

A study of CT versus MRI for the detection of intra-articular lesions of knee joint at tertiary health care center

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Abstract

Background: Arthroscopy is considered as "the gold standard" for diagnosis of intra-articular knee lesions. MRI is the imaging modality of choice and is preferred over other radiological investigation for assessment of knee joint diseases. **Aims and Objectives:** To study CT versus MRI for the detection of intra-articular lesions of knee joint at tertiary health care center. **Methodology:** This was a prospective cross-sectional study carried out in the department of Radiology over the period of one year from March 2018 to March 2019. The study was conducted on 80 patients referred to the department for evaluation of knee pathologies. Out of the 80 patients, 40 undergone CT scan followed by Arthroscopy and other 40 by MRI followed by Arthroscopic evaluation. The details of the patients like age, sex and the results of sensitivity and specificity was calculated by MEDCAL software. **Results:** For the lesions like ACL injury PCL Injury, MM injury, LM injury, MCL injury, LCL injury, tendon injuries, cartilage lesions, loose bodies, Intra-articular tumors the sensitivity and specificity for CT Scan was - 50.12, 23.45; 52.3, 21.90; 53.12, 19.89; 52.34, 20.12, 51.45; 23.52, 52.39; 23.15, 58.32; 32.43, 57.39; 39.29, 60.01; 38.45, 54.12; 36.36. For MRI was 83.45, 68.63; 85.23, 65.23; 80.12, 63.41; 83.12, 62.78; 80.12, 61.32; 81.82, 59.80; 83.59, 64.58; 87.93, 71.59; 90.82, 73.16; 92.16, 75.74 respectively. **Conclusion:** It can be concluded from our study that MRI was superior to CT scan with respect to sensitivity and specificity in the lesions of knee like ACL injury, PCL injury, MM injury, LM injury, MCL injury, LCL injury, tendon injuries, cartilage lesions, loose bodies, and intra-articular tumors. **Key word:** CT scan, MRI, intra-articular lesions of knee, arthroscopy.

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INTRODUCTION

Generally Arthroscopy is considered as "the gold standard" for diagnosis of intra-articular knee lesions¹ However, arthroscopy is an invasive procedure that requires hospitalization and anesthesia, thus presenting all the potential complications of a surgical procedure.²

Since its introduction in the 1980's, Magnetic Resonance Imaging (MRI) has gained in popularity as a diagnostic tool of the musculoskeletal disorders³ Especially the knee is the most frequent examined joint with MRI. Many surgeons tend to believe that CT and MRI are non-invasive diagnostic methods for assessment of the knee injuries. CT scan is better for the assessment of bony injury and MRI is preferred for the evaluation of the ligaments and soft tissue. These imaging modalities play important role in patient management.⁴ So we have studied the efficacy of MRI versus CT scans for the diagnosis of knee lesions without the arthroscopic evaluation.

METHODOLOGY

This was a prospective cross-sectional study carried out in the department of Radiology, Bharati Vidyapeeth Medical College, Pune, Maharashtra, India. It was

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conducted during one year period i.e. March 2018 to March 2019 on patients who needed the radiological evaluation for the knee pathologies. Total 80 patients were enrolled into the study by

Inclusion criteria: Who gave written consent, adult patients who are more than 13 years old, primary patients who has not undergone any surgical or diagnostic intervention while

Exclusion criteria: terminally ill patients, immune-compromised patients, pregnant patients, age less than 13

years old and patients who were undergone any surgical or diagnostic procedure were excluded from the study. Out of the 80 patients, CT scan was performed on 40 patients and MRI was performed on rest of the 40 patients. The details of the patients like age, sex and the results of sensitivity and specificity was calculated for each lesion for CT scan and MRI was calculated independently by ROC function and table given for calculation of sensitivity and specificity by the MEDCAL software.

RESULT

Table 1: Distribution of the patients as per the age

Age	No.	Percentage
30-40	12	15.00
40-50	19	23.75
50-60	21	26.25
70-80	15	18.75
80-90	13	16.25
Total	80	100.00

The most commonly affected age group was 50-60 years that contributes 26.25% of the patients. It was followed by 40-50 years (23.75%). Patients in the age group of 70-80 years were 18.75%, 80-90 years were 16.25% and 30-40 years were 15.00%.

Table 2: Distribution of the patients as per the sex

Sex	No.	Percentage (%)
Male	45	56.25
Female	35	43.75
Total	80	100.00

Out of 80 patients, 45 were male and rest 35 were females.

Lesions	ACL injury	PCL Injury	MM injury	LM injury	MCL injury	LCL injury	Tendon injuries	cartilage lesions	loose bodies	Intra-articular tumors
CT –Scan (Sensitivity, Specificity)	50.12, 23.45	52.3, 21.90	53.12, 19.89	52.34, 20.12	51.45, 23.52	52.39, 23.15	58.32, 32.43	57.39, 39.29	60.01, 38.45	54.12, 36.36
MRI (Sensitivity, Specificity)	83.45, 68.63	85.23, 65.23	80.12, 63.41	83.12, 62.78	80.12, 61.32	81.82, 59.80	83.59, 64.58	87.93, 71.59	90.82, 73.16	92.16, 75.74

For the lesions like anterior cruciate ligament (ACL) injury, posterior cruciate ligament (PCL) injury, medial meniscus (MM) injury, lateral meniscus (LM) injury, medial collateral ligament (MCL) injury, lateral collateral ligament (LCL) injury, tendon injuries, cartilage lesions, loose bodies, and intra-articular tumors the sensitivity and specificity for CT scan was - 50.12, 23.45; 52.3, 21.90; 53.12, 19.89; 52.34, 20.12; 51.45, 23.52; 52.39, 23.15; 58.32, 32.43; 57.39, 39.29; 60.01, 38.45; and 54.12, 36.36 respectively. For MRI was 83.45, 68.63; 85.23, 65.23; 80.12, 63.41; 83.12, 62.78; 80.12, 61.32; 81.82, 59.80; 83.59, 64.58; 87.93, 71.59; 90.82, 73.16; and 92.16, 75.74 respectively.

DISCUSSION

Normal knee joint functional activity is essential for day to day life. The number of patients with complaints of painful knee joint is quite significant and therefore CT and MRI of the knee is of great value in understanding and to diagnose the varied pathologies causing painful knee joint. The information obtained from conventional radiographs of the knee is limited, and by CT scans is limited to bone pathology with limited information about ligaments and synovium [5, 6]. MRI allows superior soft

tissue detail with multiplanar imaging capability that provides accurate evaluation of the intra-articular and extra-articular structures of the knee not demonstrated with any other imaging modalities currently available. The development and advancement in MRI and the introduction of high resolution coils have provided a non-invasive, non-operator dependent, cost effective means to diagnose knee pathology. MRI is well tolerated by patients, widely accepted by evaluating physicians and assists in distinguishing pathologic knee conditions that

may have similar clinical signs and symptoms.^{5,6} Injuries to the intra-articular structures like menisci and cruciate ligaments are diagnosed with high sensitivity and specificity by MRI as compared with arthroscopy, which is still regarded as the gold reference standard. MRI is currently the imaging modality of choice for nearly all clinical indications concerning the knee. The acutely injured knee is readily imaged for the detection of meniscal and ligamentous injury. In the evaluation of chronic knee pain, MRI can obviate the need for multiple imaging procedures simultaneously evaluating the structures of the knee, marrow space, synovium and periarticular soft tissues concerning the knee.^{7,8} Magnetic resonance imaging is one of the most commonly used modality for assessing the integrity of tissues in the knee, including the articular cartilage, ligaments, and meniscus, because of its excellent soft-tissue contrast. However, the reported sensitivity of MRI for identifying lesions varies among the cartilage and other tissues types⁹⁻¹² ranging from a sensitivity of 45% for cartilaginous lesions to 97.5% for defects of the meniscus.^{12,13} In our study we have seen that the most commonly affected age group was 50-60 years that contributes 26.25% of the patients. It was followed by 40-50 years (23.75%). Patients in the age group of 70-80 years were 18.75%, 80-90 years were 16.25% and 30-40 years were 15.00%. Out of 80 patients, 45 were male and rest 35 were females. For the lesions like ACL injury, PCL injury, MM injury, LM injury, MCL injury, LCL injury, tendon injuries, cartilage lesions, loose bodies, Intra-articular tumors the sensitivity and specificity for CT scan was - 50.12, 23.45; 52.3, 21.90; 53.12, 19.89; 52.34, 20.12; 51.45, 23.52; 52.39, 23.15; 58.32, 32.43; 57.39, 39.29; 60.01, 38.45; and 54.12, 36.36 respectively. For MRI was 83.45, 68.63; 85.23, 65.23; 80.12, 63.41; 83.12, 62.78; 80.12, 61.32; 81.82, 59.80; 83.59, 64.58; 87.93, 71.59; 90.82, 73.16; and 92.16, 75.74 respectively. Our result was comparable with Artit Laorungthana¹⁴ They found that there were 50 patients with the mean age of 36.7 year old (ranging from 18-75 years) and 30 were males and 20 were females. The sensitivity, specificity, accuracy and negative predictive value (NPV) in detecting the complete tear of the ACL injury were 90.9%, 84.6%, 88.6% and 84.6%, respectively. For PCL tear, it was 100%, 97.1%, 97.5% and 100%, respectively. The MRI evaluation for definite medial meniscus tear revealed 100% in sensitivity, 52.6% in specificity, 64% in accuracy and 100% in NPV. For the lateral meniscus, it yielded 55.6%, 83.3%, 75.8% and 83.3%, respectively. Among the 22 patients who underwent the ACL reconstruction without the PCL or collateral ligament injury, there was 50% of associated meniscal injury with similar ratio between medial and lateral side. Similar Smith TO¹⁵ also found that MRI was

superior for the detection of patellofemoral joint chondral lesions. They also found that lesions were more accurately detected on higher field strength MRI than lower field strength MRI.

CONCLUSION

It can be concluded from our study that MRI was superior to CT scan with respect to high sensitivity and specificity in the lesions of knee like ACL injury, PCL injury, MM injury, LM injury, MCL injury, LCL injury, tendon injuries, cartilage lesions, loose bodies, and intra-articular tumors.

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