

Evaluation Of Knee Meniscal Tear Frequency In Symptomatic Patients Setting MRI As Gold Standard

Sana Javed¹, Abid Ali², And Taiba Zulfiqar³

¹⁻³ University Institute of Radiological Sciences and Medical Imaging Technology, The University of Lahore, Gujrat Campus, Pakistan.

² Department of Allied Health Sciences, The University of Lahore, Gujrat Campus, Pakistan.

* Corresponding Author e-mail: Sanajaced3459@gmail.com, Abid.Ali@ahs.uol.edu.pk, Taibazulfiqar1@gmail.com

ABSTRACT

Background: Physical activities like sports gymnastics games, cycling, brisk walking, and running has always been a fun and important activities for people's health and especially when it became their occupation. Due to increased unhealthy eating disorders in people, they have developed an unhealthy weight which is causing them to be weakened and causing pain especially at joints. For the diagnosis conventional radiography was never helpful because it is not for soft tissues whereas MRI is been using in musculoskeletal as modality of choice.

Methods: total 600 patients were included in this prospective study with acute knee pain held at Lahore. 1.5 T MRI is used to rule out meniscal tears. Duration was of one year. Scans were reported by 2 expert radiologists and spss version 25.0 is used for frequency analysis. Asymptomatic patients were excluded from this study.

Results: Knee meniscal tear frequency was ruled out in symptomatic patients including acute knee pain. Frequency was determined from 600 patients by determining male and female in them. Positive meniscal tear findings were discriminated by negative meniscal tear findings. Men has high ratio of meniscal tears because of many factors as compared to women.

Conclusion: Jumping, supports, running and high intensity physical activities can be the cause of meniscal tear. Early evaluation of tear is necessary for the treatment of symptoms such as acute knee pain etc. Magnetic resonance imaging is non- invasive useful musculoskeletal imaging modality which can detect the tear even at very small grade such as grade 1.

Keywords: Knee Pain, MRI, Meniscal Tear, Knee.

Article Information

Received: September 01, 2022; Revised: October 05, 2022; Online: December, 2022

INTRODUCTION

Physical activities like sports gymnastics games, cycling, brisk walking, and running has always been a fun and important activities for people's health and especially when it became their occupation. Due to increased unhealthy eating disorders in people, they have developed an unhealthy weight which is causing them to be weakened and causing pain especially at joints. Also with increasing age, bones and joints became weaker causing them to pain and sometime injuries. Knee injuries are most common for people of increased age, weight and for people having increased physical activity as occupation.(1) Meniscus provides lubrication, stability, support, force transmission and act as a shock absorber. Due to excessive use, pressure and work load cause meniscus to tear with severe acute pain. This tear needed to be diagnosed and treated. Meniscal lesions are painful and often cause disability in people. Medial meniscus tear is most common form of knee Injury.(2) For the diagnosis conventional radiography was never helpful because it is not for soft tissues whereas MRI is been using in musculoskeletal for more than 25 years. It is easily

available, non-invasive, non-ionizing, and used for contralateral comparisons. Compound ultrasound so far is best technique for evaluation of margins and internal echo texture of nodules but its diagnosis is questionable and variable. Whereas MRI is most powerful, non-invasive and accurate method for soft tissues. It has accuracy of 87% -97%. It is expensive and not readily available. Arthroscopy is a standard procedure for meniscal tears and has accuracy of 69%-98%⁽³⁾.

All patients having positive meniscal tear on MRI was not present on arthroscopy. For this grading system was introduced in which patients with grade I and grade II were negative at the time of surgery but meniscal tear was present at surgery in grade III patients. After this relation of grade III with meniscal tears MR findings and surgical findings agreed in 91.3% of menisci⁽⁴⁾. Meniscal tears can cause disability in patients so it is necessary to diagnose tears early. Meniscal tear is highly based on occupation like athletic and daily activities can cause meniscus injury and knee pain. ultrasound is inexpensive, real time imaging used in musculoskeletal exams but its results are not accurate as much as of MRI. Ultrasound is good for diagnosis but is useful in uninjured knees⁽⁵⁾. Increasing percentage of acute knee patients requires early diagnose of meniscal tears so that type of treatment can be finalized and patients can go back early to their normal life activities. MRI is gold standard for meniscal abnormalities but it can't be performed right after injury for weeks or months. MRI is also costly and no affordable for everyone. Ultrasound is an effective diagnostic tool for meniscal pathologies. For early diagnosis ultrasound is used but it has some limitations in diagnosis.⁽⁶⁾

Compared to ultrasonography MRI is not dynamic its images are static so this is not helpful in analyzing the function of meniscus. Meniscus is to divide the workload between femur and tibia but with meniscal root injuries meniscal extrusion is possible. Meniscal extrusion inhibits the function, leading to a condition comparable to meniscectomy. To evaluate meniscal function dynamic study is needed which is possible on MRI. BMI and gender has no effect on meniscal extrusion and tear but weight and age plays important role in meniscal injuries⁽⁷⁾. Acute knees having meniscal tears may be present in both athletes and non-athletes. They can cause knee pain and disability as well as the onset and progression

of knee osteoarthritis. Ultrasonography has controversial diagnosis. In some patients with meniscal tear present and confirmed on arthroscopy ultrasound showed nothing on exam. On ultrasound depth of penetration is limited by making diagnostic accuracy variable⁽⁸⁾. In our research we performed MRI in patients with acute knee pain. We ruled meniscal tears and their increasing percentage setting MRI as gold standard. MRI is used for soft tissues and considered to be having 98% diagnostic accuracy.⁽⁹⁾

MATERIAL AND METHODS:

This prospective study was performed at radiology department in Lahore on 600 patients. 1.5 T MRI machine with a phased array knee coil was used to perform the knee scan. Fat pads were used to immobilize the joint within the coil. Localiser, T2 axial stir coronal, T1 coronal T2 coronal sagittal pd, axial stir, T2 sagittal sequences were used. Mri scans were reported by and confirmed by 2 radiologists. Spss version 25.0 is used for analysis and frequency evaluation.

RESULTS

Total 600 patients of acute knee pain were enrolled in this study. 427(71.2) patients were male while 173(28.8) patients were female as shown in table 1. Male to female ratio was 2:1

Table 1: Distribution of Gender .

Gender	Frequency	Percentage
Male	427	71.2
Female	173	28.8
Total	600	100

Meniscal tear findings on Magnetic Resonance Imaging are shown in table 2. out of 600, 178(29.7%) patients were negative with no meniscal tear finding while 422(70.3%) patients were found positive in magnetic

resonance imaging scan. This shows high percentage is found in men. The frequency of meniscal tear by using magnetic resonance imaging is given below.

Table 2: Meniscal tear Frequency.

Meniscal Tear	Frequency	Percentage
Negative	178	29.7
Positive	422	70.3
Total	600	100

DISCUSSION

We observed that knee meniscal tear in men was prevalent in our prospective study held at Lahore. Previous studies have shown that patients with symptomatic knee osteoarthritis had a high frequency of meniscal injury (67 to 91%).(10).

Meniscal tears are frequently difficult to diagnose only based on a clinical examination and many patients now demand an MRI assessment. Before MRI became widely available and used, arthroscopy had been promoted as a useful diagnostic tool.(11) The literature contains a number of studies that assess the sensitivity, specificity, and accuracy of MRIs performed under standardised settings as well as their cost-effectiveness. The number of ordered MRI studies continues to increase year after year, cost or no cost.

Based on MRI exams, there is insufficient information in the literature about the normal growth of the medial and lateral meniscus. The medial meniscus is typically described “the medial meniscus is larger, has a wider posterior horn, and is more open towards the intercondylar notch” when compared to the lateral meniscus.(12) the posterior horn of the medial meniscus showed a much higher incidence of anomalies.

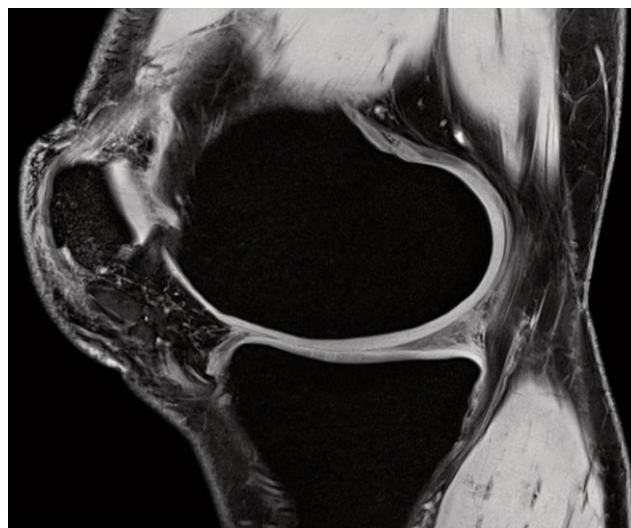


Figure 1: Sagittal view showing knee meniscus.

We discovered that concurrent early radiographic knee meniscal tear was linked to a higher likelihood of self-reported catching, inflammation, and soreness subsequently in the day. There were no additional symptom observed. In people with knee abnormality, swelling and stiffness are well-known symptoms. However, catching is more frequently identified as a mechanical symptom and therefore is commonly thought to result from a meniscal injury. A significant prevalence of catching in people with knee Osteoarthritis suggests that the degenerative nature of Osteoarthritis, which affects multiple joint components, rather than the meniscal tear itself, is what causes catching.(13)

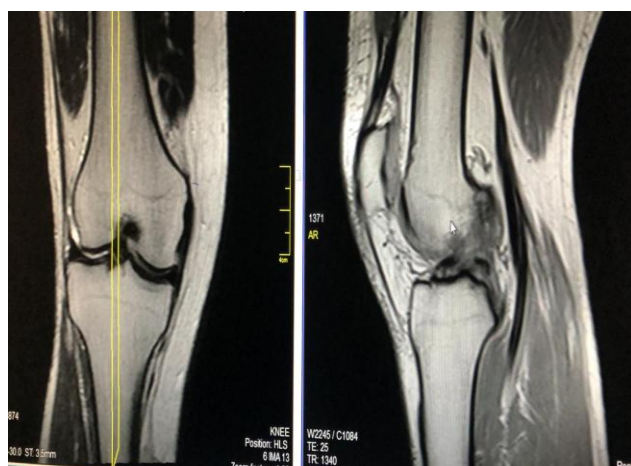


Figure 2: Shows Knee meniscal tear.

Age and body mass index (BMI) most likely have a significant impact on the meniscus' degradation. In patients with a BMI exceeding 30 kg/m², a research by Hwang et al.(14) revealed a 4.9-fold increase in medial meniscus posterior root tears. Further research is required to clarify the impact of age and BMI on the athlete's meniscus given the current rise in popularity of distance cross training and running. In this study, it was found that athletes whose sports don't demand constant pivoting (such as distance runners and Ironman competitors) had a higher prevalence of symptomatic meniscal pathology (60%) than athletes whose sports do (18%). (football, basketball, etc.)

This finding most likely draws attention to the meniscus's vulnerability to repetitive impact activities like long distance running and endurance sports. It's interesting to note that meniscal tears were also more common in non-pivot athletes, which may indicate that early meniscal degeneration increases the chance of undetected (asymptomatic) tears and early-onset OA.(15) By keeping an eye on their activity and moment with right body posture, knee joint can be saved for life time.



Figure 3: Coronal pd weighted image knee MRI.

CONCLUSION

Jumping, supports, running and high intensity physical activities can be the cause of meniscal tear. Early evaluation of tear is necessary for the treatment of symptoms such as acute knee pain etc. Magnetic resonance imaging is non-invasive useful muscoskeletal imaging modality which can detect the tear even at very small grade such as grade 1.

Limitations: MRI is radially used for meniscal tears but it has some limitation for patient's e.g. It's expensive, claustrophobic patients cannot be examined; patients with any type of metal placed in body can't be scanned on MRI.

REFERENCES

1. Navali AM, Bazavar M, Mohseni MA, Safari B, Tabrizi A. Arthroscopic evaluation of the accuracy of clinical examination versus MRI in diagnosing meniscus tears and cruciate ligament ruptures. Archives of Iranian medicine. 2013;16(4):229.
2. Renström P, Johnson RJ. Anatomy and biomechanics of the menisci. Clinics in sports medicine. 1990;9(3):523-38.
3. Alizadeh A, Jandaghi AB, Zirak AK, Karimi A, Mardani-Kivi M, Rajabzadeh A. Knee sonography as a diagnostic test for medial meniscal tears in young patients. European Journal of Orthopaedic Surgery & Traumatology. 2013;23(8):927-31.
4. Crues 3rd J, Mink J, Levy T, Lotysch M, Stoller D. Meniscal tears of the knee: accuracy of MR imaging. Radiology. 1987;164(2):445-8.
5. Park G-Y, Kim J-M, Lee S-M, Lee MY. The value of ultrasonography in the detection of meniscal tears diagnosed by magnetic resonance imaging. American journal of physical medicine & rehabilitation. 2008;87(1):14-20.
6. Cook JL, Cook CR, Stannard JP, Vaughn G, Wilson N, Roller BL, et al. MRI versus ultrasonography to assess meniscal abnormalities in acute knees. The journal of knee surgery. 2014;27(04):319-24.
7. Achtnich A, Petersen W, Willinger L, Sauter A, Rasper M, Wörtler K, et al. Medial meniscus extrusion increases

- with age and BMI and is depending on different loading conditions. *Knee Surgery, Sports Traumatology, Arthroscopy*. 2018;26(8):2282-8.
8. Akatsu Y, Yamaguchi S, Mukoyama S, Morikawa T, Yamaguchi T, Tsuchiya K, et al. Accuracy of high-resolution ultrasound in the detection of meniscal tears and determination of the visible area of menisci. *JBJS*. 2015;97(10):799-806.
 9. Gielen JL, De Schepper AM, Vanhoenacker F, Parizel PM, Wang XL, Sciort R, et al. Accuracy of MRI in characterization of soft tissue tumors and tumor-like lesions. A prospective study in 548 patients. *European radiology*. 2004;14(12):2320-30.
 10. Lohmander L, Östenberg A, Englund M, Roos H. High prevalence of knee osteoarthritis, pain, and functional limitations in female soccer players twelve years after anterior cruciate ligament injury. *Arthritis & Rheumatism: Official Journal of the American College of Rheumatology*. 2004;50(10):3145-52.
 11. Kelly BT, Williams RJ, Philippon MJ. Hip arthroscopy: current indications, treatment options, and management issues. *The American journal of sports medicine*. 2003;31(6):1020-37.
 12. Bedoya MA, Barrera CA, Chauvin NA, Delgado J, Jaramillo D, Ho-Fung VM. Normal meniscal dimensions at different patient ages—MRI evaluation. *Skeletal Radiology*. 2019;48(4):595-603.
 13. Englund M, Roemer FW, Hayashi D, Crema MD, Guermazi A. Meniscus pathology, osteoarthritis and the treatment controversy. *Nature Reviews Rheumatology*. 2012;8(7):412-9.
 14. Chiba D, Sasaki T, Ishibashi Y. Greater medial meniscus extrusion seen on ultrasonography indicates the risk of MRI-detected complete medial meniscus posterior root tear in a Japanese population with knee pain. *Scientific Reports*. 2022;12(1):1-7.
 15. Everhart JS, Magnussen RA, Abouljoud MM, Regalado LE, Kaeding CC, Flanigan DC. Meniscus tears accelerate joint space loss and lateral meniscal extrusion increases risk of knee arthroplasty in middle-aged adults. *Journal of Orthopaedic Research®*. 2020;38(11):2495-504.