 years (48%). 84% of patients of this study were male.

Anterior cruciate ligament

In our study 28 patients (56%) had ACL tears. Therefore ACL tear was identified as commonest injury among ligamentous tears around the knee joint (Singh JP *et al* 2004).However in our study, out of 28 patients with ACL tears, 13 patients (46.4%) were having partial tears and 15 patients (53.6%) were having complete tears.

The indirect signs of ACL tears were analyzed in the form of objective criteria such as sagittal ACL tibial angle, PCL angle and anterior tibial translation were used. The mean sagittal ACL- tibial angle was 47° in case of partial ACL tears, while the mean angle was only 28.13° in complete tears. The mean PCL angle was 124.38° in partial ACL and more acute angle with mean angle of 101.53° in complete ACL tears. The mean anterior translation measured 2.31 mm in partial ACL tears and 9.93 mm in complete ACL tears.

Posterior cruciate ligament

In our study injury to PCL was noted in 7 patients (14%). All these patients had increased intra-substance signal intensity of ligament. In all patients continuity of the ligament was

maintained but showed increased thickness in anteroposteiror diameter. The mean PCL thickness was 9.1 mm in these cases (William Rodriguez *et al*, 2008). Bone contusion was found in 5 patients (71.42%) of PCL tears.

Meniscal tears

Two criteria for diagnosing a meniscal tear are commonly used (Edwin HG Oei *et al*, 2003).

1. An intra-substance area of intermediate or high signal intensity that unequivocally extends to the articular surface
2. Abnormal meniscal pathology.

Tears are more common in the medial meniscus, possibly because the medial meniscus is less mobile and it bears more force during weight bearing than the lateral meniscus (Michael G. Fox *et al*, 2007).

Medial meniscus tears

There is preponderance of medial meniscus tears over lateral meniscus tears in our study. In our study out of total 43 patients with meniscal tears 20 (46.5%) patients were having isolated medial meniscus tears, 16 (37.2%) patients were having isolated lateral meniscus tears and in 7 (16.3%) patients both meniscus were involved.

Out of 20 patients (46.5%) with isolated medial meniscus tears, the posterior horn was commonest site of involvement occurring in 11 patients (55%) and the predominant type of tear was horizontal and oblique that occurred in 7 patients (35%) each, followed by complex tears (20%), radial tear (5%) and bucket handle tear (5%). Grade III tears were the commonest seen in 12 patients (60%) (Ismael Silva *et al*,1988) followed by grade II in 8 patients (40%) which can be attributable to severity of trauma involved in young adults.

Lateral meniscus tears

In our study out of 16 patients (37.2%) with isolated lateral meniscus tears, the anterior horn was commonest site of involvement occurring in 5 patients (31.3%) followed by posterior horn (18.8%) and the predominant type of tear was horizontal and was seen in 5 patients (31.3%) followed by radial tear (25%), bucket handle tear (18.8%), oblique tear (12.5%) and complex tear (12.5%). Grade III tears were the commonest and were seen in 8 patients (50%) followed by grade II in 6 patients (37.5%).

Collateral ligaments

Medial collateral ligament tears

In our study, out of 50 patients, 19 patients (38%) had MCL tears were found to be more common than LCL tear. Out of 19 patients, 11 patients (57.9%) had grade I tears, 4 patients (21.1%) had grade II tears and 4 patients (21.1%) had grade III tears. Ancillary findings of MCL tear include joint effusion, bone contusion of femoral and tibial condyles, osteochondral fracture of the tibial condyles and meniscal tears. In our study out of 19 patients with MCL tear, 7 patients (36.84%) had medial meniscal tear and only 3 patients (15.78%) had lateral meniscal tear. It is also noteworthy to find that 10 patients (52.63%) out of these 19 MCL tears also had ACL tears. O'Donoghue's triad (combination of ACL, MCL and medial meniscus tear) was seen in 2 patients.

Lateral collateral ligament tears

In our study, out of 50 patients studied, 11 patients (22%) had LCL tears were found to be less common than MCL tears (38%). Out of these 11 patients, 6 patients (54.5%) had grade I tears, 3 patients (27.3%) had grade II tears and 2 patients (18.2%) had grade III tears. Associated findings include joint effusion, bone contusion and meniscal tears. 4 patients (36.36%) out of total 11 LCL tears had associated lateral meniscus tear, while 2 patients (18.18%) had associated medial meniscus tear. There is a strong association between LCL tear and lateral meniscal tear.

CONCLUSION

The present study attempts to determine the role of magnetic resonance imaging in the evaluation of internal derangements of the traumatic knee joint. Knee joint being the largest and most complex weight bearing joint of the body is subject to damage because of its inherent structural complexity and the various types forces it is subjected to. In the setting of traumatic knee joint, MR imaging is the best noninvasive modality for the diagnosis of meniscal and ligament tears.

In the present study, 50 cases with history of trauma to knee joint were studied.

The most common age group to be involved between 15-30 years. The following pattern of knee injuries were seen.

- Most common injury was ACL tear were seen in 28 patients (56%).Complete tears were common seen in 15 patients (53.6%). Posterior cruciate ligament tears were less common and were seen only in 7 patients (14%).
- Among the meniscal injuries medial meniscal tears were more common and were seen in 20 patients (46.5%) than lateral meniscus. Grade III tears were common in both.
- Medial collateral ligament tears out numbered lateral collateral ligament tears and were seen in 19 patients (38%). Grade I tears were more common in medial collateral ligament.
- Other associated findings like bone contusions and joint effusion osteo-arthritis, mucoid degeneration of meniscus, patellar tendon injury, lipohaemarthosis. Meniscal cyst, popliteal cyst and ganglion cyst of ligament etc were accurately detected and characterized with the help of magnetic resonance imaging.

References

Vaz CES, Camargo OP de, Santana PJ de, Valezi AC. Accuracy of Magnetic Resonance in Identifying Traumatic Intraarticular knee lesions. *Clinics*. 2005; 60(6); 445-50

Edwin H.G. Oei, AbidaZ. Ginai, M.G. Myriam Hunink. MRI for Traumaticknee injury: A Review 2007.

Rodriguez W, Vinson EN, Helms CA, Toth AP. MRI Appearance of Posterior Cruciate Ligament Tears. AJR 2008; 191:W155-W159.

Singh JP, Garg L, Shrimali R, Setia V, Gupta V-MR Imaging of knee with arthroscopic correlation in twisting injuries. *Indian J Radiol Imaging* 2004; 14:33-40

Edwin HG Oei, Jeroen J Nikken, Antonia CM Verstijnen, Abida Z Ginai, MG Myriam Hunink-MR Imaging of the menisci and cruciate ligaments. A systemic Review. *Radiology* 2003; 837-848.

Michael G. Fox, MR Imaging of the meniscus: Review, current Trendsand clinical implications; radiolclin N AM 2007; 45:1033-1053.

Silva I, Silver DM: Tears of the meniscus as revealed by magnetic resonance imaging. *J Bone joint Surg* 70 A: 199-202, 1988.

How to cite this article:

Siddesh M B *et al*., Role of Mr Imaging in Traumatic Knee Joint-A Prospective Study. *Int J Recent Sci Res.* 8(12), pp. 22721-22725. DOI: http://dx.doi.org/10.24327/ijrsr.2017.0812.1324

****