

**“ AN OBSERVATIONAL STUDY EVALUATING THE PREVALENCE OF DEGENERATIVE
MENISCAL INJURIES IN KNOWN CASES OF OSTEOARTHRITIS OF THE KNEE BY
MAGNETIC RESONANCE IMAGING”**

BY

REG NO: BL0120001

Dissertation

Submitted to the

**KLE Academy of Higher Education & Research
(Deemed-to-be-University)
Belagavi, Karnataka**

In partial fulfilment of the requirements for the degree of

MASTER OF SURGERY

IN

ORTHOPAEDICS

**DEPARTMENT OF ORTHOPAEDICS
JAWAHARLAL NEHRU MEDICAL COLLEGE,
KAHER**

BELAGAVI, KARNATAKA

JUNE/JULY - 2023

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ABSTRACT

KEY WORDS: Osteoarthritis, Meniscus, Knee, Meniscal tears, Magnetic Resonance Imaging, Radiographic grade, Kellgren-Lawrence grade

INTRODUCTION: Meniscal injuries are common in patients with knee OA. This study was done to find out the prevalence of meniscal injuries in patients with mild and moderate grade (Kellgren Lawrence grade 2 and 3) knee osteoarthritis. We assessed the relationship between meniscal lesions and the presence of radiographic knee osteoarthritis (OA) in the above patients.

METHODS: The radiographs and magnetic resonance images of 92 patients with knee pain aged below 65 years were reviewed for knee OA and meniscal lesions. The prevalence of different types of meniscal lesions was calculated, and the relationship between the prevalence of meniscal lesion types and the presence of radiographic knee OA was analysed.

RESULTS: Mean age of participants was 53.1 ± 5.5 years, ranging from 41 to 65 years. Majority 63% were in age group of 50 to 60 years. 28.2% had Acute on Chronic Knee Pain, 47.8% had chronic knee pain, 8.7% occasional knee pain, 4.3% had trauma and 2.2% had twisting knee injury. Majority 51.1% had medial meniscal injury, 15.2% had both medial and lateral and 4.3% had only lateral meniscal tear. Majority 52.1% had posterior horn tear, 15.2% had anterior horn tear and 5.4% had body tear. 27.1% had horizontal tear type, 7.6% had myxoid and radial type and 1.1% had vertical tear type. Medial tears were more as compared to lateral tears. In grade 2 OA knee, 59.67% had meniscal tears and in grade 3 OA knee, 91.66% had meniscal tears. As OA grade increases tear rate also increases.

CONCLUSION: This study suggests a strong association between symptomatic OA knee and meniscal lesions (detected on MRI studies). Regardless of the causative factor, treating the

meniscal lesions can help in mitigation of symptoms and delay the progress of disease in knee osteoarthritis.

LIST OF ABBREVIATIONS

LM- Lateral Meniscus

MM- Medial Meniscus

MRI- Magnetic Resonance Imaging

OA- Osteoarthritis

ACL- Anterior Cruciate Ligament

TNF- Tumor Necrosis Factor

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INTRODUCTION

The major causes of morbidity worldwide is ageing and the obesity. The highly prevalent amongst the treated medical condition globally is Osteoarthritis. (for example, 3532 per 100 000 people in the United States) ¹. Clinical examination and radiographs plays a pivotal role in diagnosing osteoarthritis. The studies being conducted in the US and UK⁴ shows that increased age is the significant risk factor and obese people are at more risk. The literature also states that middle age and older aged people are more prone to develop osteoarthritis^{2,3}

Radiographs plays an amazing role in identifying the hard tissue structures like osteophytes, bony outgrowths at the margins of the joints and also narrowed joint space. However soft tissues pathology cannot be identified by the radiographs⁴. MRI performs a pivotal function in analysing the tender tissues which are clinically applicable and performs a critical function in structural development that isn't visualized in radiographs. Additional benefits of MRI includes the recognition of incidental findings in asymptomatic people⁵.

With respect to studying about the structure of the knee on MRI, it visualises the most important joint additives like articular cartilage, intra-articular ligaments, synovium, intra articular cartilage, bone marrow, subchondral cysts etc which are not at all detected by radiographs⁶

Even in the absence of radiographic osteoarthritis, there will be the presence of meniscal pathology. The weight bearing capacity of the knee is hampered when the meniscus is impaired mechanically and this in-turn will create damage in the chondral-articular zone of the same compartment and the subchondral bone, finally facilitating the development of osteo arthritis⁷.

Radiographic tibiofemoral osteoarthritis occurs due to meniscal damage as suggested in one study⁸

However, there may be sparse data concerning the consequences of diverse sorts of meniscal changes as visible in MRI, on cartilage loss in subregional area in topics with and without osteoarthritis. Most of the research have focussed on the impact of various sorts of damage to the meniscal area on loss of the cartilage post arthroscopic meniscectomy⁹. Also, we've a totally scarce data concerning the area of damage to the meniscus on loss of the cartilage within the same compartment. MRI has excessive sensitivity and specificity in detecting the meniscal damages¹⁰. MRI is precise and extensively utilized in evaluation of the articular cartilage for the measurement of the cartilage loss longitudinally in the knee joint. Hence, the aim of this study was to evaluate the prevalence of degenerative meniscal injuries in knee osteoarthritis by Magnetic Resonance Imaging.

AIMS AND OBJECTIVES

To find out the prevalence rate of meniscal injuries in patients presenting with mild and moderate grade (Kellgren Lawrence grade 2 and 3) knee osteoarthritis.

REVIEW OF LITERATURE

The wear and tear, followed by continuous loss of articular cartilage results in a degenerative disease affecting the joints, which is termed as osteoarthritis. This disease affects individuals of all the ages, however more commonly involves the adult population. It is classified as primary and secondary. When the disease is not associated with a specific underlying cause, it is termed as primary and secondary osteoarthritis occurs due to excessive pressure application on the knee joint as in case of trauma or even rheumatoid arthritis cases.

Clinically, the patient complains of pain which is gradual in onset and starts worsening with activity. The pain also keeps worsening over a period of time. The patient also complains of stiffness associated with the joint and swelling. The pain occurs both at rest and after sitting for a prolonged period of time. We don't have any therapeutic agents to modify the disease, backed up by the evidence in the medical literature^{13, 14, 15}

Classification^{16, 17}

Primary osteoarthritis

Secondary osteoarthritis

Etiology^{16,17}

Possible causes of secondary knee Osteoarthritis

Post-surgical

Scoliosis

Rickets

Hemochromatosis

Posttraumatic

Varus or valgus malposition.

Rickets

Chondrocalcinosis

Ochronosis

Limb malformations

Pseudogout

Acromegaly

Psoriatic arthritis

Avascular necrosis

Paget disease

Rheumatoid arthritis

Wilson disease

Infectious arthritis

Haemophilia

Risk Factors for Knee OA^{16,17}

Modifiable

Weight

Health metabolic syndrome

Occupations that require prolonged standing

Frequent knee bending

Trauma to the articular tissue

Imbalancing of the muscles

Non-modifiable

Age

Genetics

Ethnicity

Female gender

Epidemiology

It is a disease associated with increasing age, and obesity seems to be a risk factor for the occurrence. Females are usually affected with the disease. There is a 40% hike in the occurrence of the disease, when the individual crosses 70 years of his age. At times, even if radiographic changes depict the knee osteoarthritis, the patients remains asymptomatic for prolonged period of time. An estimated of 200 symptomatic osteoarthritis knee cases may be found per 10,000 people in a year^{18, 19}

Pathophysiology

Osteoarthritis typically involves all the joints. The precise etiology is unknown, however there is combined or associated role played by various risk factors, mechanical stress and abnormal joint mechanics. Eventually, it involves a cascade of various pro-inflammatory markers that in turn causes joint destruction. However, the exact pathways leading to the joint destruction is not very clear.

The pathological changes involve the articular cartilage where the surface shows a pattern of irregularity, fibrillation followed by erosions. Over a period of time, these erosions penetrate

deep into the bone and joint cavity and keeps on continuously expanding to involve increased joint surface area.

Microscopically, following the injury of the cartilage, there is destruction of collagen matrix and proliferation of chondrocytes, which later combine together to form huge clusters enmass. Cartilage outgrows and then shows ossification, and there is formation of osteophytes. The collagen matrix further gets destroyed and there is apoptosis of chondrocytes. Subchondral bone thickening is seen in areas where there is partial mineralisation of collagen. Rarely, bony erosions do appear.

The disease typically has its effects on the soft tissues including the capsule and meniscus. The ligaments are at also increased risk to be affected by the disease. We find the accumulation of calcium phosphate and calcium pyrophosphate dehydrate crystals in the end stages of the disease., however they are believed to cause synovial inflammation^{20, 21,22}.

Histopathology

Aging associated changes in the cartilage²³

There will be reduction in water, proteoglycans, chondrocyte number with increased age.

There will be a decrease in modulus of elasticity and chondrocyte size with increasing age.

The synthesis of proteoglycans remains the same with increasing age

Aging associated cartilage changes in osteoarthritis

The collagen appears to be more disorganized with increasing age

The water content and synthesis of proteoglycans decreases with increasing age

The proteoglycans and the modulus of elasticity reduces with increasing age.

The size of the chondrocytes and the number of chondrocytes remains the same

Pathological findings

Macroscopically, the cartilage is lost along with the degeneration in the cystic region of the bone that surrounds the joint and the surface shows irregularity, the edges showing abnormal bone formation (osteophytes; fig 1) followed by joint space narrowing.

Microscopically, the articular cartilage surface shows fibrillation and flaking and voids formation resulting in destruction and formation of bony cysts ²⁴.

Subchondral bone shows variations in the cellular content and also blood flow, which in turn is responsible for sclerosing the bone in certain areas and formation of novel bony tissue with callus²⁴.

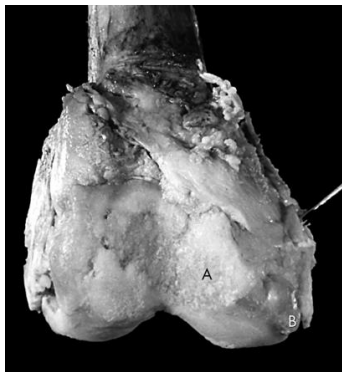


Figure 1: Specimen of osteoarthritis that picturizes (a) cartilaginous fibrillation (b) osteophytic formation in the femoral part of the knee

Risk factors

Age:

Osteoarthritis is typically associated with increasing age. As the age advances, there will be increased laxity around the joints, decreased proprioception of the joint, calcification of the cartilage, and hampered functioning of the chondrocytes.

Individuals in the age range of 60-70 years showed 27% of the radiographic features in osteoarthritis and this got hiked to 45% to individuals over 80 years of age²⁵

Literature also points that when an individual crosses 65 years, he is 80% at the risk for showing radiographic osteoarthritic features²⁶.

Coming to the proprioception, literature have found that it keeps declining with increasing age in patients with knee osteoarthritis²⁷.

Trauma

Meniscal tears, cruciate and collateral ligament tears are associated with joint fracture and increases the risk of osteoarthritis.

According to the evidence, if there is an history of past traumatic knee injury, there is an increased risk of osteoarthritis²⁵. Following the knee injury, meniscectomy results in hiked occurrence of tibiofemoral osteoarthritis²⁸.

Occupation

The incidence of osteoarthritis is seen more in people performing heavy duty workers, like those associated with frequent bending of the knee, and kneeling etc. Sedentary job people have lower risk of osteoarthritis when compared to miners²⁹. There is a significant relationship between occupational kneeling³⁰ and osteoarthritis.

Exercise

High impact sports people like athletes have increased incidence of osteoarthritis²⁶. The weakness associated with primary quadriceps muscle is a strong risk factor for the development of osteoarthritis as it hampers the joint stability and produces a negative impact on the shock absorbing properties associated with the muscle²⁹.

Genetics

Monozygotic twins are at increased risk, comparative to dizygotic twins for the prevalence of osteoarthritis³¹. There is a positive association with chromosomes 4, 16 and 2q. However, if we look for genetic history, evidence states that autosomal dominant patterns are very rarely inherited. The defective genes usually codes for proteins present in the extracellular matrix region, both for the joint and collagens. However, if the parents gives an early history for the development of osteoarthritis, the progeny also shows an increase risk³¹.

Diet

Lack of or diminished intake of vitamins like C and D increases the risk of knee osteoarthritis²⁵. Animal models studies in the literature have shown that vitamin C retards the occurrence of osteoarthritis, owing to its antioxidant and collagen promoting properties. Low intake of vitamin D also plays a significant contributing role as a risk factor of osteoarthritis, however there is lack of literature favouring the beneficial effect of vitamin E on the osteoarthritis³².

Obesity

Obesity is considered to be one of the major risk factor, showing a strong prediction. The increased body weight is transferred across all the joints during the physical activities which then increases the weight on the joints and puts them at an increased risk for developing osteoarthritis

For every 5 kg increase in body weight, the odds ratio for development of the knee osteoarthritis in the radiographs increases by 1.36³³. There is 50% reduction in the symptoms associated with osteoarthritis with every 5 kg loss of weight²⁷. Obese people with localised disease also are at increased risk³⁴

Bone density

Literature have found an inverse relationship between osteoarthritis and bone density. There will be increased loading on weight bearing joints with increased sub-chondral bone density²⁹.

Natural history

Osteoarthritis shows a gradual onset. The osteoarthritis of knee may take several years to progress and once established, it remains stable for a prolonged period of time.

One third of patients in cohort of 63 patients showed radiographic features of osteoarthritis³⁵. Eight years follow up was done for 31 patients with the knee osteoarthritis, 20 of them showed worsening of the symptoms and seven did not. There was no co-relation between changes seen in disability, radiographs and the symptoms³⁶.

When studying about the hip joint, there is a variable history. In a Danish study, two-thirds of hips showed radiographic deterioration for a total of ten years era, although there was improvements with respect to symptoms³⁷. Other studies have established that deterioration in clinical symptoms was quite common. Unlike knee osteoarthritis, the symptoms and radiographic images can be improved.

In the hands, it is initially a relapsing and relapsing disease with occasional inflammatory stages associated with redness and swelling of the joints. Bone swelling develops at this stage. The frequency of eruptions then decreases and the swollen joint becomes stiff and immobilized. This is related to pain reduction.

Biochemical markers in osteoarthritis

The primary modality of diagnosis is based on the clinical history and the radiographs. The radiographic changes however are irreversible and even do occur in the terminal stages of the disease. Diagnosis on the early stages is basically dependent on the molecular markers. However, with time, these markers are subjected to a quantitative change and hence are not totally reliable^{38, 39}.

A mixed analysis of three markers like TNF receptor II, epitope 846 and COMP can differentiate between healthy and osteoarthritic knee⁴⁰. Hence, it is believed that a study of various markers and associated analysis of the genetic spectrum may prove to be more beneficial in providing unique and personalized risk assessment for osteoarthritis, and also to assess the therapeutic benefits.

Knee Osteoarthritis imaging features

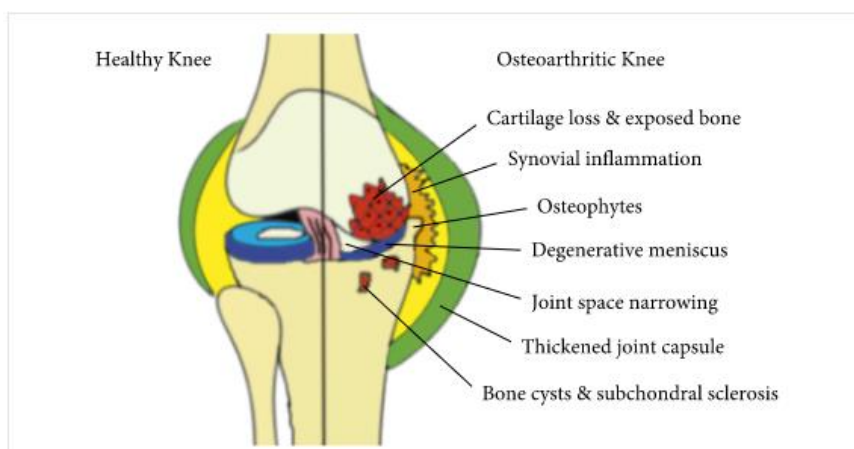


Figure 2 – Comparison of osteoarthritis of the knee and a healthy knee.

Radiography:

It is considered as gold standard for diagnosis of osteoarthritis. The calcium in the body tends to absorb the radiation that is passed into the body during the procedure and the bone structures start appearing white. For the clinical assessment of the knee, weight bearing condition is preferred, because the knee will be under natural loading while the functions are executed.

Magnetic Resonance Imaging (MRI):

The magnetic wave theory is being incorporated in the working principle of MRI. The patient is slid into the MRI tube in his sleeping position. It produced precise and promising cross

sectional and longitudinal images and hence is considered as the most beneficial tool in the research studies

Computed Tomography (CT):

Here, computers are utilized to produce an image for the internal body which is scanned by rotating ray machine. It is extensively performed for meniscal evaluation and anterior cruciate ligament evaluation and involves imaging of both and either of the weight bearing as well as non-weight bearing joints ⁴¹. There is a utility of the contrast dye for precise and enhanced visualization of targeted areas.

Nuclear Medicine Bone Scan:

Also termed as bone scintigraphy. Here the radioactive tracer is being injected into the vein of the patient and the imaging is performed. This imaging modality is helpful in differentiating osteoarthritis from other bone disorders like bone metastases and osteomyelitis.

Ultrasonography:

Here the ultrasound waves are used to evaluate both the soft tissues and the joint cavity. The patient is positioned in supine position, and the knees will be fully extended. The scanner is moved in the longitudinal section and the knee is scanned manually in the coronal plane. Ultrasonography provides quick assessment of knee imaging. The Clarius HD scanner is available in the market these days, which is a wireless ultrasound device and handheld and hence very convenient to use.

Optical Coherence Tomography (OCT):

This technique consists of microscopic evaluation for detecting the minor degenerative changes in the cartilage⁴². It assesses the anisotropy of cartilage since it is usually coupled with mechanical indentation. It is helpful in clinical interpretation of MRI quantitatively for assessing the articular cartilage non-invasively. It is extensively used as a transitional research tool. There is a lack of sufficient literature regarding the use of OCT in human samples.

The meniscal pathology: Lesion definitions and characteristic features

We see the lesions of the meniscus in the form of tears and substance loss. The tears usually are characterized by intra meniscal signal that keeps extending into the meniscal surface where -as the substance loss is characterized by the loss of triangular meniscal shape.

Meniscal fragments usually undergo displacement, hence should be commonly searched for the dislocations. The utility of MRI is limited because the meniscus often shows fragmentation⁴³.

MRI shows the tear as an abnormal signal within the meniscus on T2-weighted or proton density MRI images with clear contact with the meniscal surface; That is, the tear in at least two sequential sections or in two images taken in different planes is visible^{44, 45}

These tears are classified according to their type using the same classification as the arthroscopic surgeon⁴⁶. Vertical tears can be radial, oblique and longitudinal or can take up a parrot beak appearance (combination of radial and longitudinal)

Traumatic vertical tears can be posterior, peripheral, and longitudinal. Degeneration and contact with the articular surface of the meniscus leads to the formation of a horizontal tear. A horizontal tear runs parallel to the tibial plateau and bisects the meniscus, with the tear flowing

from the apex of the meniscus. The tear affects the articular surface of the femur or tibia rather than the apex of the meniscus. Finally, the intricate teardrops display a group of patterns

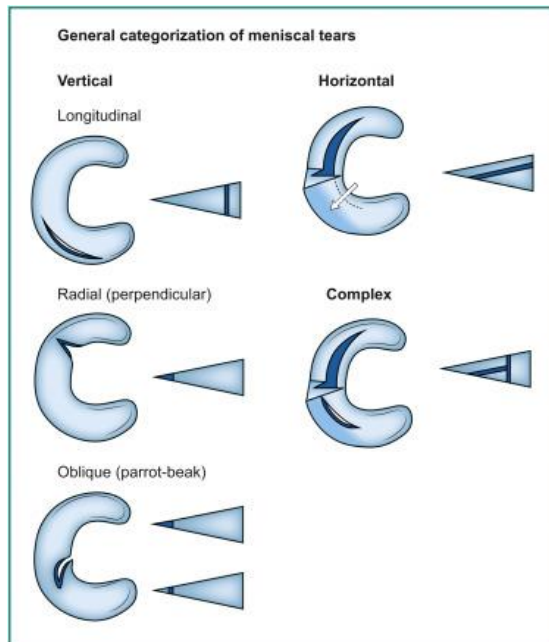


Figure 3. A vertical tear can be longitudinal, radial and oblique. A horizontal tear is usually caused by degeneration. Complex tears have multiple directions

The substance loss:

The meniscal tissue is lost either by degeneration or by trauma to the meniscus. The loss of substance is being followed by fragment separation. When there is a loss of substance, we cannot see the triangular meniscal shape, which is the normal finding and in very severe cases, we notice a total loss, that may be indicative of the chronicity of the lesion or may also be seen in extensive meniscectomy cases or can also be acute following the displacement of meniscus like in case of intracondylar bucket handle fracture

Fragments and displaced flaps:

More frequently meniscal tissues undergo fragmentation. Displaced flap is the one when the fragmented meniscal tissue still remain adherent to the parent meniscus. The meniscal fragment which is free is termed as detached meniscal tissue. While interpreting the MRI, it is important to know the potential migration areas and it should be precisely checked throughout the knee. Many a times, the fragment remains attached to the parent meniscal tissue and can be traced in the joint cavity or can also get migrated to a varied distance from its parental meniscal tissue. It usually migrates to the intercondylar notch and also to the superior meniscal recess cavity and the inferior meniscal recesses cavity.

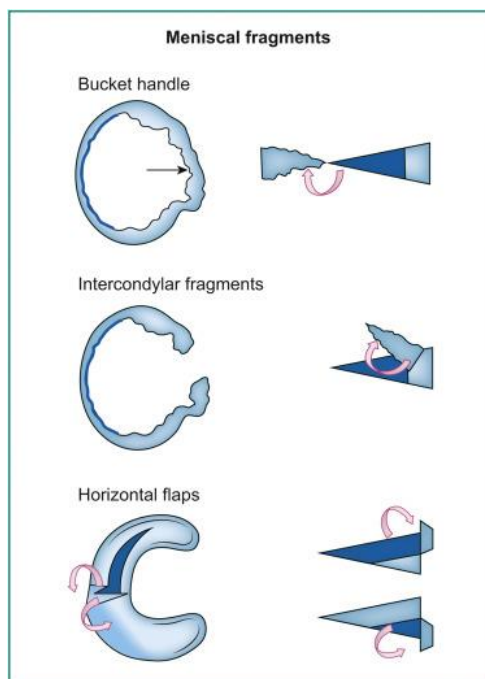


Figure 4. Bucket handle fragment, Inter-condylar fragments, Horizontal flaps

MRI technique:

Meniscus injuries can occur solitary or with ligament damage. MRI is the primary imaging modality for the evaluation of all⁴⁷. Another advantage of MRI is that it is non-invasive and therefore patient-friendly. Two-dimensional images of the knee joint were acquired at the axial, sagittal, and coronal levels. The machine uses fast-spinning 3D echo sequences such as SPACE (Siemens-Healthinners, Erlangen, Germany), CUBE (GE Healthcare, Milwaukee, WI, USA), and VISTA (Philips, Eindhoven, The Netherlands). It produces anisotropic images that facilitate polyhedral reconstruction. The weighted average of proton density and lipid signal extinction is the optimal image weight for the detection of meniscal lesions^{48, 49}

Characterization of the diagnostic capacity:

Frequently missed meniscal tears:

The lateral meniscus cannot be more precisely detected by MRI, when compared to the medial meniscus. The patters of tears also effects the performance. For example, we can easily locate the horizontal along with complex lesions, when compared to the vertical lesions. The frequently overlooked lesions includes the radial tears⁵³

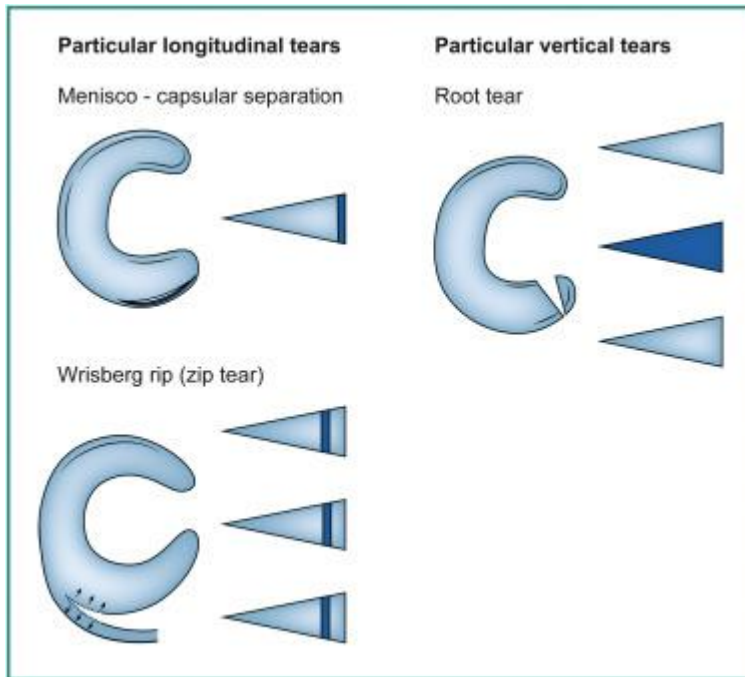


Figure 5: Particular longitudinal tears and vertical tears, Wrisberg rip tear



Figure 6: Coronal (a) sagittal (b) proton density images. The free edges of the posterior and middle meniscal segments are perpendicular to the radial tear (arrows in c).

Root drift, also known as root extraction or posterior radial corneal tear in MM, is often overlooked on MRI, but its identification plays a key role for two important reasons. The first is that the biomechanical prognosis is very poor and is associated with an abnormal risk of osteoporosis and skeletal complications, such as hypochondral fractures to mechanical epiphyseal necrosis⁵⁴⁻⁵⁶. Second, improved endoscopic knowledge, which allows classification

of lesions based on the proximity of the site of the bone insertion and the lesion to the insertion site of the posterior tibia provides new insights into the targeted lesion management.^{57, 58}

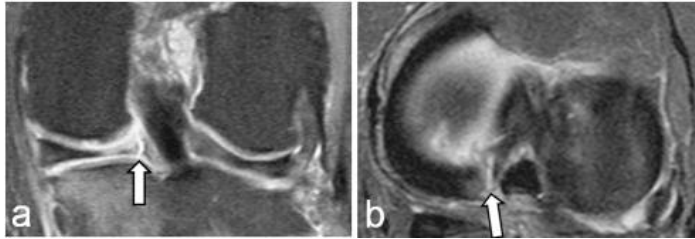


Figure 7: Coronal (a) and transverse (b) proton intensity images. A linear tear is seen proximal to the insertion site of the tibia projected onto the posterior horn

Radial posterior horns are visualised much better by coronal view. Posterior detachment is usually noticed, where we can notice the subluxation of meniscus on the medial joint space. A subtle sign which we see in the sagittal view is the meniscal disappearance, which is often referred as ghost meniscus, between normal posterior horn slices.

There is an high association of meniscal lesions with anterior cruciate ligament tears, giving rise to an incident rate of 50-65%, with medial meniscal posterior horn being involved commonly (>75%)⁵⁹. The utility of MRI is poor for visualizing the lesions on the lateral side when compared to the medial lesions. The sensitivity for lateral lesions ranges from 50-60%, whereas for medial lesions it is more than 90%⁶⁰⁻⁶².

There is an increasing risk to come to a definitive diagnosis if ACL tears accompanies the meniscal lesions. If the MRI is used to assess the injury immediately following the traumatic event, there is a high chance that the meniscal tear will be missed in the MRI imaging^{63,64}

There is no cleavage on the MM posterior horn. When fluid is present or the peripheral posterior border of the meniscus⁶⁵ has an uneven contour, a relevant lesion is often thought to

be present. A pathologic vertical line with a high signal strength at the posterior edge of the MM posterior horn must be interpreted as being indicative of a menisco-capsular separation or peripheral tear lesion⁶⁵⁻⁶⁷. ACL tears are more frequently seen in men⁶⁸

Accompanying ACL injuries, we have longitudinal tears which are present on the medial meniscus at the posterior side, these lesions should not be overlooked, particularly when a surgeon consider various treatment options for the meniscal ramp lesions. These lesions are responsible to a greater extent in causing instability of the knee and plays a vital role in the secondary displacements⁶⁹. If these lesions are not subjected to displacement, they present with spontaneous cicatrisation⁷⁰. However, cicatrisation is not an option to be considered if we find vertical, longitudinal, peripheral lesion with signal that is “not frankly bright” on T2-weighted imaging⁷⁰.

The lesions located posteriorly to the MM posterior horn possess difficulty in diagnosis on MRI, and even more difficulties on the arthroscopic evaluation since the medial posterior segment poses difficulties in accessibility on the anterior arthroscopic evaluation. Hence MRI may be helpful to perform an arthroscopic approach posteriorly⁷¹.

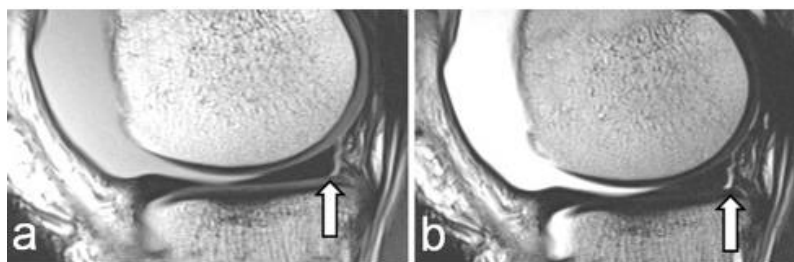


Figure 8: Meniscus separation (horizontal transverse tear) along the medial meniscus's posterior edge. Lines of elevated signal intensity along the posterior border of the posterior horn of the medial meniscus in contact with two surfaces are seen in sagittal (a) or T2-weighted proton density images (b) (arrows). A vertical limb tear linked to an ACL injury is what is meant by this (climbing injury).

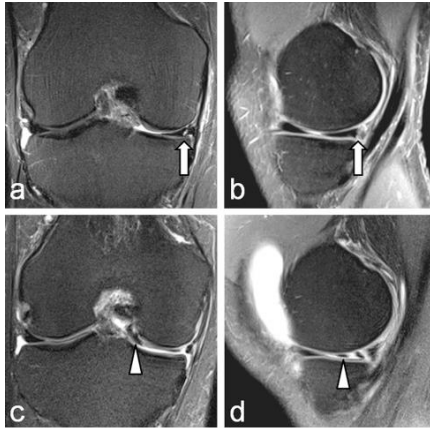


Figure 9: Detachment of the meniscal capsule at the posterior horn of the medial meniscus is associated with anterior cruciate ligament injury and migration of the secondary button of the medial meniscus. Coronal (a) and sagittal (b) proton density views with fat funnel showing the perpendicular perineal tear and detachment of the posterior horn (arrow in b) extending into the middle part of the medial meniscus (arrow in a). Follow-up MRI (c and d), performed 6 months later, to assess pain after a sudden twisting movement showed displacement of a large portion of the barrel-shaped meniscus in the intercondylar fissure (arrows in c and d).

LM posterior horn is involved in vertical longitudinal tears. A cleavage is formed that extends between the femoral -ligament and the posterior horn on the lateral medial aspect. If the cleavage extends 14 mm ahead of the reference point, it means LM posterior horn has a longitudinal tear. The morphology and pathogenesis decides the lesion to be a “zip” or “rip”⁷²⁻⁷⁴. Adjacent to the medial and lateral meniscal roots, we see separation tears particularly in association with ACL tears⁷⁵

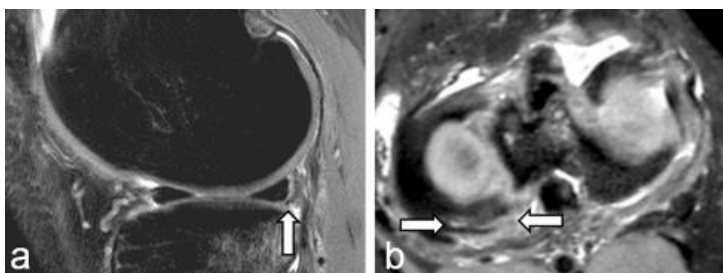


Figure 10: (Wrisberg's zipper). Sagittal (a) and transverse (b) view of the proton density. Longitudinal tearing is shown after an ACL injury, indicated by arrows

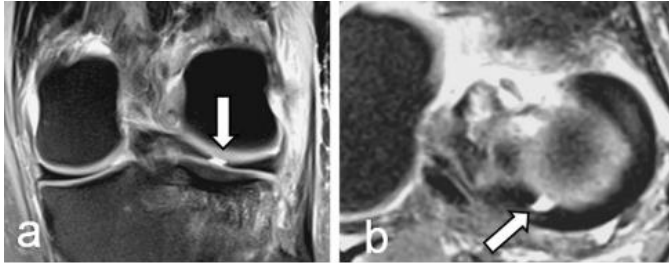


Figure 11: Coronal (a) and lateral (b) view of the proton density. Deep radial tears in the posterior horn of the meniscus can be well defined.

Management of meniscal injuries

Non-operative management

Literature have focussed well on non-operative therapy for meniscal injuries, specially the degenerative tears. Joint pain reduction and improved knee functions have been seen by exercises^{76,77}. Mangione et al⁷⁸ found that a 5-minute exercise bike session strengthened the quadriceps muscles and increased knee function by 35% in osteoarthritis patients. Herrlin et al⁷⁹ tested the findings of Mangione et al in patients with a torn medial meniscus. A total of 90 subjects with a medial meniscus tear were divided into two treatment groups⁸⁰, partial arthroscopic meniscal resection then either supervised exercise alone or after supervised exercise⁸¹. The exercise was designed to improve muscle strength, flexibility and proprioception for eight weeks. Various outcomes were assessed after eight weeks and after 6 months. At follow-up, significant improvements were assessed. The results showed that there

was no statistically significant improvement in either group, supporting the positive effect of exercise alone.

The authors advise beginning therapy with guided exercising alone. A subsequent investigation found that the groups' commonalities were constant over a five-year period⁸². Other multicenter studies of patients with meniscus showed similar results^{83, 208}. Final results for transition patients at 12 months of age. However, patients who underwent surgery were essentially similar, indicating that nonsurgical therapy is a reasonable initial mode of strategy.

Yim et al⁸⁴ also found that meniscectomy had no beneficial effect on exercise. Another study⁸⁵ monitored the effects of exercise therapy in 37 patients with an allergic tear of the medial meniscus found an improvement in knee function for up to 6 months, followed by a reduction and further development of the osteoarthritis. The decrease was also associated with the patient's body mass index. The literature also indicates that non-surgical treatment does not cause degenerative changes, but meniscectomy does^{86, 87}

Meniscectomy

The meniscus plays a very important role in the function of the knee joint. They perform load, shock absorption and stability as their functions. They also lubricate the joints, nourish the joint cartilage and help proprioception⁸⁸. Baratz et al⁸⁹ in his study found that total medial meniscectomy was beneficial in reducing intra-articular surface contact area by 75% and increasing contact pressure at the peak by 235%. Similar observations were made by Ahmed and Burke⁹⁰.

After total resection of the meniscus, during flexion, the meniscus pressure increases to 85% and the contact pressure increases to 100% -200%. When compared to medial meniscectomy, Roos et al.⁹¹ shown that the risk of osteoarthritis following lateral meniscectomy was higher than usual, possibly because the convexity of the lateral tibial plateau mirrors that of the distal femoral condyle.

Meniscal absence leads to increased tendency of point loading. Certain degree of congruity is provided by the medial tibial plateau's concavity even without a meniscus⁹⁴. The wide compartmental area is being covered by the lateral meniscus, due to which the greater compartment load is carried by lateral meniscus, when compared to medial meniscus, hence risking the occurrence of osteoarthritis ⁹⁵.

The biomechanics of the knee shows a lot of negative changes following total meniscectomy, hence it is more vital that meniscus should be preserved. The peripheral part of the meniscus is more important for biomechanics of the knee, hence preserving it is of utmost importance. Hence partial meniscectomy is more preferred for the knee ⁹⁶.

Northmore-Ball et al ⁹⁷ carried out a research comparing the effects of partial and open meniscectomy and concluded that, partial meniscectomy was more beneficial in yielding better patient satisfaction. Burks et al ⁹⁸, Jaureguito et al ⁹⁹ also concluded the same.

Partial meniscectomy is more beneficial for short term, however long-term effects are more of degenerative changes

A study ¹⁰⁰ was carried out on 136 patients, where the authors found that following partial meniscectomy, the second surgical rate was 22.8% and 53% of subjects presented with MRI changes of osteoarthritis. A study was carried on athletes¹⁰¹ where they found that at 4.5 years

of follow up, half of the patients were asymptomatic, but even one third turned out to be asymptomatic at the end of 14 years

Partial meniscectomy was the subject of research by Matsos and associates¹⁰². The scientists discovered that when there was no prior joint injury, great outcomes were achieved. Additionally, they discovered that arthroscopic partial meniscal excision was a long-term therapy that was both acceptable and successful for patients over the age of 40, particularly in those with minimal meniscal injury. Even there were less acceptable outcomes in a study¹⁰³ where there was arthroscopic resection of flap tears from the posterior horn of the medial meniscus and chondromalacia was extensively noticed after the treatment

Patients were randomly randomised to either debridement, endoscopic drainage, or sham operation in a study¹⁰⁴. The authors came to the conclusion that the results of endoscopic or laparoscopic debridement weren't any superior than sham surgery. However, due to a number of study-related flaws, including selection bias, the study's findings are not therapeutically relevant. All of the patients were men. Osteoarthritis severity was not rated.

Bernstein and Quach¹⁰⁵ reviewed the research and came to the conclusion that perhaps the criteria for inclusion were too open-ended and that arthroscopy performed under these circumstances should not be successful. Katz and colleagues studied¹⁰⁶ beneficial effects of partial meniscectomy, and the authors concluded that partial meniscectomy produced favourable outcomes. Although poor prognostic factors cannot be ignored, they include, but are not limited to, the degree of joint damage and impairment of physical function prior to knee surgery.

Predictors of good outcomes include age < 40 years, onset of symptoms <1 year, absence of patellar symptoms, absence of signs of degeneration on preoperative imaging, and absence of ligament damage¹⁰⁷

Meniscal repair

The functional importance of meniscus in biomechanics of knee function is well established in the literature. Hence owing to this, the aim in providing relief from osteoarthritis should focus more on preserving the meniscus, rather than resecting it. Hence, meniscal repair is of crucial importance than meniscectomy.

Date back, in 1980's, animal studies proved that healing capacity of meniscus in response to injury, especially at the peripheral rim. On 20 canine and 12 rhesus knee joints, Cabaud et al¹⁰⁸ repaired longitudinal median meniscal incisions with a single Dexon suture. Maximum amount of healing was seen in just a span of 4 months. This healing in- turn preserved the underlying articular cartilage. There was a presence of scar tissue histologically, composing of cartilage in its unorganised form, lacking sufficient amount of ground substance. Arnoczky and Warren¹⁰⁹ reported angiogenic responses at the completion of a partial transectal resection of the medial meniscus in 15 dogs. The healing was noticed with the presence of fibrovascular scar tissue. Peripheral synovial tissues played a pivotal role in initiating this response. The longitudinal incisions in the avascular portions did not heal.

For the healing of meniscus, a good amount of blood supply is needed. The areas where there is not sufficient blood supply do not heal, and further on are subjected to meniscectomy. Hence it is of importance to initiate the bleeding points in the avascular areas. External fibrin plugs have been used to stimulate restorative responses in nonvascular areas¹¹⁰. Trepination when

performed with meniscal repair produces excellent results. A study ¹¹¹ was carried out to study the beneficial role of trephination when added to meniscal repair and it was found that trephination, when performed along with meniscal repair reduced the re-tear rate.

Cannon and Vittori ¹¹² found that bleeding aids in meniscal repair. The literature also have focussed on the beneficial role of anterior cruciate ligament reconstruction. When meniscal repairs were performed in conjunction with anterior cruciate ligament reconstruction, a greater amount of healing rate was noticed. Additionally, it was found that acute repairs showed early healing when compared to chronic repairs. Johnson and colleagues reviewed 113 consecutive series of 8 patients who underwent arthroscopic-assisted repair of meniscal tears. 76% of a clinical success rate was seen. Minimum joint changes were seen in 8% of the operated knees, when compared to 3% in the contralateral knee. Similar results were observed by a study ¹¹⁴ with 10 years follow up. The authors estimated a 79% long-term survival rate and radiographic proof of biomechanical function for a successful meniscus repair.

Another study ¹¹⁵ showed that if the meniscal injuries are repaired early, they show promising results when compares to late repair. The authors also additionally found that isolated atraumatic medical meniscal tears should be better treated by meniscectomy.

Seo et al performed¹¹⁶ follow-up endoscopies in 11 patients who underwent endoscopic posterior root repair at 13 months after surgery, but none of the repairs healed. Another study ¹¹⁷ showed that after meniscal repair by Ortho-CT, the healing rate of the posterior segment was reduced compared with a midsegment tear.

There is lack of sufficient literature comparing meniscal repair and meniscectomy. It is quite tough to define whether a meniscal tear has recovered after surgery. MRI radiographs has its own limitations, being only 80% precise in locating meniscal tears in the initial period and even

very less accuracy post-operatively. A strong signal in the meniscal tissues might be a genuine tear, degeneration, oedema, or a healing tear after repair¹¹⁸

Stein and colleagues¹¹⁹ conducted trials comparing arthroscopic meniscal repair with arthroscopic partial meniscal repair for meniscal tears. Meniscal repair in longitudinal and vertical full-thickness tears greater than 1 cm or barrel-handle tears in the red-red to red-white region. Partial meniscal resection is a tear of the white-to-white area, or any tear that cannot be repaired due to its type and size. The authors concluded that patients who have undergone a simple meniscectomy usually return to normal work after a few weeks. However, to achieve success after meniscus repair, patients must wear a joint splint for up to 6 weeks, followed by extensive physical therapy. These limitations must be considered and evaluated on a case-by-case basis.

Meniscal repair techniques

The literature have well focussed on the benefits of repairing the meniscus, rather than excising it. Meniscal repair approaches have received more attention with the advent of arthroscopic surgery. An incision is given posteriorly to the collateral ligaments in repairing the meniscus, but thus is rarely performed because it has associated neurovascular injury

Rockbom and Gillquist¹²⁰ studied the functional outcome of open meniscal repair. The authors found an increased knee function in the meniscal repair group, however there was no beneficial radiographic changes seen. The failure rate noticed was 29%. The inside-out, outside-in and all inside repairs are the various other techniques for repairing the meniscus

A suture is passed either from the inside to the outside or the vice versa through arthroscopy and then the knot is tied ahead the capsule of the joint via a small incision. However, while using these techniques, the surgeons have to take the utmost care in preserving the

neurovascular structure, while giving accessory incisions, especially those found medially to the saphenous nerve and lateral to the peroneal nerve ¹²¹

The all-inside technique avoids the usage of accessory incisions. The usage of rigid biodegradable devices has yielded far better results. Grill et al ¹²² repaired meniscal injuries utilizing such devices and found an amazing success rate, and a declining need for surgery.

But after 6.6 years, this success rate fell to just 71% in a follow-up study¹²³. Biomechanical analyses ¹²⁴ of solid degradable products showed that the considerable reduction in rupture strength at week 2 was caused by hydrolysis. Wire-based devices allow for a more flexible attachment of the meniscus fragments and eliminate the difficulties that the rigid device was also linked to. The claimed success rate is 83% thus far^{125, 126}

Barber and Herbert ¹²⁷ noted that suture-based devices have greater pullout resistance than rigid devices. Double vertical sutures are the strongest. However, these suture-based devices suffer from some drawbacks, including increased cost, retention of polymer debris, cartilage damage, and a steep learning curve with high withdrawal rates during removal ¹²⁸. A systematic review was done by Grant et al¹²⁹, where he found no difference in subjective outcomes and clinical failure between inside and outside meniscal repair techniques. However, both methods have associated complications. The inside-out repair technique showed more neurological symptoms, while the all-in technique showed more implant-related complications.

METHODOLOGY

A cross sectional study was performed on the patients visiting the Outpatient Department of orthopaedics at a tertiary care and medical centre, Belagavi. We included a total of 84 symptomatic osteoarthritis patients

Statistical analysis

The data was subjected to statistical analysis using a Stata 10 software We applied ANOVA or a chi square test. A $P > 0.05$ was considered to give a statistical significance

Inclusion criteria

Skeletally mature individuals

Those presenting with Kellgren and Lawrence grade 2 and 3 knee osteoarthritis

Those signing the informed consent

Exclusion criteria

Rheumatoid arthritis patients

Knee pain due to past traumatic history

Those with a past history of intra-articular steroidal injections

Previous knee surgery history

Patients where MRI is contra-indicated

Prior commencing the study, an institutional ethical committee approval was taken and written signed informed consent was taken from the patients. The procedures of the study were explained to the patients. We, then took the anteroposterior weight bearing radiographs and lateral radiographs of the knee. Following which, grading for the osteoarthritis was done on a

scale of 0 to 4 as described by Kellgren and Lawrence. MRI was taken in those cases that presented with grade of 2 and 3.

MRI and grading of meniscal integrity:

1.5-tesla scanner (Siemens) was used to grade MRI regarding the knee. Images beside three branch sequences were added into the assessment concerning the fidelity of the menisci: sagittal yet coronal fat-saturated, proton-density-weighted, turbo spin-echo snapshots (repetition time, 3610 msec; echo time, 40 msec; slice thickness, 3.5 mm; interslice gap, zero mm; noise spacing, 13.2 msec; turbo factor, 7; field of view, a hundred and forty mm × a hundred and forty mm; matrix, 256 × 256) then sagittal T1-weighted spin-echo images (repetition time, 475 msec; noise time, 24 msec; slice thickness, 3.5 mm; interslice gap, zero mm; discipline concerning view, one hundred forty mm × a hundred and forty mm; matrix, 256 × 256).

The MRI scans were studied by one reader who had a background in orthopaedics; because of instances in which the diagnosis used to be no longer definitive, confirmation was once present out of a 2nd reviewer, who was a musculoskeletal radiologist. Readings were rendered for each of the meniscal segments (the terminal horn, the body, or the posterior horn) for both the medial or lateral menisci. Inter-observer agreement (kappa statistic) because of the discovery regarding meniscal harm was 0.72.

Readers were blinded to subject characteristics and clinical and radiographic data. Longitudinal, defined as a vertical tear perpendicular to the plane of the tibia and parallel to the circumferential fiber orientation; radial, defined as a vertical tear that began at the medial free edge and was perpendicular to both the tibial plateau and the circumferential orientation of the fibula; complex, defined as multiple tears in more than one setting; and the root, defined

as a tear at the posterior or anterior articular attachment ¹¹. Absence of meniscal tissue due to complete soaking, destruction, or surgical resection was recorded as meniscal destruction. In this report, we refer to a meniscal injury as a tear or destruction of a segment of the medial or lateral meniscus.

A meniscal tear showing contact with the inferior, superior, or free edge of the meniscal surface on at least two consecutive images increases the signal at MR¹². MRI shows horizontal and oblique tears. When the tear runs parallel to the tibial plateau and separates the meniscus into superior and inferior parts, it is called horizontal and also oblique parrot's beak, where it runs diagonally towards the surrounding collagen fibers. In subjects with a Kellgren-Lawrence score greater than 2, we also performed a knee radiograph (posterior) of the weight-bearing bones followed by MRI. If the Kellgren-Lawrence score was 2 or greater, tibiofemoral osteoarthritis was diagnosed.

RESULTS

Age distribution

Age in years	Frequency	Percentage
40 to 50	31	33.7
50 to 60	58	63
>60	3	3.2
Total	92	100

Table 1: Age-wise distribution of patients

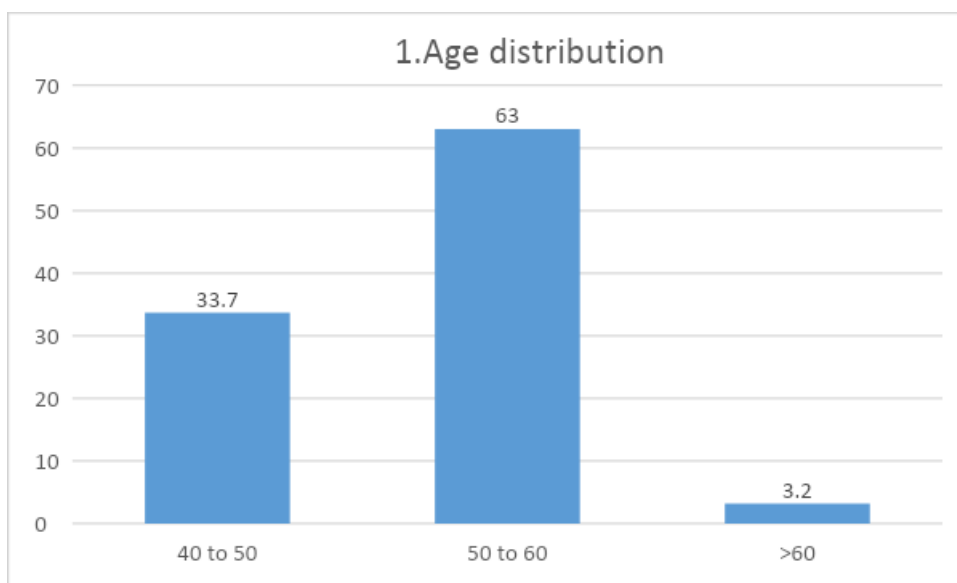


Figure 12: Mean age was 53.1 ± 5.5 years, ranging from 41 to 65 years. Majority 63% were in age group of 50 to 60 years.

Gender distribution

Gender	Frequency	Percentage
Male	45	49
Female	47	51
Total	92	100

Table 2: Gender-wise distribution of patients

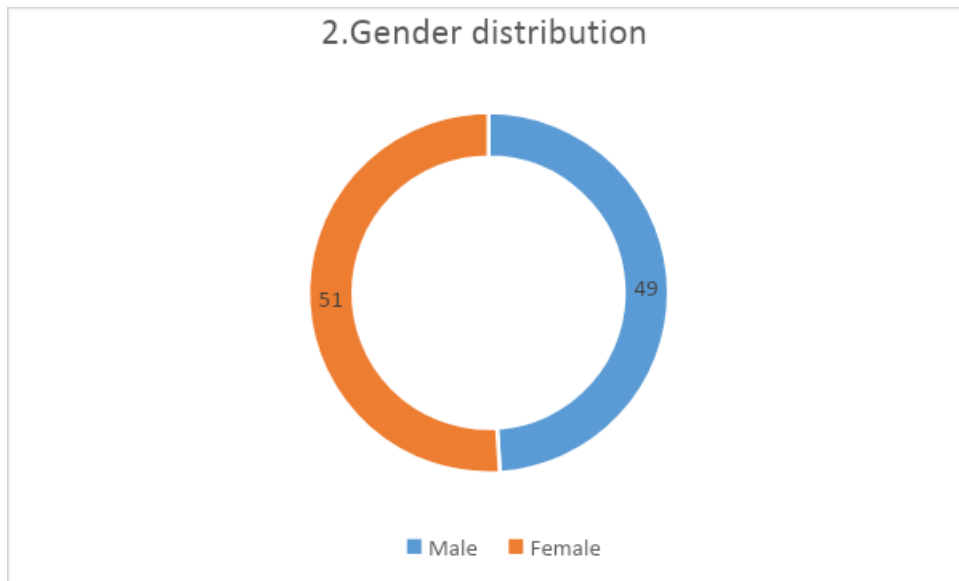


Figure 13: Majority 51% cases were females and 49% were males.

Distribution on affected side

Side	Frequency	Percentage
Right	48	52.2
Left	44	47.8
Total	92	100

Table 3: Distribution as per affected side

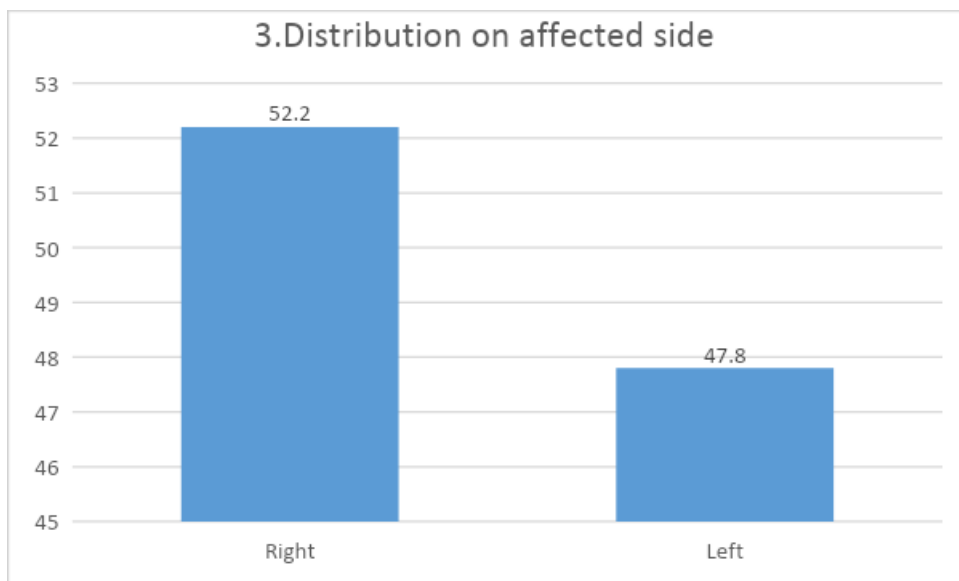


Figure 14: In majority of cases 52.2% right side was affected

Past history of knee pain

History	Frequency	Percentage
Ac On Chr Knee Pn	26	28.2
Chronic Knee Pain	44	47.8
NAD	8	8.7
Occasional Knee Pain	8	8.7
Trauma	4	4.3
Twisting Injury Knee	2	2.2
Total	92	100

Table 4: Distribution according to past history of patients



Figure 15: 28.2% had Acute On Chronic Knee Pain, 47.8% had chronic knee pain, 8.7% occasional knee pain, 4.3% had trauma and 2.2% had twisting knee injury.

OA grade

O.A. GRADE	Frequency	Percentage
0	5	5.4
1	1	0.9
2	62	67.3
3	24	23.2
Total	92	100

Table 5: Distribution according to OA grade.

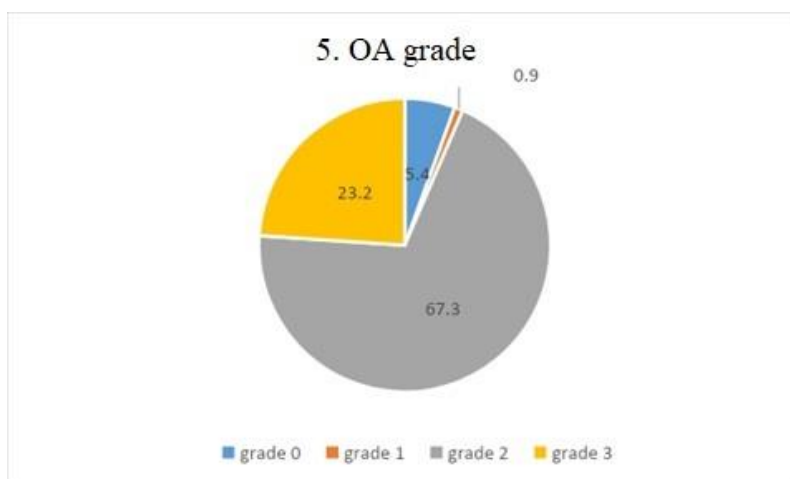


Figure 16: Majority 67.3% had OA grade 2, 23.2% had OA grade 3, 5.4% had grade 0 and 0.9 had grade

Meniscus injured

Meniscus	Frequency	Percentage
Medial	47	51.1
Lateral	4	4.3
Both	14	15.2
Nil	27	29.3

Table 6: Distribution according to the involved meniscus-medial/lateral

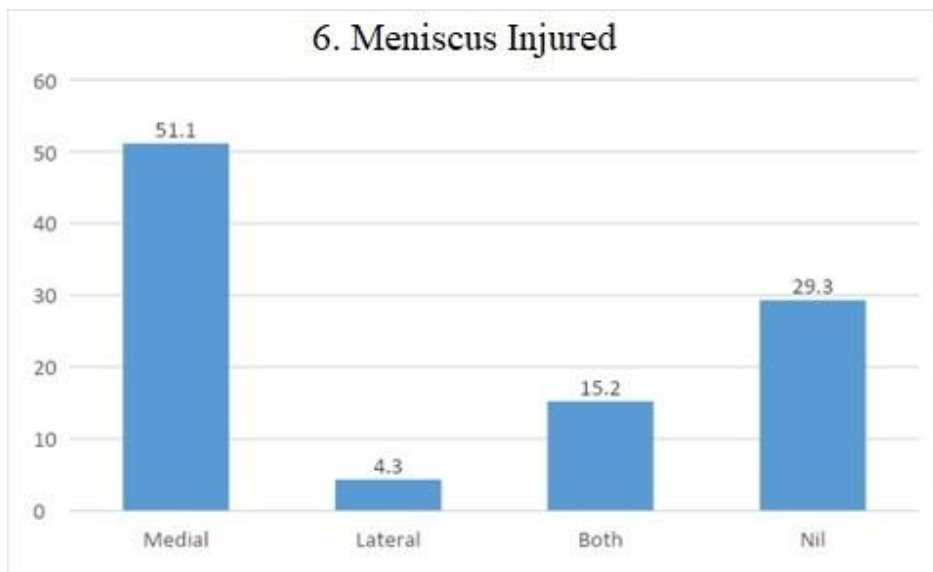


Figure 17: Majority 51.1% had medial meniscal injury, 15.2% had both medial and lateral and 4.3% had only lateral meniscal tear.

Tear location

Location	Frequency	Percentage
Anterior horn	14	15.2
Posterior	48	52.1
Body	5	5.4
Nil	27	29.3

Table 7: Tear location on the meniscus

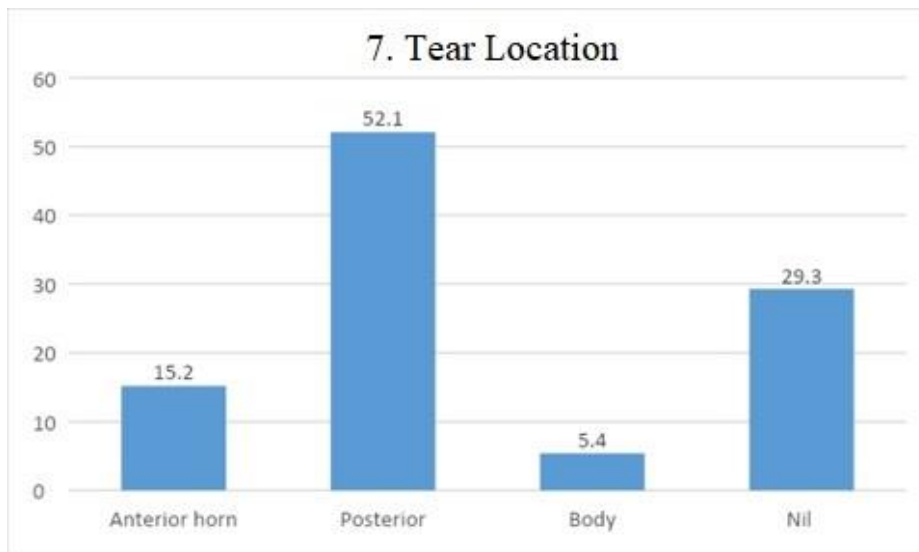


Figure 18: Majority 52.1% had posterior tear, 15.2% had anterior tear and 5.4% had body tear.

Tear type

Type	Frequency	Percentage
Horizontal	25	27.1
Myxoid	7	7.6
Radial	7	7.6
Vertical	1	1.1

Table 8: Frequency of tear types

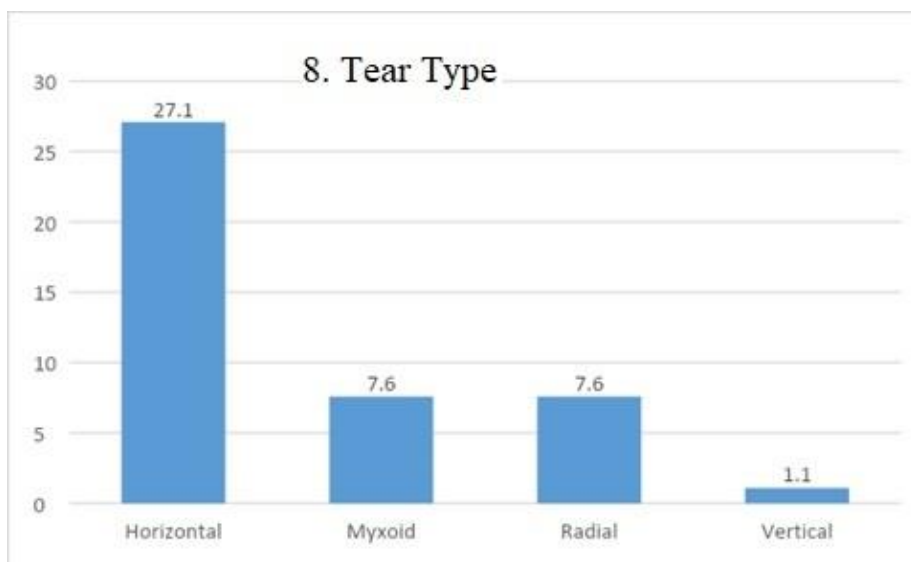


Figure 19: 27.1% had horizontal tear type, 7.6% had myxoid and radial type and 1.1% had vertical tear type.

Associated injuries

Injury	Frequency	Percentage
Mild	27	29.3
Moderate	8	8.7
Effusion	60	65.2
Cyst	16	17.3

Table 9: Associated injuries to intra-articular structures

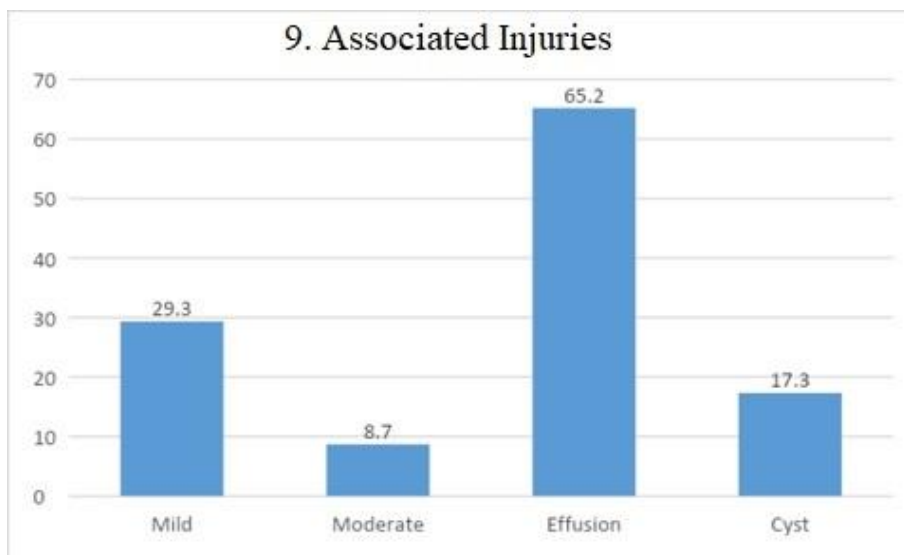


Figure 20: 65.2% had effusion, 29.3% had mild, 17.3% had cyst and 8.7% had moderate injuries.

Association between OA Grade and Meniscal tear

O.A. GRADE	Meniscus tear				Total
	Medial	Lateral	Both	Nil	
0	2	1	2	0	5
1	0	0	1	0	1
2	31	2	4	25	62
3	14	1	7	2	24
Total	47	4	14	27	92

Table 10: Showing the frequency of meniscal tear in each grade of OA knee.

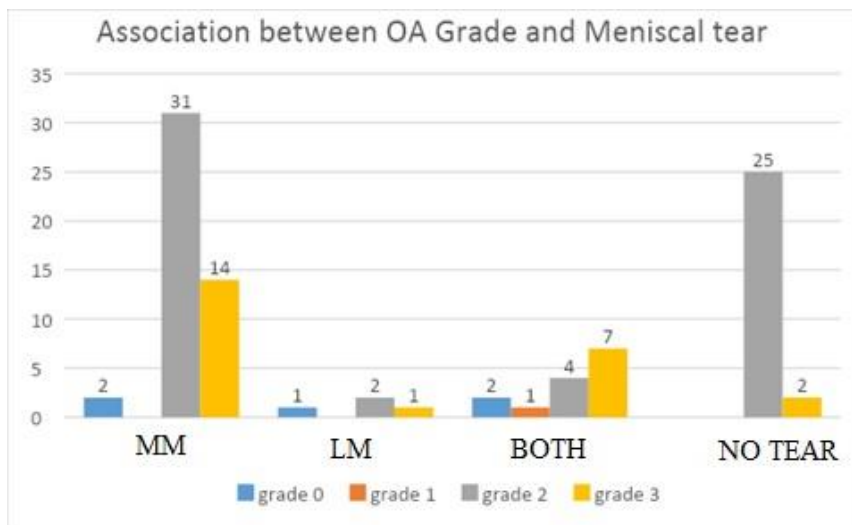


Figure 21: Shows percentage of meniscal tears in each grade OA knee.

In grade 2 OA knee, 59.67% had meniscal tears and in grade 3 OA knee, 91.66% had meniscal tears. As OA grade increases tear rate also increases.

It shows that medial tear were more as compared to lateral tear. As OA grade increases tear rate also increases. Applying chi square test, chi square value=24.7, degree of freedom 9 and p value is 0.003. as p value is <0.05, shows statistical significance.

DISCUSSION

Age distribution

Mean age was 53.1 + 5.5 years, ranging from 41 to 65 years. Majority 63% were in age group of 50 to 60 years. Guermazi A et al ¹³¹ showed that mean age was 62.3 years. Study by P. Kaukinen et al ¹³² showed that mean age was 59.9 years. Study by Crema et al ¹³³ showed that mean age was 57.3 years.

Gender distribution

Majority 51% cases were females and 49% were males. Guermazi A et al ¹³¹ showed that 55% were females and 45% were males. Study by P. Kaukinen et al ¹³² showed that 61.3% were females and 38.7% were males.

Side affected

In majority of cases 52.2% right side was affected. Study by Crema et al ¹³³ showed that mainly right side was affected. Same results were seen in present study.

History and type of injury

28.2% had Ac On Chronic Knee Pain, 47.8% had chronic knee pain, 8.7% occasional knee pain, 4.3% had trauma and 2.2% had twisting knee injury. Guermazi A et al ¹³¹ showed that 29% cases had knee pain. Study by P. Kaukinen et al ¹³² showed that 55% had knee pain.

OA grade

Majority 67.3% had OA grade 2, 23.2% had OA grade 3, 5.4% had grade 0 and 0.9 had grade 1. Study by P. Kaukinen et al ¹³² showed that 2.5% had grade 0, 26.3%, 25%, 25% and 21.3% had grade 1, 2,3,4 respectively. Study by Crema et al ¹³³ showed that 30% had grade 2, and 28% had grade 3. Similar findings that as grading increases the severity of the disease also increase were seen.

Meniscal tear and type

Majority 51.1% had medial meniscal injury, 15.2% had both medial and lateral and 4.3% had only lateral meniscal tear. Majority 52.1% had posterior tear, 15.2% had anterior tear and 5.4% had body tear. 27.1% had horizontal tear type, 7.6% had myxoid and radial type and 1.1% had vertical tear type. Culvenor AG¹³⁴ showed that 24% had cartilage defect and 10% had meniscal tear. Guerhazi A et al¹³¹ showed that 33% had lateral side affected, 24% had medial meniscal injury. Study by P. Kaukinen et al¹³² showed that 37.5% had knee injury, 27% had medial meniscal tear, 19% had lateral and 9% had anterior and 31% had posterior. Study by Crema et al¹³³ showed that 59% had medial meniscal injury, 9% had horizontal, 2% had vertical etc. majority 55% posterior injury. Horga, L.M., et al¹³⁵ showed that 30% had meniscal tear. 23% had horizontal, 2% had vertical etc.

Association between OA Grade and Meniscal tear

65.2% had effusion, 29.3% had mild, 17.3% had cyst and 8.7% had moderate injuries. Guerhazi A et al¹³¹ showed that 32% had effusion of joint. In grade 2 OA knee, 59.67% had meniscal tears and in grade 3 OA knee, 91.66% had meniscal tears.

Present study shows that medial tears were more as compared to lateral tear. As OA grade increases tear rate also increases. Applying chi square test, chi square value=24.7, degree of freedom 9 and p value is 0.003. as p value is <0.05, shows statistical significance. Study by Crema et al¹³³ showed similar results as present study.

SUMMARY

- Mean age was 53.1 + 5.5 years, ranging from 41 to 65 years. Majority 63% were in age group of 50 to 60 years.
- Majority 51% cases were females and 49% were males.
- In majority of cases 52.2% right side was affected
- 28.2% had Ac On Chronic Knee Pain, 47.8% had chronic knee pain, 8.7% occasional knee pain, 4.3% had trauma and 2.2% had twisting knee injury.
- Majority 67.3% had OA grade 2, 23.2% had OA grade 3, 5.4% had grade 0 and 0.9 had grade 1.
- Majority 51.1% had medial meniscal injury, 15.2% had both medial and lateral and 4.3% had only lateral meniscal tear.
- Majority 52.1% had posterior tear, 15.2% had anterior tear and 5.4% had body tear.
- 27.1% had horizontal tear type, 7.6% had myxoid and radial type and 1.1% had vertical tear type.
- 65.2% had effusion, 29.3% had mild, 17.3% had cyst and 8.7% had moderate injuries.
- In grade 2 OA knee, 59.67% had meniscal tears and in grade 3 OA knee, 91.66% had meniscal tears.
- It shows that medial tear were more as compared to lateral tear. As OA grade increases tear rate also increases. Applying chi square test, chi square value=24.7, degree of freedom 9 and p value is 0.003. as p value is <0.05, shows statistical significance.

CONCLUSION

Present study showed that meniscal lesions are common in osteoarthritic patients. The incidence increases with the severity of osteoarthritis. In these patients, radiological evidence of OA needs to be detected early. The OA knee evaluation on MRI is also necessary. Thus, every patient coming to OPD having knee pain and diagnosed with OA, should be evaluated with MRI.

Early diagnosis and treatment helps the patient to halt the disease and avoid further complications. Immobilization leads to muscle atrophy, joint stiffness and obesity, further leading to increased knee pain. Thus, patient enters a vicious circle. MRI being a good tool for investigating the disease, Orthopedician should advice the patients with knee pain for further workup to detect meniscal lesions. Treatment of these lesions leads to good prognosis of the disease.

SCOPE AND LIMITATIONS

This study has a limited sample size of 92 patients. Stronger evidence requires studies with larger sample size.

This study does not include the arthroscopic findings/follow-up of these patients.

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ANNEXURE 1: INFORMED CONSENT

TITLE OF THE STUDY: “AN OBSERVATIONAL STUDY EVALUATING THE PREVALENCE OF DEGENERATIVE MENISCAL INJURIES IN KNOWN CASES OF OSTEOARTHRITIS OF THE KNEE BY MAGNETIC RESONANCE IMAGING”

PRINCIPAL INVESTIGATOR: BL0120001

GUIDE:

This Informed Consent Form is for men and women who attend Dr PRABHAKAR KORE HOSPITAL AND RESEARCH CENTRE and who we are inviting to participate in an Observational Study aimed to evaluate meniscal injuries in knee osteoarthritis patients.

The title of the study is “AN OBSERVATIONAL STUDY EVALUATING THE PREVALENCE OF DEGENERATIVE MENISCAL INJURIES IN KNOWN CASES OF OSTEOARTHRITIS OF THE KNEE BY MAGNETIC RESONANCE IMAGING”

Name of Principal Investigator:

This Informed Consent Form has two parts:

- Information Sheet (to share information about the research with you)
- Certificate of Consent (for signatures if you agree to take part)

You will be given a copy of the full Informed Consent Form.

PART I: Information Sheet

INTRODUCTION:

I am BL0120001, PG Resident, JAWAHARLAL NEHRU MEDICAL COLLEGE, Belagavi. We are doing an Observational Study to determine the prevalence of meniscal injuries in knee osteoarthritis patients. I am going to give you information and invite you to be part of this research. You do not have

to decide today whether or not you will participate in the research. Before you decide, you can talk to anyone you feel comfortable with about the research.

There may be some words that you do not understand. Please ask me to stop as we go through the information and I will take time to explain. If you have questions later, you can ask them of me, the study doctor or the staff.

PURPOSE OF THE RESEARCH:

Knee osteoarthritis is a common orthopaedic problem that eventually causes significant morbidity to patients. Meniscal tears are frequently found during magnetic resonance imaging of osteoarthritic knees. Specific types of degenerative meniscal injuries are associated with osteoarthritis. Specific meniscal injuries are also associated with subsequent cartilage volume loss.

The advantages: Early intervention delays the acceleration of the disease course and yields better prognosis.

The purpose of this study is to determine the “PREVALENCE OF DEGENERATIVE MENISCAL INJURIES IN KNOWN CASES OF OSTEOARTHRITIS OF THE KNEE BY MAGNETIC RESONANCE IMAGING” in Orthopaedic department of KLE’S Dr. Prabhakar Kore Hospital and Medical Research Centre and Charitable Hospital, Belagavi from 1st January 2021 to 31st December 2021.

PARTICIPANT SELECTION:

Adults with age less than 60 years, who are cases of primary knee osteoarthritis i.e. not occurring to known causes like joint infection, trauma, surgery etc.

VOLUNTARY PARTICIPATION/ WITHDRAWAL:

Taking part in this study is voluntary. I may choose not to take part in this study, or if I decide to take part, I can later change my mind and withdraw from the study. My decision will not change the present or future health care or other services that I receive. The investigator may stop my participation in this study. I will inform about any important new findings that may change my willingness to continue to take part. If I choose not to take part in the study, I will receive the standard treatment for patients with my condition.

PROCEDURE:

A one-year hospital based Observational Study.

Patients in Outpatient Department after history and clinical examination diagnosed clinically with knee osteoarthritis who are willing to participate in the study will undergo knee X-Rays. Posteroanterior, weightbearing, fixed-flexion radiographs will be obtained followed by review of the images and grading the osteoarthritis on a scale of 0 to 4 (as described by Kellgren and Lawrence).

Among them, the patients with grade of 2 and 3 osteoarthritis will undergo MRI of the affected knee for the assessment of meniscal injury.

DURATION:

This is a one-year hospital based Observational Study.

RISKS:

There are no risks associated with this study.

BENEFITS:

Your participation is likely to help us find the answer to the research question. Early intervention delays the acceleration of the disease course and yields better prognosis.

COMPENSATION

As the subject voluntarily consents to be a part of the study, no compensation will be given.

CONFIDENTIALITY:

All information collected about the subject during the course of the study will be kept confidential to the extent permitted by the law. The code numbers will identify the patient in this research record. Information from this study may be presented but the subjects' identity will be confidential in any publication.

SHARING THE RESULTS:

The knowledge that we get from doing this research will be shared with you through journal publications. Confidential information will not be shared.

RIGHT TO REFUSE OR WITHDRAW:

You do not have to take part in this research if you do not wish to do so. You may also stop participating in the research at any time you choose. It is your choice and all of your rights will still be respected.

WHO TO CONTACT:

If you have any questions, you may ask them now or later, even after the study has started. If you wish to ask questions later, you may contact any of the following:

BL0120001, PG resident JNMC, Belagavi.

This proposal has been reviewed and approved by ETHICS COMMITTEE JNMC, Belagavi, which is a committee whose task it is to make sure that research participants are protected from harm. If you wish to find about more about the IRB, contact [name, address, telephone number.].

PART II: CERTIFICATE OF CONSENT

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Print Name of Participant _____

Signature of Participant _____

Date _____ Day/month/year

If illiterate

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print name of witness _____

Thumb print of participant

Signature of witness _____

Date _____ Day/month/year

STATEMENT BY THE RESEARCHER/PERSON TAKING CONSENT:

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that the following will be done:

The patients diagnosed clinically with knee osteoarthritis will undergo knee X-Rays. This will be followed by review of the images and grading the osteoarthritis on a scale of 0 to 4 (with increasing findings/severity).

Among them, the patients with grade of 2 and 3 osteoarthritis will undergo MRI of the affected knee for the assessment of meniscal injury.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Print Name of Researcher/person taking the consent_____

Signature of Researcher /person taking the consent_____

Date _____ Day/month/year

VOLUNTARY PARTICIPATION / WITHDRAWAL

Taking part in this study is voluntary. I may choose not to take part in this study, or if I decide to take part, I can later change my mind and withdraw from the study. My decision will not change the present or future health care or other services that I receive. The investigator may stop my participation in this study. I will tell of any important new findings that may change my willingness to continue to take part. If any enquiries in the future or in case of study related injury or illness, you may contact following person:

PRINCIPAL INVESTIGATOR:

BL0120001,
PG. RESIDENT,
DEPARTMENT OF ORTHOPAEDICS,
KAHER, JAWAHARLAL NEHRU MEDICAL COLLEGE,
NEHRU NAGAR,
BELAGAVI – 590010

GUIDE:

PROFESSOR,
DEPT. OF ORTHOPAEDICS,
KAHER J. N. MEDICAL COLLEGE,
BELAGAVI – 590010

If you still have any queries please contact:

DR. HARSHA HEGDE
CHAIRPERSON,
JNMC IEC &
SCIENTIST D, ICMR,
NATIONAL INSTITUTE OF TRADITIONAL MEDICINE,
BELAGAVI- 9480422500

ANNEXURE 2: CASE PROFORMA

“AN OBSERVATIONAL STUDY EVALUATING THE PREVALENCE OF DEGENERATIVE MENISCAL INJURIES IN KNOWN CASES OF OSTEOARTHRITIS OF THE KNEE BY MAGNETIC RESONANCE IMAGING”

PATIENT NO:

OP/IP NO:

NAME:

AGE:

SEX:

ADDRESS:

OCCUPATION:

DOA:

CHIEF COMPLAINTS:

PRESENTING COMPLAINTS:

Pain in the knee

Swelling

Stair climbing difficulty

HISTORY OF PRESENT ILLNESS:

History of pain during squatting or while sitting cross legged?

Any history of acute knee pain

Any history of night pain

Any history of trauma to knee

HISTORY OF PAST ILLNESS:

Any history of sports related knee injury

a) History of Diabetes Mellitus, Hypertension, Asthma, Rheumatoid Arthritis, Tuberculosis and other chronic illness

Yes

No

Previous history of any medication received:

PERSONAL HISTORY:

Diet: Veg/ Nonveg/Mixed

Appetite: Increased or Decreased

Habits: Smoking/ Alcohol /Tobacco chewer / others

Bowel & Bladder Habits: Normal or Abnormal

FAMILY HISTORY:

GENERAL PHYSICAL EXAMINATION:

Built: Well /Moderate/Poor

Weight:

Temperature:

Pulse:

Blood Pressure:

Respiratory Rate:

Pallor

Cyanosis

Icterus

Clubbing

Pedal oedema

Lymphadenopathy

SYSTEMIC EXAMINATION:

Cardiovascular System Examination:

Respiratory System Examination:

Per Abdomen Examination:

Central Nervous System Examination:

ANNEXURE 3: PHOTOGRAPHS



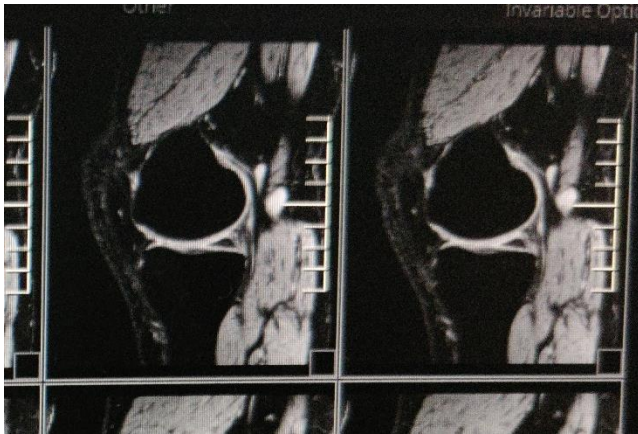
Figure 22: a) AP weight bearing and lateral radiographs of the left knee of a 59-year-old female patient showing grade 2 Osteoarthritis.



b) MRI knee of the same patient showing grade 3 complex tear in the outer 1/3rd of the body of medial meniscus.



Figure 23: a) AP and lateral weight bearing radiographs of a 55-year-old male patient having pain in left knee since 6 months. It shows grade 2 OA knee.



b) MRI of the same patient showing a linear tear in the posterior horn of medial meniscus.

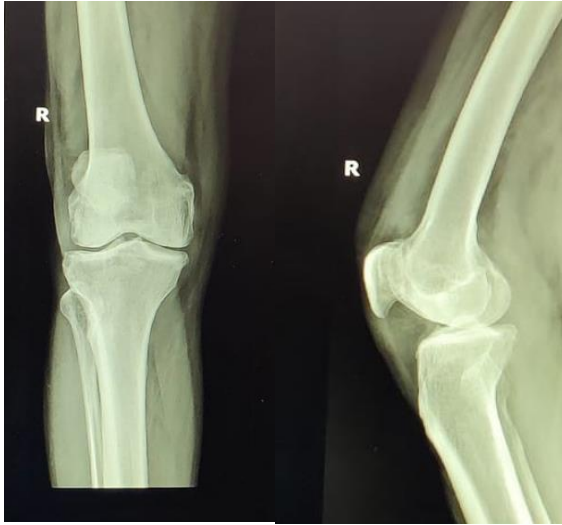


Figure 24: a) AP weight bearing and lateral radiograph of right knee of a 57-year-old male showing grade 2 OA knee.



b) MRI knee of the same patient showing myxoid degeneration of the posterior horn of medial meniscus

MASTER CHART

ANNEXURE - IV MASTER CHART

S. NO	ON AGE	SEX & SIDE	HISTORY	O.A. GRADE	MEDIAL/LATERAL MENISCUS	TEAR LOCATION	TEAR TYPE	ASSOCIATED INJURIES
1		57 M/ R 1			MED MEN	POST HORN		
2		43 F/	TWISTING INJURY KNEE	2	NI	NI	LYRHOID DEGENERATION	MILD EFFUSION
3		45 F / LT knee	ACUTE ON CHRONIC PAIN KNEE		LAT MEN	ANT & POST HORN	HORIZ TEAR IN ANT & POST	MILD Effusion MOD EFFUSION, LCL SPRAIN
4	46 YR	M / RT knee	ACUTE KNEE PAIN	2	MED MENISCUS	POST HORN	HORIZ TEAR	ACL TEAR, LCL SPRAIN, BAKERS CST
5	55YR	M/ LT knee	CHRONIC KNEE PAIN	2	MED MEN	POST HORN	VERTICAL TEAR	PARTIAL ACL TEAR, CAPITELLAE GR 2
6		51 F/ LT knee	PAIN	2	MED MENISCUS	ANT & POST HORN	VERTICAL TEAR	NI
7		47 F/ LT knee	CHRONIC KNEE PAIN	1	MED MEN; LAT MEN	POST HORN TO POST CORN OF MED MEN,	RADIAL TEAR OF HAM, SMALL RADIAL TEAR OF LM	
8		52 M/ Lt knee	H/O FALL 1 MONTH	2	MED MEN	POST ROOT	RADIAL TEAR WT SUBURN	CHONDRO PATELLAE, MOD EFFUSION
9		49 F/ Lt knee	H/O FALL X 1 WEEK	2	NI	NI	GR 2 DEGEN LONGIT TEAR	MFL AVULSION, LOOSE BODY
10		45 F/ RT knee	ACUTE KNEE PAIN		MED MEN; LAT MEN	POST HORN, POST CORN OF POST HORN & B	GR 2 DEGEN LONGIT TEAR	ACL SPRAIN, GR 1 CM PATELLA MILD EFFUSION
11		59 F/ Lt knee	CHRONIC KNEE PAIN	2	MED MEN	POST HORN & LAMIN T OF POST HORN & B	COMPLEX TEAR	SMALL BAKERS CST, MILD EFFUSION
12		57 M/ RT knee	H/O RT KNEE PAIN X 1 WEEK		MED MEN & LAT MEN	ANT & POST HORN OF M.M., POST HORN	HORN & VER POST HORN, VER ANT. HORN OF M.M., MXY DEG OF LM	
13		54 M/ RT knee	H/O RT KNEE PAIN X 2YRS	2	MED MEN	ANT & POST HORN OF M.M., POST HORN OF	COMPLEX TEAR	MINIMAL EFFUSION
14		56 F/ RT knee	CHRONIC KNEE PAIN 2YRS	2	MEDIAL MENISCUS	POSTERIOR HORN	LACOID DEGENERATION	GR 1 SPRAIN OF mcl, MILD TO MOD JOINT EFFUSION
15		50 F/ RT knee	H/O RT KNEE PAIN X 2YRS	2	LAT MENISCUS	ANTERIOR HORN	HORIZ TEAR	ACL TEAR & MINIMAL EFFUSION
16		48 F/ Lt knee	H/O LT KNEE PAIN 2YEARS	3	MED MEN	ANTERIOR HORN	RADIAL TEAR	MENISCAL CST
17		45 M/ RT knee	TWISTING KNEE INJURY	2	MED MENISCUS	POST HORN	HORIZ. TEAR	PAPA MENISCAL CST POST HORN OF MEDIAL MENISCUS
18		52 F/ RT knee	AC ON CHR KNEE PN 3YRS	2	NI	NI	NI	PARTIAL ACL TEAR, CMP, MILD EFFUSION
19		52 F/ Lt knee	AC ON CHR KNEE PN 3YRS	2	MED MEN	POST HORN	DEGENERATIVE TEAR	BAKERS CST MCL/FEM ATTACHMENT SPRAIN, EFFUSION
20		59 F/ Lt knee	CHRONIC KNEE PAIN 4 YRS	2	NI	NI	NI	partial acltear, old changes, effusion, Gr 1 sprain of MCL
21		56 M/ RT knee	ACUTE ON CHRONIC KNEE PN: 2M ON	3	MEDIAL MENISCUS	POST HORN	HORIZONTAL TEAR	DID and mild effusion
22		50 F/ RT knee	CHRONIC KNEE PN 4YRS	2	NI	NI	NI	DID, MODERATE JOINT EFFUSION
23		65 M/ RT knee	Acute On Chronic knee Pa	3	Lar meniscus	POST HORN	HORIZONTAL TEAR	DID, JT EFFUSION, BAKERS CST, SPRAIN OF MCL
24		59 F/ Lt knee	CHRONIC KNEE PN 5YRS	3	NI	NI	NI	DID & Mid Joint Effusion
25		60 M/ Lt knee	ACUTE ON CHRONIC KNEE PN	3	Medial Meniscus	Post Horn MedMen, Degen Post Horn LAT M	Horizontal Tear	DID & Mid Joint Effusion
26		51 F/ Lt knee	Chronic knee pn	2	Medial Meniscus	Posterior horn	Horizontal Tear	Complete tear of ACL, DID
27		41 M/ Lt knee	Acute on chronic knee pn	2	Medial Meniscus	body	Extrusion	DID, Minimal effusion
28		59 M/ RT knee	Chronic knee Pain 6yrs	3	Med Meniscus	Posterior horn	Radial tear	Complete tear of ACL, DID
29		55 F/ Lt knee	Acute on Chronic knee pain	3	Medial Meniscus	Posterior horn	Horizontal tear	Advanced OA, Mild joint effusion
30		60 F/ Lt knee	Chronic knee Pain 5 yrs	2	Medial Meniscus	Posterior horn	Horizontal tear	Advanced OA, Mild joint effusion

Bilateral degenerative joint disease.

ANNEXURE - IV MASTER CHART

31	59 M/Rt knee	Acute on chronic knee pain	3	medial meniscus	posterior horn		Horizontal and radial	Degenerative joint disease, Mild joint effusion, degeneration of lateral meniscus
32	57 F/ Rt knee Rt	Chronic knee pain	3	lateral meniscus & medial meniscus	anterior horn(LM), posterior horn (MM)	Complete tear (LM), Horizontal Tear(MM)	Complete tear (LM), Horizontal Tear(MM)	Chial Patella, Mild Effusion of knee Rt
33	56 F/Rt knee	Acute on chronic knee pain	2	Lat Men & Med Men	Post Horn(LM) Post Horn(MM)	*bilucoid degeneration (MM) Horizontal Tear (LM)	Mucoid degeneration of ACL, DID with effusion	Mucoid degeneration of ACL, DID with effusion
34	48 F/Left knee	Chronic knee pain	2	nil	nil	nil	nil	DID, Myxomatous Degeneration of ACL, Moderate Rt Effusion, Bakers cyst
35	56 F/ Rt knee	occasional knee Pain	2	medial meniscus	posterior horn	Bryomatous degeneration	Degenerative tear	DID Changes, Mild Joint Effusion
36	52 F/Left knee	Bill knee pain	2	medial meniscus	posterior horn	Degenerative tear	Degenerative tear	Mucoid degeneration/partial tear of ACL, Chial Patella, Mild Effusion
37	53 F/ Rt knee	Bill knee Pain	2	nil	nil	nil	nil	Mucoid degeneration/partial tear of ACL, Mild joint effusion
38	60 M/ Rt knee	Occasional knee Pain	2	nil	nil	nil	nil	Mucoid degeneration/partial tear of ACL, Chial Patella, Mild Effusion
39	60 m/Rt knee	Chronic knee Pain	3	Medial Meniscus	Post Horn	Gr 1 degeneration	Gr 1 degeneration	Degenerative joint disease, Minimal joint effusion
40	56 M/Lt knee	Acute on chronic knee pain	3	Medial Meniscus	Anterior Horn	Horizontal Tear	Horizontal Tear	DID, Minimal Rt effusion, Bakers Cyst
41	47 M/ Rt knee	Acute on Chronic knee Pain	2	Medial & Lateral Meniscus	Posterior horns of both MM & LM	Complex tear MM & Horizontal Tear LM	Complex tear MM & Horizontal Tear LM	DID, Bakers Cyst, Sprain of MCL
42	57 M/Lt knee	Chronic knee Pain	2	Medial Meniscus	Ant & Post horns	Horizontal Tears	Horizontal Tears	DID, Joint effusion
43	59 F/Lt knee	Chronic knee Pain	2	nil	nil	nil	nil	DID, Moderate Effusion, Partial ACL tear, Gr 1 sprain of MCL
44	54 M/ Lt knee	Acute on Chronic knee Pain	2	Medial Meniscus	Posterior horn	Complex Tear	Complex Tear	DID, Bakers Cyst, Gr 1 sprain of MCL
45	57 M/ Rt knee	Ch knee Pain	3	Medial Meniscus	Anterior Horn	Bucket Handle tear	Bucket Handle tear	Significant DID, Partial intra substance tear of ACL
46	59 M/ Lt knee	Chronic knee pain	2	nil	nil	nil	nil	DID with mild joint effusion
47	50 F/ Rt knee	Chronic knee pain	2	nil	nil	nil	nil	DID with moderate knee effusion
48	50 M/Rt knee	Chronic knee Pain	2	Med & Lat Menisci	PH of MM & Ant of LM	Horizontal Tears	Horizontal Tears	DID, Partial tear of ACL, Gr 1 sprain of MCL
49	58 M/Lt knee	Acute on chronic knee pain	2	Med Meniscus	Posterior horn	Horizontal Tear	Horizontal Tear	DID, Moderate Effusion, Partial ACL Tear
50	55 F/Lt knee	Acute on Chronic knee Pain	2	Medial Meniscus	Posterior Horn	Horizontal Tear	Horizontal Tear	DID with minimal joint effusion
51	59 M/Lt knee	Acute on chronic knee pain	2	Medial meniscus	Posterior horn	Root tear with extrusion	Root tear with extrusion	DID, with Mod Joint effusion, Partial ACL tear, Avulsion of MCL
52	45 M/Rt knee	CHRONIC KNEE PAIN	2	Medial Meniscus	Posterior horn	Horizontal Tear	Horizontal Tear	DID, Parameniscal cyst
53	55 F/Rt KNEE	Acute on Chr knee Pain	2	Medial Meniscus	Posterior horn	Root tear with extrusion	Root tear with extrusion	DID, Mild Joint Effusion, Mucoid degeneration of ACL
54	50 M/ Rt knee	Chronic knee pain	2	Medial Meniscus	Posterior horn	Root tear with extrusion	Root tear with extrusion	DID, Minimal Effusion, Gr 1 sprain of MCL
55	58 F/ Rt knee	Chronic knee pain	3	Med Men & Lat Men	Post horn of MM	Radial tears of MM & Root tear of LM	Radial tears of MM & Root tear of LM	DID, Complete tear of ACL, Bakers cyst, Mild joint effusion with synovial thickening
56	60 F/ Rt knee	Chronic knee pain	3	Med & Lat Menisci	Ant & PH OF MM, PH OF LM	At degenerative tears	At degenerative tears	DID, Minimal effusion, Deg tear of ACL
57	45 M/Lt knee	Chronic knee Pain	2	nil	nil	nil	nil	DID changes
58	45 M/Rt knee	Chronic knee Pain	2	nil	nil	nil	nil	DID changes
59	58 F/Lt knee	Chronic knee Pain	2	nil	nil	nil	nil	DID changes
60	42 F/Lt knee	Chronic knee Pain	2	nil	nil	nil	nil	DID changes
61	42 F/Rt knee	Chronic knee Pain	2	nil	nil	nil	nil	DID changes

ANNEXURE – IV MASTER CHART

63	51 M/Rt knee	Ac on Chr knee pain	3	Medial Meniscus	Posterior horn	Degenerative tear	D/D, Mild effusion, Bakers cyst, Mucoid Degeneration of ACL & PCL
64	57 M/Lt knee	chronic knee Pain	3	Medial meniscus	Posterior horn	Effusion	D/D, Partial tear of ACL
65	60 M/ Rt knee	Chronic knee pain	3	Med Men & Lat Men	PH of MM, AH of LM	Myxoid degeneration	D/D, Knee effusion, Myxoid deg of ACL
66	46 F/Lt knee	Acute on Chronic knee pain	3	Medial Meniscus	Posterior horn	Horizontal tear n meniscal cyst	D/D with effusion, Mucoid deg of ACL, Sprain of MCL & LCL
67	46 F/Lt knee	Chronic knee Pain	2	nil	nil	nil	D/D with mild knee effusion
68	51 M/Rt knee	Acute on chronic knee pain	2	nil	nil	nil	D/D, Grade 1 ACL lesion, Minimal effusion
69	42 M/Rt knee	Chronic knee pn	2	medial meniscus	posterior horn	myxoid degeneration	D/D changes, CMP, Gr 3!
70	60 F/Rt knee	Acute on Chronic knee pn	2	medial meniscus	anterior horn	radial tear	D/D changes with effusion (minimal), Complete tear ACL, Partial tear PCL, Gr 2 tear of LCL
71	50 M/ Rt knee	chronic knee pain	2	medial meniscus	body	complex tear with extrusion	D/D changes, Mild effusion, Bakers cyst
72	48 F/Rt knee	Chronic knee pain	2	medial meniscus		Extrusion	D/D, Effusion (minimal), Mucoid degeneration of ACL
73	59 F/Lt knee	Chronic knee pain	3	nil	nil	nil	D/D, Moderate effusion, synovial thickening, Bakers cyst, Gr 1 sprain fem art, MCL
74	50 M/Lt knee	chronic knee pain	2	med men & lat men	AH of MM, body n AH of LM	Horizontal tear MM, Gr 2 b signal changes of LM	D/D, Mild to mod effusion, Bakers cyst, Gr 1 sprain of LCL
75	59 M/Lt knee	Acute on chr knee pain	3	medial meniscus	body	degenerative tear	D/D, Mild joint effusion; mucoid degeneration of ACL
76	46 F/Lt knee	acute sport knee pain	2	nil	nil	nil	D/D, mild joint effusion; Gr 1 sprain of LCL
77	55 F/Lt knee	acute on chronic knee pain	2	medial meniscus	posterior horn	root tear with extrusion	D/D
78	58 M/Lt knee	chronic knee pain	3	medial meniscus	posterior horn n body	complex tear	Complete tear of ACL, D/D with minimal joint effusion
79	58 M/Rt knee	chronic knee pain	3	medial meniscus	posterior horn n body	complex tear	partial tear of ACL, D/D with minimal joint effusion
80	59 M/Rt knee	chronic knee pain	2	nil	nil	nil	D/D
81	49 F /Lt knee	TRAUMA	2	Lat Meniscus	Ant horn n body	complex tear	Degenerative Joint Disease
82	54 M/Rt knee	acute on chronic knee pain	3	med men & lat men	AH of LM,	extrusion of lat men	D/D, Gr 1 sprain of MCL
83	57 m/ Lt knee	occasional chr knee pain	2	nil	nil	nil	D/D, Mild joint effusion
84	55 M/Lt knee	Acute on chr knee pn	2	medial meniscus	posterior horn	horizontal tear	D/D with minimal joint effusion, Gr 1 sprain of LCL
85	53 F/Rt knee	GCT UE TIBIA	2	medial meniscus	ant horn n post horn	myxoid degeneration	D/D with mild knee effusion
86	51 F/Lt knee	chronic episodic knee pain	2	medial meniscus	posterior horn	myxoid degeneration	D/D, mild knee effusion
88	51 F/Rt knee	chronic episodic knee pain	2	medial meniscus	ant horn n post horn	tears of ant horn n post horns of med men n lat	D/D, Moderate joint effusion; partial tears of ACL and PCL
89	59 M/Rt knee	chronic knee pain	3	Med men n lat men	nil	nil	D/D changes, Gr 1 sprain of MCL
90	58 M/Rt knee	episodic knee pain	2	nil	anterior horn	horizontal tear with myxoid degeneration	partial tear of ACL, D/D, Mild joint effusion,
91	55 F/Rt knee	acute on chronic joint pain	2	medial meniscus	nil	nil	D/D, Moderate joint effusion, Complete tear of ACL, Mucoid degeneration of PCL,
92	56 M/Lt knee	Acute on Chronic knee pain	2	nil	nil	nil	