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Role of MR Imaging in Evaluation of Knee Pain in Our Tertiary Care Center

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Abstract: **Background**: ***Knee pain is a common condition affecting patients across all age groups and can arise from various causes. MRI of the knee is a frequently used diagnostic tool for identifying and assessing both acute and chronic injuries involving internal structures of the knee. It plays a key role in diagnosing and managing meniscal, ligamentous, cartilaginous, and synovial abnormalities. This article provides an overview of current clinical practices for MRI interpretation in evaluating these common knee disorders.*** ***Aims**: The primary aim of this observational study is to assess the effectiveness of MRI in diagnosing internal knee derangements in patients presenting with knee pain. The study focuses on identifying common injuries such as meniscal tears, ligament sprains, and cartilage abnormalities, and evaluates the role of MRI in guiding subsequent management and treatment decisions.* ***Methods**: Patients with knee pain referred for MRI were scanned using a Siemens Magnetom Sempra 1.5 Tesla system with dedicated knee coils. Standardized knee protocols, including sagittal, coronal, and axial sequences, were used to obtain images of the menisci, ligaments, tendons, and cartilage. Detailed MRI findings were documented, focusing on abnormalities such as meniscal tears, ligament injuries (ACL, PCL, MCL, LCL), and cartilage damage.* ***Results**: The MRI findings revealed a variety of internal knee derangements, with meniscal tears and ACL injuries being the most common. Several patients demonstrated degenerative changes consistent with osteoarthritis, while others exhibited trauma-related injuries such as ligament sprains and cartilage defects. MRI proved crucial in detecting these abnormalities, which were often not visible on initial X-rays.* ***Conclusion**: MRI is a highly valuable diagnostic tool for assessing internal knee derangements in patients with knee pain. It provides superior visualization of soft tissue structures compared to other imaging modalities, aiding in the accurate diagnosis and management of knee injuries. The findings of this study emphasize the importance of MRI in the diagnostic process and its role in improving patient outcomes.*

Keywords: MRI, Menisci tear, ligament, ACL, PCL, MCL, LCL

1. Introduction

MRI of the knee is a frequently used diagnostic tool to detect and evaluate both acute and chronic injuries involving the internal structures of the knee. It plays a crucial role in guiding patient management. While X-rays are typically the first imaging choice for diagnosing knee injuries, MRI provides a more detailed view of the bones and soft tissues. MRI is particularly valuable for identifying injuries to the meniscus, cruciate and collateral ligaments, and extensor mechanisms, as well as assessing damage to cartilage, tendons, and the synovial lining.

2. Materials and Methods

In this prospective observational study, knee MRI scans were acquired using a Siemens Magnetom Sempra 1.5 Tesla system with dedicated knee coils, ensuring optimal image quality. The MRI protocol included three orthogonal planes (axial, coronal, and sagittal) with a combination of fluid-sensitive sequences, such as T2-weighted (T2W) fat-saturated (FS) or proton density-weighted (PDW) FS sequences, along with non-fat-saturated (NFS) T1-weighted (T1W) sequences. Coronal and sagittal PDW sequences, known for providing superior signal-to-noise ratio (SNR) and spatial resolution, were utilized due to their higher sensitivity in detecting meniscal pathology compared to T2W sequences. T2W imaging was employed to better visualize bone and soft tissue oedema-like signal changes. Non-fat-saturated T1W sequences were included to assess bone marrow fat and identify marrow-replacing processes or fracture lines. The protocol adhered to American College of Radiology (ACR) guidelines, with a maximum field-of-view of 16 cm, a slice thickness not exceeding 4 mm, a maximum inter-slice gap of 50%, and a phase-frequency matrix of at least 192 × 256 (1).

Meniscus

Normal anatomy and physiology

The menisci are C-shaped fibrocartilaginous structures located on the medial and lateral tibial plateaus (Fig 1a). Each meniscus is anatomically divided into the anterior horn, body, and posterior horn. The anterior and posterior horns are anchored to the intercondylar area of the tibia via the anterior and posterior meniscal root ligaments. The menisci play a crucial role in enhancing knee joint stability, distributing axial loads, absorbing mechanical stress, and aiding in the lubrication and nutrition of the articular cartilage [2, 3]. Injuries to the menisci predispose patients to adjacent cartilage degeneration and osteoarthritis from increased axial and sheer stress [4]. Studies have shown that 50% of the medial compartment load and 70% of the lateral compartment load are transmitted through the menisci [2], and removal of the menisci increases contract stress by 100% in the medial compartment and between 200 and 300% in the lateral compartment [2, 5].

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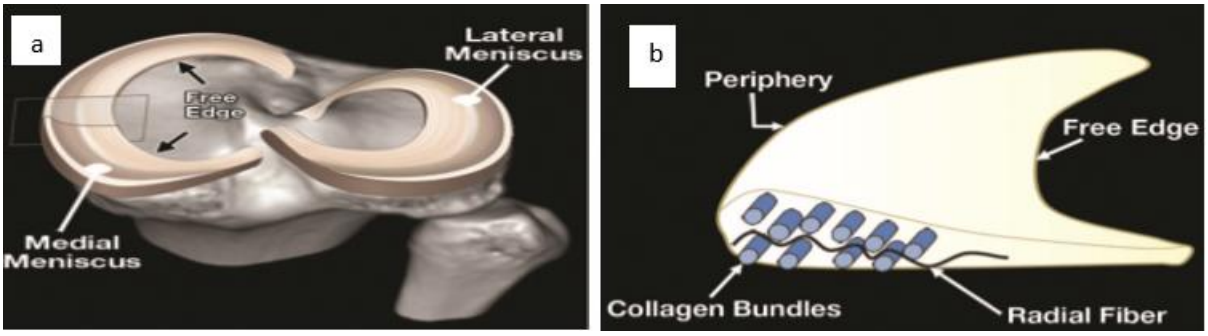

Figure 1: Normal meniscal anatomy. (a) Three-dimensional model (left) and cross-sectional diagram (right) of the semilunar meniscus highlight the concave surface, which conforms to the morphology of the femoral condyles. The result is increased contact area and a tapered central free edge. Circumferentially oriented collagen bundles (blue cylinders) provide hoop strength and course parallel to the long axis of the meniscus, while radial fibers form a lattice and provide additional structural support.

The menisci are composed of fibrochondrocytes, water, type I collagen, proteoglycans, and glycoproteins [2]. Collagen fibers are arranged circumferentially, with interwoven radial fibers, providing the hoop strength necessary to withstand axial forces and prevent outward displacement (Fig 1b) [5]. Blood supply is limited, primarily from the medial, lateral, and middle geniculate arteries, with the outer 50%, known as the "red zone, " being well-vascularized [2]. The medial meniscus is broader than the lateral, helping to distribute the greater weight-bearing load in the medial compartment [2].

The posterior horn of the medial meniscus is wider than the anterior horn and covers about 60% of the medial tibial plateau [2]. The transverse intermeniscal ligament connects the anterior horns of both the medial and lateral menisci, providing stability to the anterior horn. The posterior horn of the medial meniscus attaches between the lateral meniscus and the posterior cruciate ligament (PCL) in the posterior intercondylar fossa [2]. A posterior transverse intermeniscal ligament, connecting the posterior horns of the menisci, is rare [6, 7].

The lateral meniscus covers about 80% of the lateral tibial plateau and is more circular, with the anterior and posterior horns being nearly the same size. The anterior root attaches anterior to the intercondylar eminence and next to the ACL. The posterior root attaches behind the lateral tibial eminence and in front of the posterior horn of the medial meniscus [7]. The meniscofemoral ligament is commonly seen and courses obliquely from the periphery of the lateral meniscal posterior horn and the lateral surface of the medial femoral condyle within the intercondylar notch; it is known as the ligament of Humphry if it occurs anterior to PCL, and the ligament of Wrisberg if it occurs posterior to PCL [3, 6].

Since the menisci are primarily composed of fibrocartilage, they appear dark (either black or charcoal grey) on all MRI pulse sequences (Fig 2 and 3). In patients under 40, intermediate signal intensity may be seen along the peripheral edges, reflecting vascularity or contusions from previous trauma. In older patients, signal changes within the meniscus that do not meet the criteria for a tear are often associated with intrasubstance degeneration or contusion. On coronal imaging, each meniscus typically displays a predictable isosceles triangular shape, with longer superior and inferior articular surfaces compared to the periphery (Fig 4a and b). Any deviation from this shape in patients without prior meniscal surgery is a direct indicator of meniscal tear. On sagittal MRI, the peripheral portion of each meniscus exhibits a "bow tie" or rectangular shape (Fig 4c), indicating the connection between the anterior and posterior horns. As the sagittal slices move toward the center, the anterior and posterior horns normally separate, creating distinct triangular shapes (Fig 2) [8].

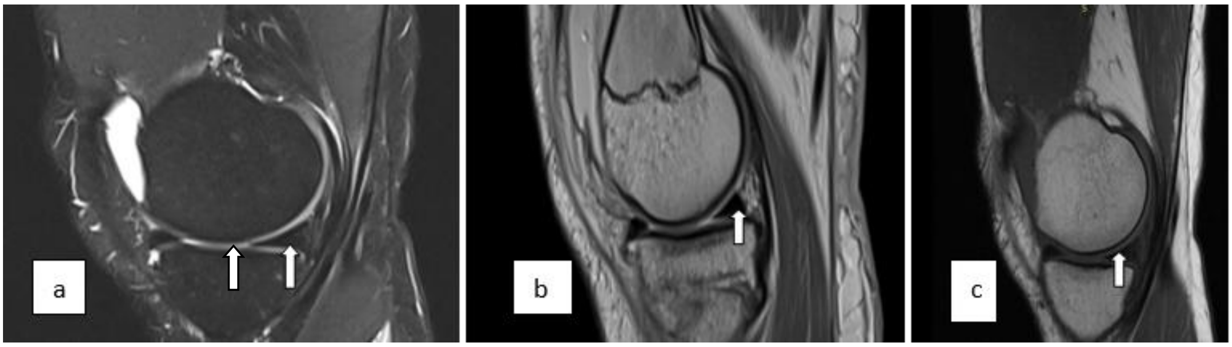

Figure 2: Normal Medial Menisci with larger posterior horn (arrow) and smaller anterior horn a) T2 FS SAG b) PD SAG c) T 1 SAG

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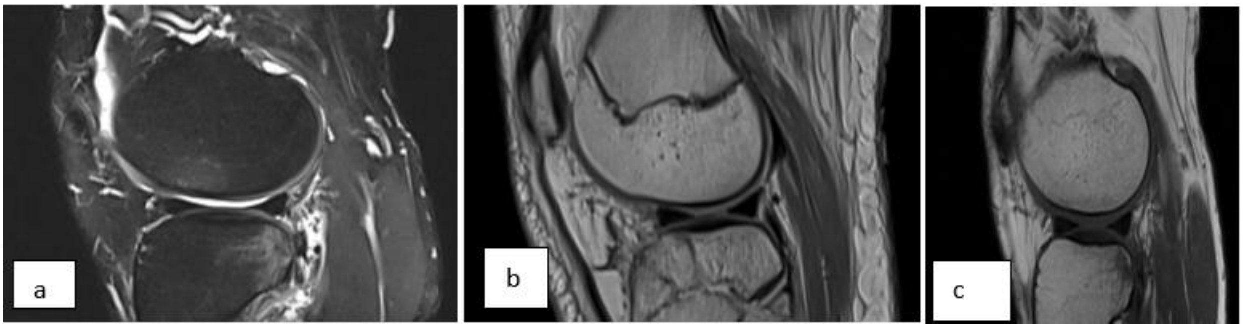

Figure 3: Normal Lateral Menisci with equal anterior and posterior horn a) T2 FS SAG b) PD SAG c) T1 SAG

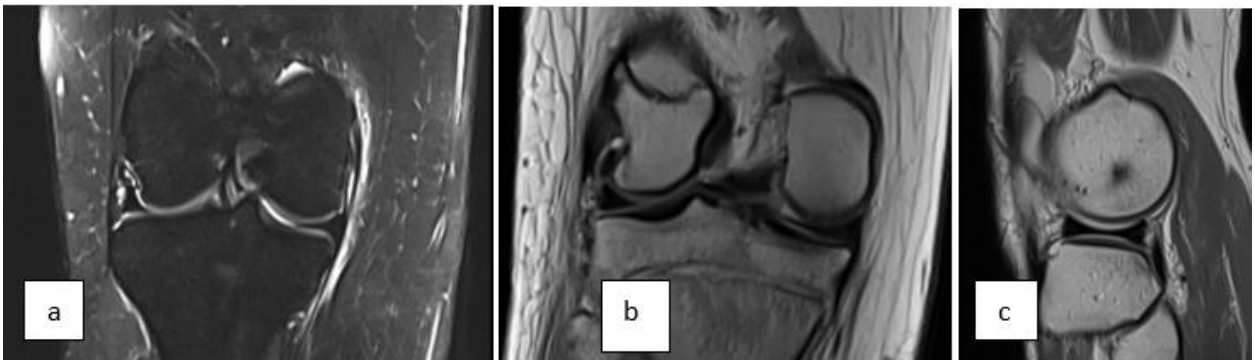

Figure 4: Normal medial and lateral menisci a) T2 FS CORONAL b) PD CORONAL c) PD SAG bow tie appearance of lateral menisci

Tears

The diagnosis of a meniscal tear is confirmed when a linear intra-meniscal signal reaches the superior or inferior articular surface of the meniscus, or when there is a disruption in the normal shape of the meniscus [3, 6, and 9]

When a meniscal tear is suspected but the abnormal linear signal only reaches the articular surface on a single MRI image, the positive predictive value (PPV) for a tear decreases to 43% in the medial meniscus and 18% in the lateral meniscus [3, 6, 10, 11]. In such cases, the tear is often described as "probable" or "possible." If the increased signal does not contact the articular surface, it is generally not associated with a meniscal tear [12], nor does it typically progress to one [13].

Several secondary findings can further indicate the presence of a meniscal tear. A parameniscal cyst, which results from joint fluid leaking through a horizontal meniscal tear [14], has a 90% PPV for tears, except when located near the anterior horn of the lateral meniscus, where the PPV drops to 67%. Meniscal extrusion, where the meniscus extends more than 3 mm beyond the tibial plateau, is also linked to meniscal tears [6, 15].

Tear description

When a meniscal tear is identified, it is important to document both the shape of the tear and the presence of any displaced meniscal fragments, as displaced fragments can lead to mechanical obstruction of the knee. Various terminologies are used to describe meniscal tears, although there is no universal consensus. Common terms include horizontal, longitudinal or vertical, and radial tears. Additional descriptors such as oblique, parrot beak, vertical flap, horizontal flap, meniscal root, and bucket handle tears are often used, with many of these representing displaced fragment variations of the primary tear types. Complex tears, which involve more than one pattern, are referred to as multidirectional tears.

Horizontal tears run parallel or obliquely to the articular surface and may extend to either the superior or inferior articular surface, or the inner free edge of the meniscus (Fig 9) [3]. When these horizontal tears extend to the articular surface, they may also be described as oblique tears (Fig 8 and 10). These tears are often degenerative and age-related, and are seen in the setting of osteoarthritis [3, 16]. Parameniscal cysts are more commonly associated with horizontal tears [3, 17].

A longitudinal vertical tear runs perpendicular to the articular surface and follows the longitudinally oriented fibers of the meniscus [3]. These tears are typically caused by trauma and are often associated with ACL injuries [3, 18]. They usually occur in the peripheral "red zone" of the meniscus, particularly in the posterior horn [3, 19]. Due to the red zone's better blood supply, nondisplaced tears in this area are often managed conservatively, as they have a higher potential for healing. When a longitudinal vertical tear becomes displaced, it is referred to as a bucket handle tear, which is a more common form of medial meniscal displacement. A bucket handle tear, which is a displaced longitudinal vertical tear, commonly occurs in the medial meniscus (Fig 12 and 13). The displaced meniscal fragment often moves into the intercondylar notch next to the PCL, creating the "double PCL" sign on sagittal imaging, or it can appear near the anterior horn, producing the "double anterior horn" sign.

Radial tears, like longitudinal vertical tears, also run perpendicular to the articular surface [3]. However, radial tears are oriented along the short axis of the meniscus, cutting across the longitudinally aligned fibers (Fig 5, 6 and 7). These tears compromise the meniscal hoop strength, leading to functional loss and potential extrusion of the meniscus [2, 3]. When a radial tear involves the posterior meniscal root, it is termed a meniscal root tear or avulsion [3].

Differentiating radial tears from longitudinal vertical tears on imaging can sometimes be challenging since both have vertical components. A longitudinal vertical tear remains equidistant from the meniscal periphery and inner free edge across multiple images. In contrast, a radial tear, when oriented obliquely to the imaging plane, shows a defect that moves progressively from the inner free edge toward the periphery across sequential images, known as the "marching cleft" sign. If the radial tear lies entirely within the sagittal or coronal plane, the meniscus may be absent on some images, producing the "ghost meniscus" sign, with a corresponding vertical defect on the orthogonal plane. Tear at the inner free edge of the meniscus to a longitudinally oriented tear closer to the periphery is often termed a “parrot beak” tear.

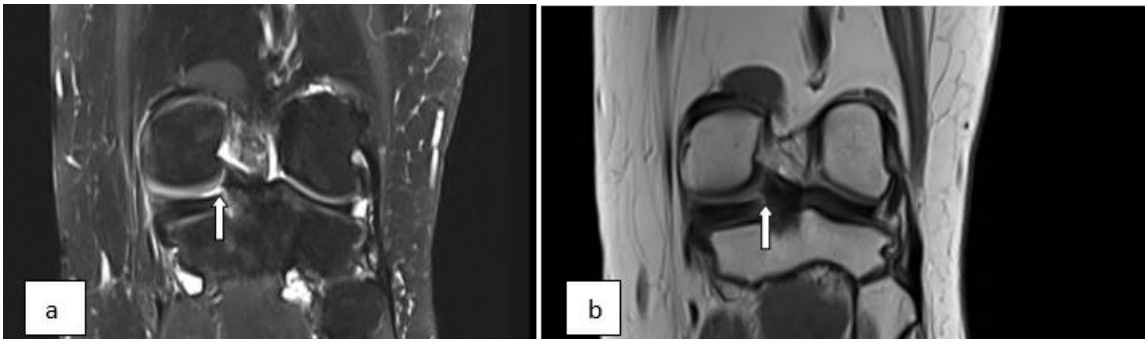

Figure 5: Radial tear of posterior horn of medial menisci (arrow) a) T2 FS CORONAL b) PD CORONAL

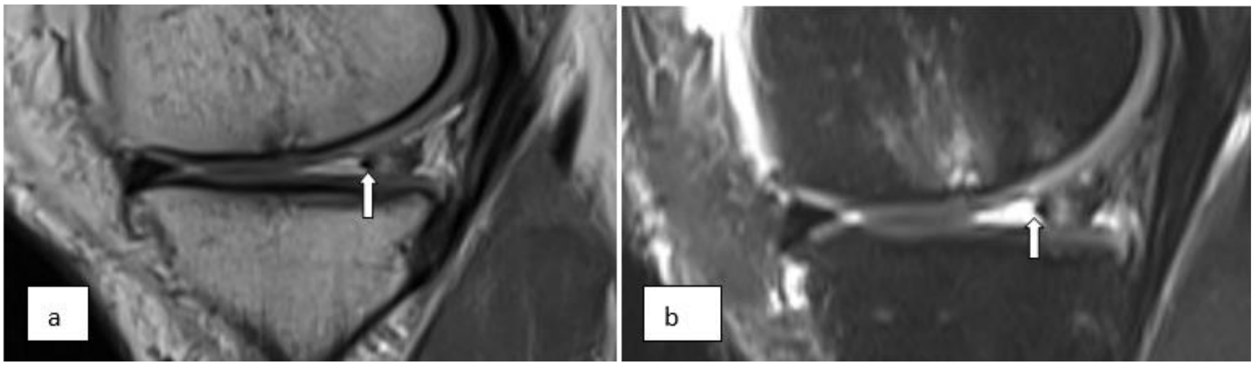

Figure 6: Radial tear in the posterior horn of medial menisci (arrow) a) PD SAG b) T2 FS SAG

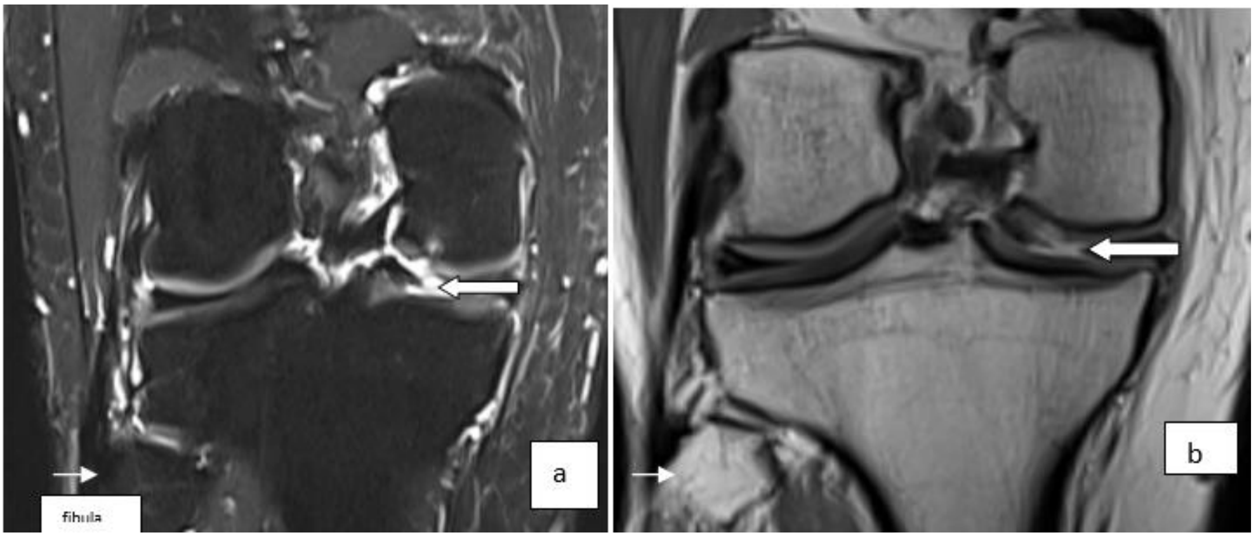

Figure 7: Radial tear in posterior horn of medial menisci (arrow) a) T2 FS CORONAL b) PD CORONAL. Short arrow is fibula

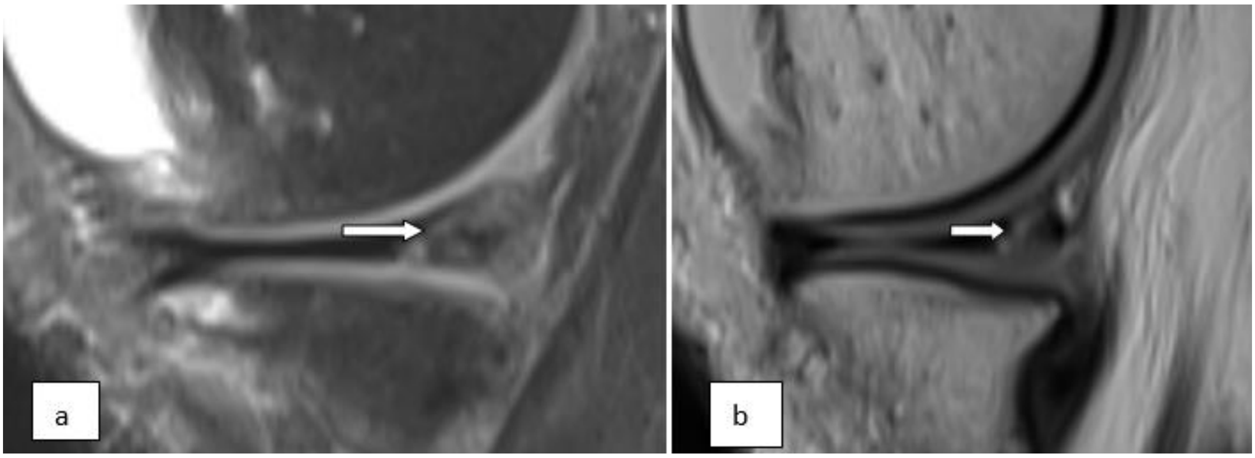

Figure 8: Oblique tear in body of medial menisci (arrow) a) T2FS SAG b) PD SAG

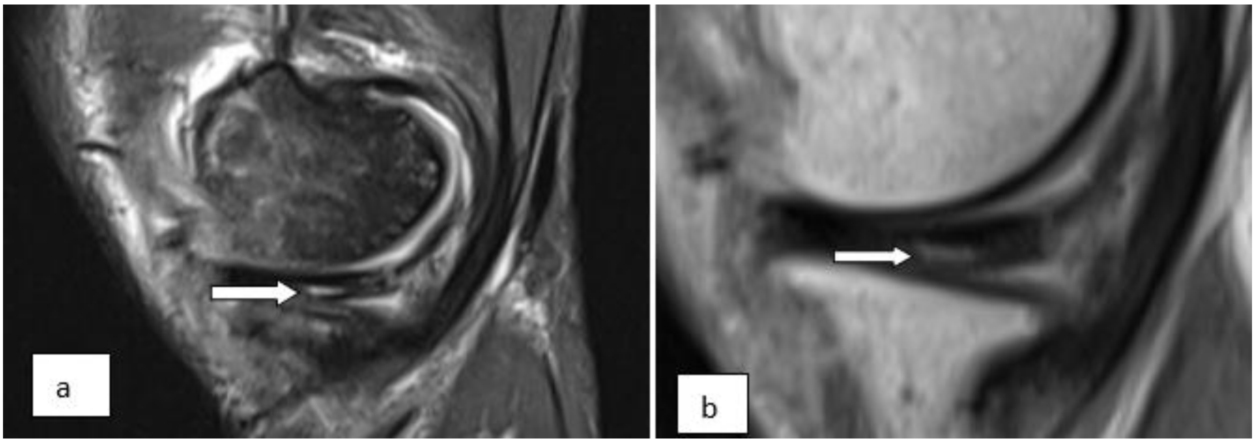

Figure 9: Horizontal tear in the body of medial menisci (arrow) a) T2FS SAG b) PD SAG

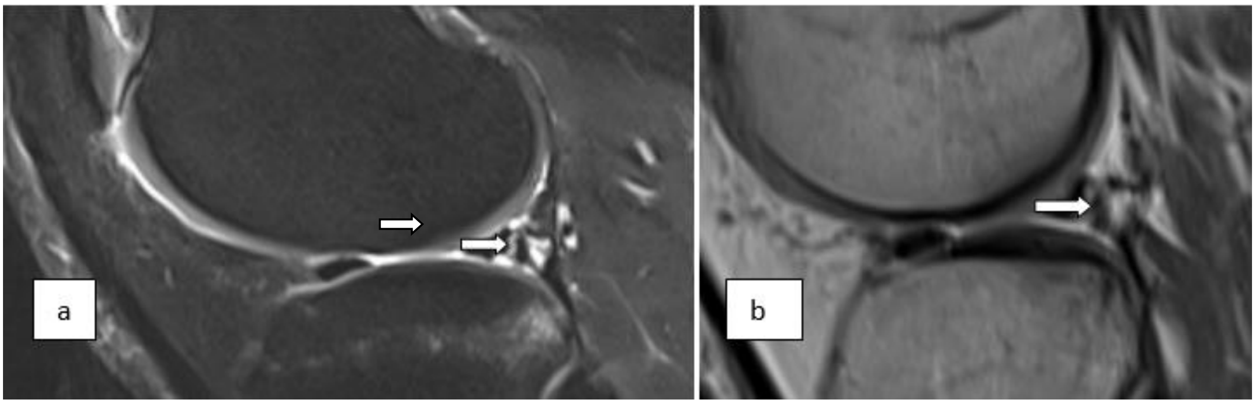

Figure 10: Oblique tear in posterior horn of lateral meniscus (arrow) a) T2 FS SAG b) PD SAG

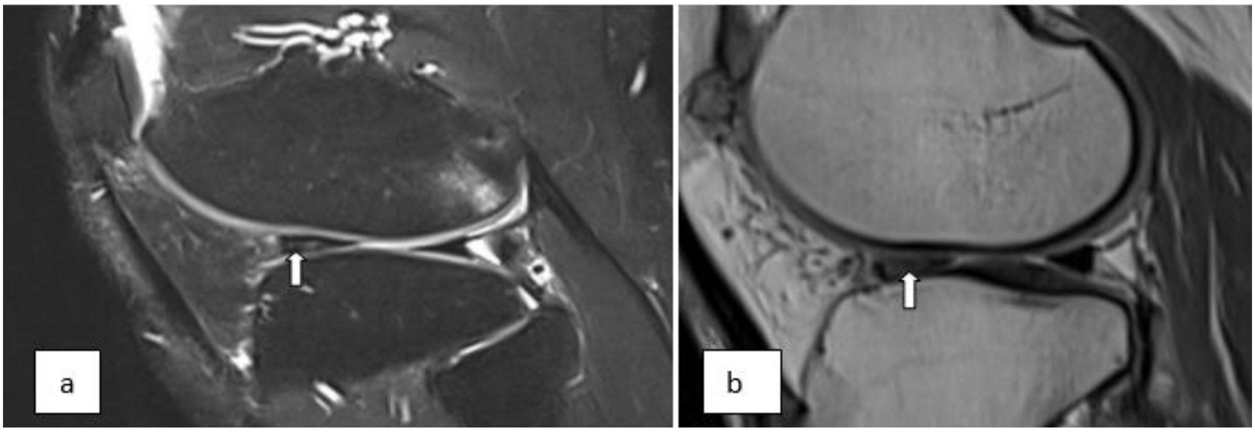

Figure 11: Intermediate signal intensity noted within the anterior horn with irregular margins suggestive of degenerative tears of lateral meniscus a) T2FS SAG b) PD SAG.

Bucket Handle Tear:

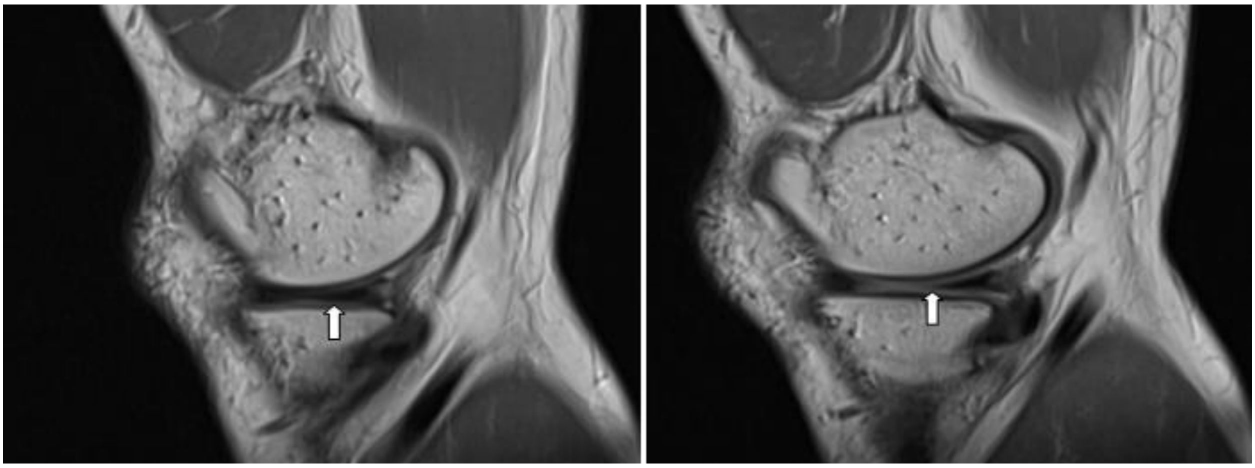

Figure 12: Sequential image showing absent bow tie sign of medial menisci PD SAG

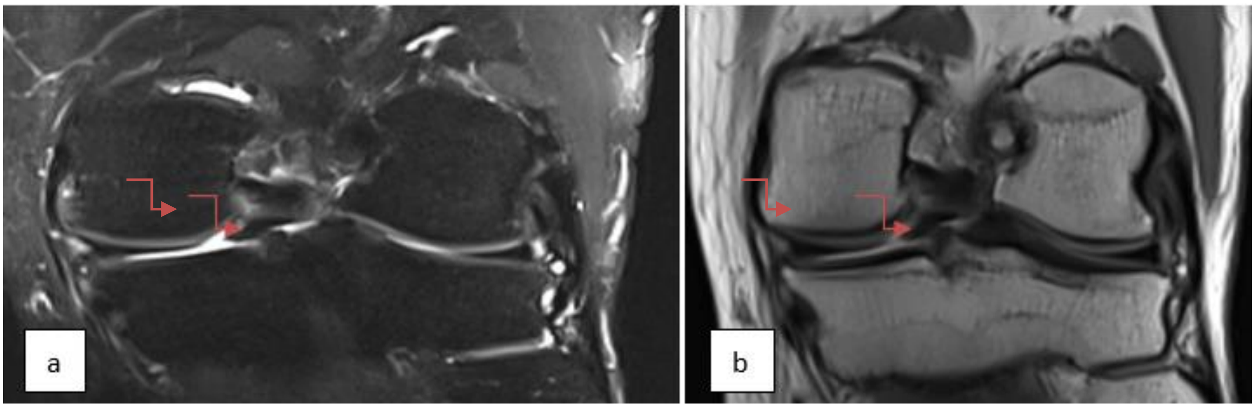

Figure 13: Fragment seen in the intercondylar notch of tibia representing displaced segment of medial menisci (red curved arrow) a) T2 FS CORONAL b) PD CORONAL

Cruciate ligaments: anterior and posterior

Anterior cruciate ligament

The anterior cruciate ligament (ACL) originates from the medial aspect of the posterior lateral femoral condyle within the intercondylar notch and attaches to the tibial eminence. Its fibers are oriented parallel to the roof of the intercondylar notch when the knee is in an extended position (Fig 14). The ACL is composed of two distinct bundles: the anteromedial bundle and the posterolateral bundle. The posterolateral bundle originates more distally and has a more oblique orientation compared to the anteromedial bundle [20]. The tibial footprint of the ACL is larger than its femoral origin, resulting in a heterogeneous appearance distally between the attachment sites of the two bundles [20]. Functionally, the anteromedial bundle is tautest during knee flexion and helps limit anterior tibial translation in that position, while the posterolateral bundle is tautest during extension and restrains anterior tibial translation when the knee is extended [20, 21].

On MRI, the ACL should be carefully assessed on axial, coronal, and sagittal images to confirm its continuity and proper attachment to both the femoral and tibial sites. The ACL bundles should appear as contiguous bands of low signal intensity with a taut appearance on sagittal images, positioned parallel to the roof of the intercondylar notch.

Anterior cruciate ligament (ACL) injuries are prevalent and frequently lead to knee instability. Various mechanisms contribute to ACL injuries; however, most occur when the knee is nearly fully extended, often involving sudden deceleration followed by a change in direction or landing, or as a result of valgus forces [22]. Research indicates that women experience a higher incidence of ACL injuries compared to men, with female basketball and soccer players exhibiting a three-fold increased risk [23]. This discrepancy is believed to be associated with factors such as ligament size, limb alignment, muscle strength and activation patterns, as well as potential variations in the size of the intercondylar notch (Fig 14 c) [20].

Detecting partial thickness ACL tears is crucial, as these injuries can be challenging to diagnose clinically. The most frequent site of partial tearing is near the femoral origin of the ACL because these tears can progress to complete tears [21, 24]. Partial ACL tears also known as interstitial tear of ACL.

Traditional MRI systems with strength of 1.5T or lower have shown limited ability to accurately diagnose partial ACL tears [21, 25-27]; however, 3T MRI has demonstrated accuracy rates of up to 95% for identifying partial thickness ACL tears [24]. On MRI, partial tears are suspected when there is abnormal intra-ligamentous signal within the ACL (Fig 17) [21, 24, 25, 28].

Magnetic resonance imaging (MRI) is highly accurate for diagnosing complete ACL ruptures [24, 29, and 30]. In acute, full-thickness ACL tears, edema is often present within the ligament, with a focal complete discontinuity of fibers and abnormal orientation (Fig 16). Several secondary signs can suggest an ACL tear. In pivot shift injuries, bone marrow edema may be seen due to osseous impaction along the terminal sulcus of the lateral femoral condyle, known as the “deep femoral notch” sign. Osseous contusions on the posterolateral tibial plateau are also common. In hyperextension injuries, contusions typically appear on the anterior tibial plateau and anterior femoral condyles (Fig 17a). Complete ACL tears often result in anterior translation of the tibia relative to the femur, a finding known as the "anterior drawer" sign when exceeding 7 mm. Anterior tibial subluxation may also expose the posterior horn of the lateral meniscus, and full visualization of the lateral collateral ligament (LCL) on a single coronal MRI slice is another secondary indicator of ACL injury [20].

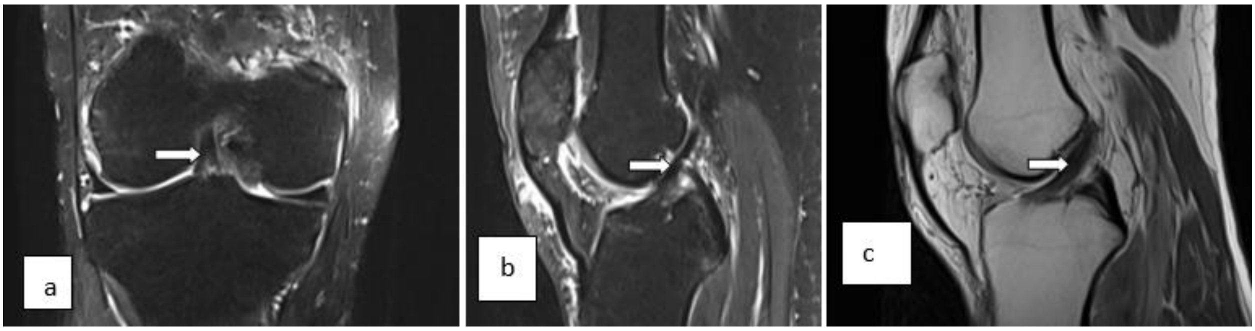

Figure 14: Normal Anterior Cruciate Ligament a) T2 FS Coronal b) T2 FS SAG c) PD SAG

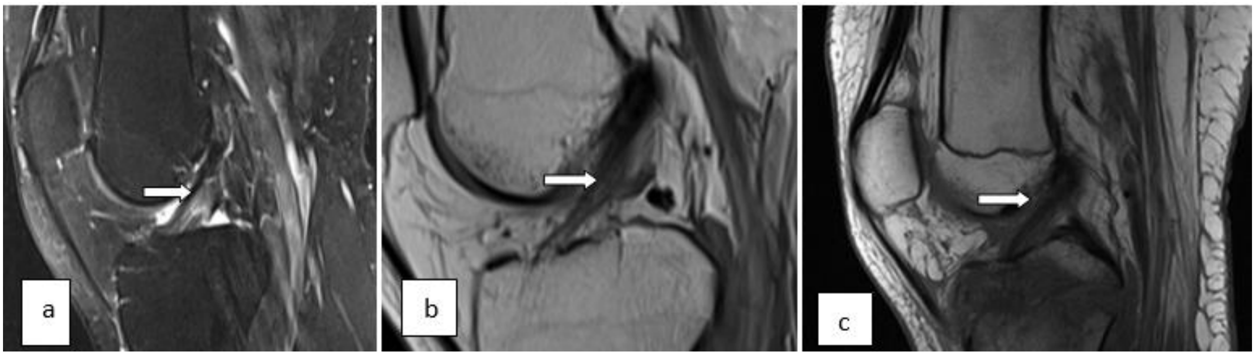

Figure 15: Anterior Cruciate Ligament sprain in Distal 1/3 rd a) T2 FS SAG b) PD SAG c) T1 SAG

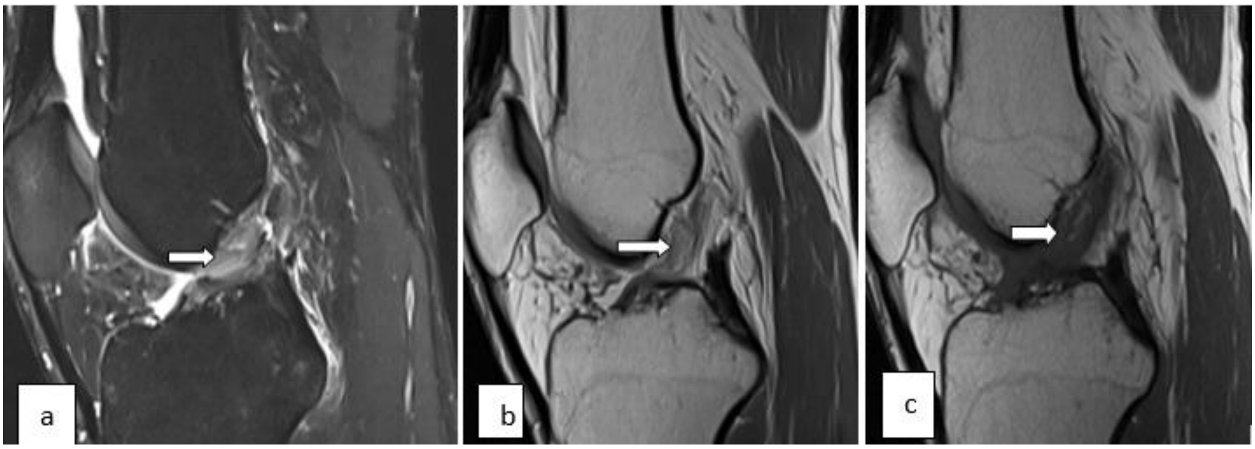

Figure 16: Full thickness ACL Tear a) T2FS SAG b) PD SAG c) T1 SAG

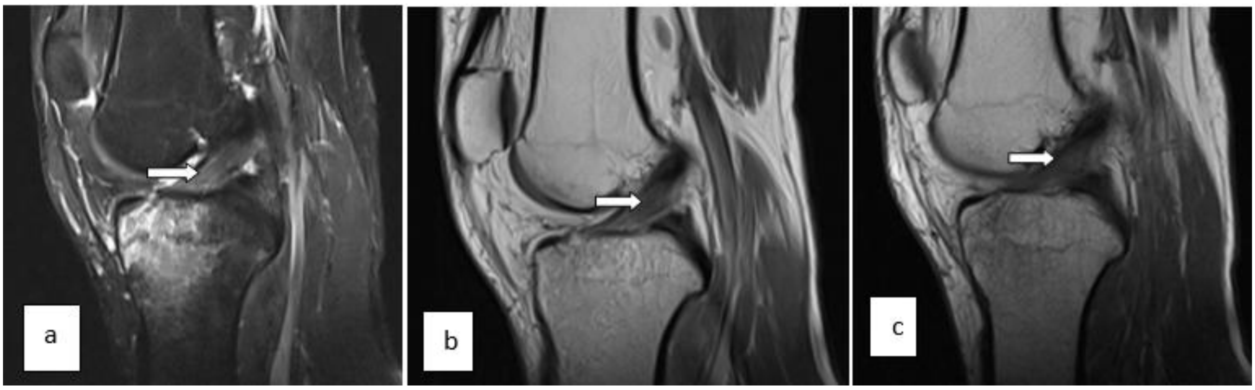

Figure 17: Interstitial ACL tear a) T2FS SAG b) PD SAG c) T1 SAG

The posterior cruciate ligament (PCL)

Posterior cruciate ligament originates from the lateral surface of the medial femoral condyle within the anterior intercondylar notch and inserts onto the posterior intercondylar fossa of the tibia, near the root of the medial meniscus. It is composed of two bundles: the larger anterolateral bundle and the smaller posteromedial bundle. The anterolateral bundle is most taut during knee flexion, while the posteromedial bundle becomes maximally taut during extension. The PCL's primary function is to prevent posterior translation of the tibia and control tibial external rotation [20, 31].

On MRI, the PCL appears as a curvilinear, homogeneous low-signal structure extending from the femur to the tibia (Fig 18). It is divided into two segments: a proximal horizontal segment and a distal vertical segment, with the point where these segments meet referred to as the genu. Careful examination of the PCL on axial, sagittal, and coronal images is essential to detect any changes in its contour, thickness, or signal intensity [32].

A study by Rodriguez et al. involving 34 patients with surgically confirmed PCL tears found that thickening of the distal vertical segment of the PCL, measuring 7 mm or more on sagittal T2-weighted images, had a sensitivity and specificity exceeding 90% for detecting both full-thickness and partial-thickness tears [20, 32]. The authors proposed that a distal PCL measurement of 6 mm or less was considered normal, while a measurement of 7 mm or more was indicative of a tear. Measurements between 6 and 7 mm were deemed indeterminate, though up to 8 mm thickness could be normal if no abnormal intrasubstance signal was present. In PCL sprain PCL appears intact, but with slight thickening or increased signal intensity on T2-weighted images (Fig19).

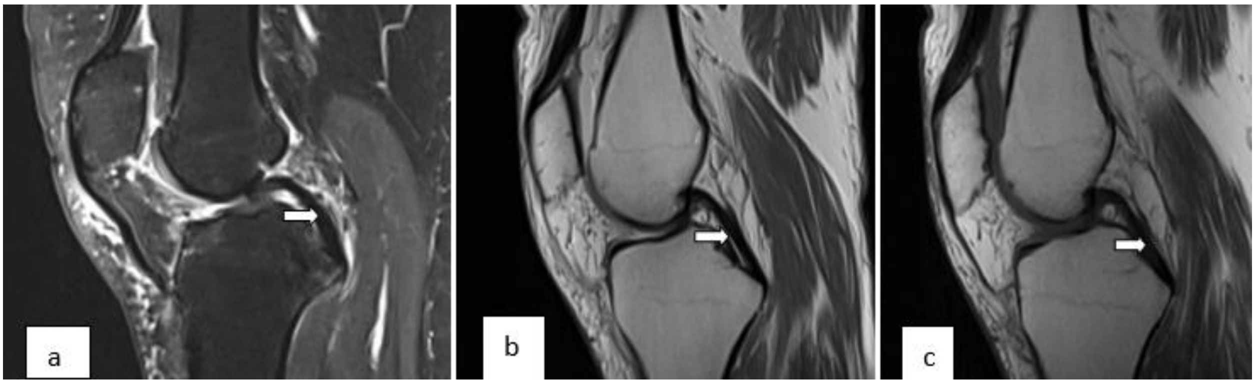

Figure 18: Normal Posterior Cruciate Ligament A) T2FS SAG b) PD SAG c) T1 SAG

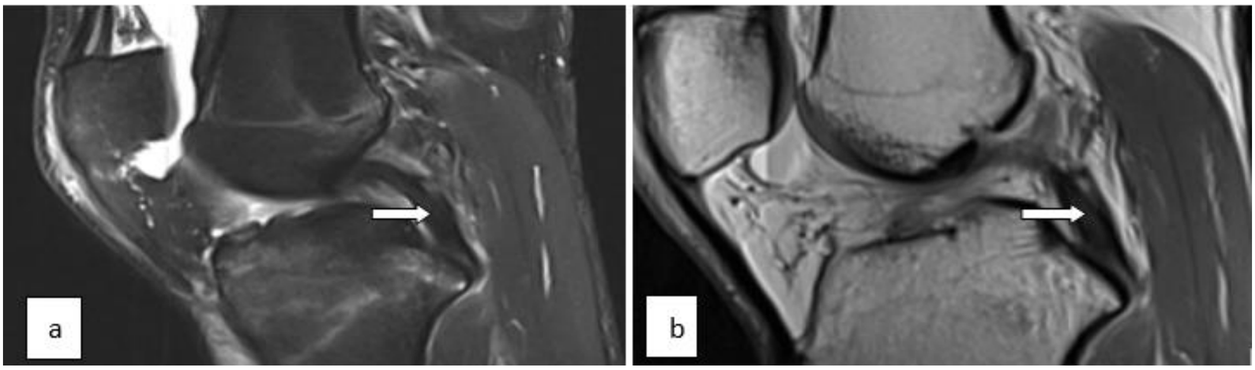

Figure 19: Increased signal intensity noted in the posterior cruciate ligament PCL sprain a) T2 FS b) PD SA

Medial collateral ligament

The medial collateral ligament (MCL) is the primary stabilizer of the posteromedial aspect of the knee, consisting of superficial and deep layers. The superficial MCL originates from a point posterior and proximal to the medial femoral epicondyle and inserts onto the semimembranosus tendon and the posteromedial tibial crest. The deep MCL represents a thickening of the medial joint capsule and is divided into meniscofemoral and meniscotibial components. The superficial MCL serves as the primary restraint to valgus stress and tibial rotation, while the deep MCL provides secondary resistance to valgus force and acts as a restraint to tibial internal rotation [20].

On MRI, the superficial MCL appears as a continuous, uniformly thick, low-signal intensity band extending from the femoral epicondyle to its tibial insertion (Fig 20). It should not show surrounding edema or intrasubstance signal alterations. The deep MCL, being thinner, attaches the medial meniscus to both the medial femoral condyle and tibial plateau near the joint line, which can make it difficult to visualize unless injured.

MCL injuries are common and often result from valgus stress [20, 33, 34]. A grading system is typically used to classify these injuries: Grade 1 injuries show an intact MCL with surrounding soft tissue edema (Fig 21) ; Grade 2 injuries are characterized by a partial tear of the ligament (Fig 22) ; and Grade 3 injuries involve full-thickness disruption of the MCL, although the tear may not span the entire width of the ligament (Fig 23). On MRI, Grade 2 and 3 tears show partial or complete fiber disruption with increased signal intensity within the normally low-signal ligament [35].

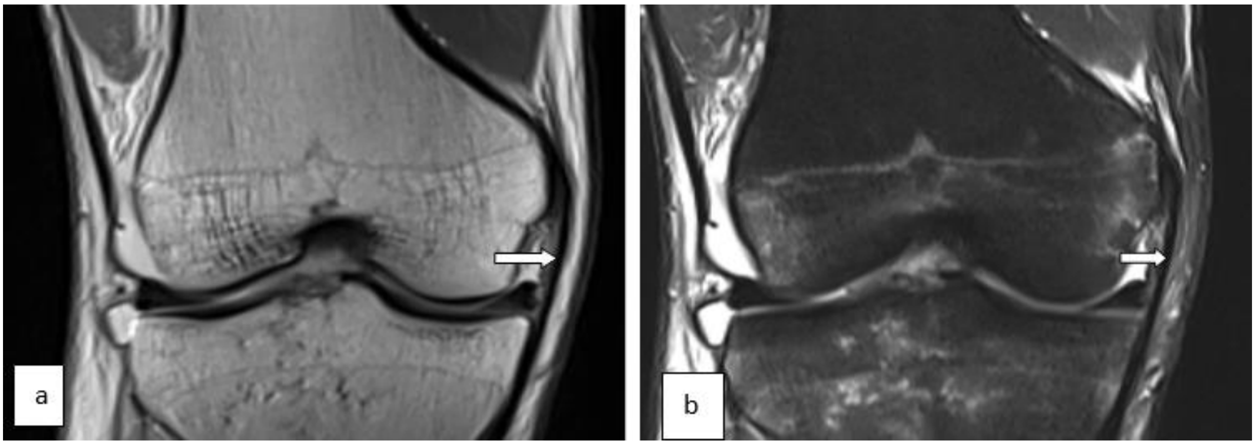

Figure 20: Normal Medial Collateral Ligament a) PD CORONAL b) T2 FS CORONAL

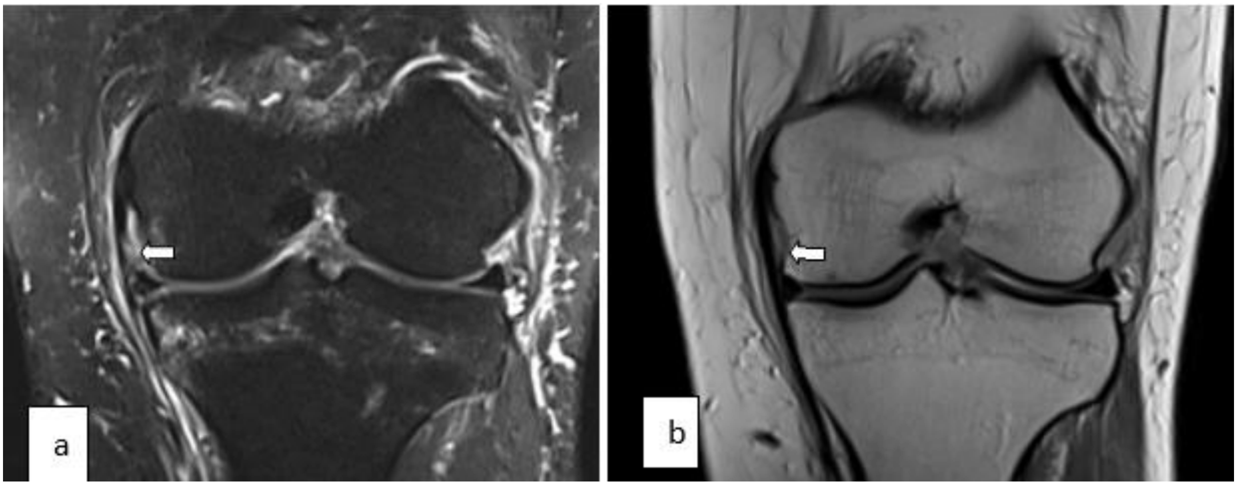

Figure 21: Sliver of fluid superficial to the ligament suggestive of GRADE I medial collateral injury. a) T2 FS CORONAL b) PD CORONAL

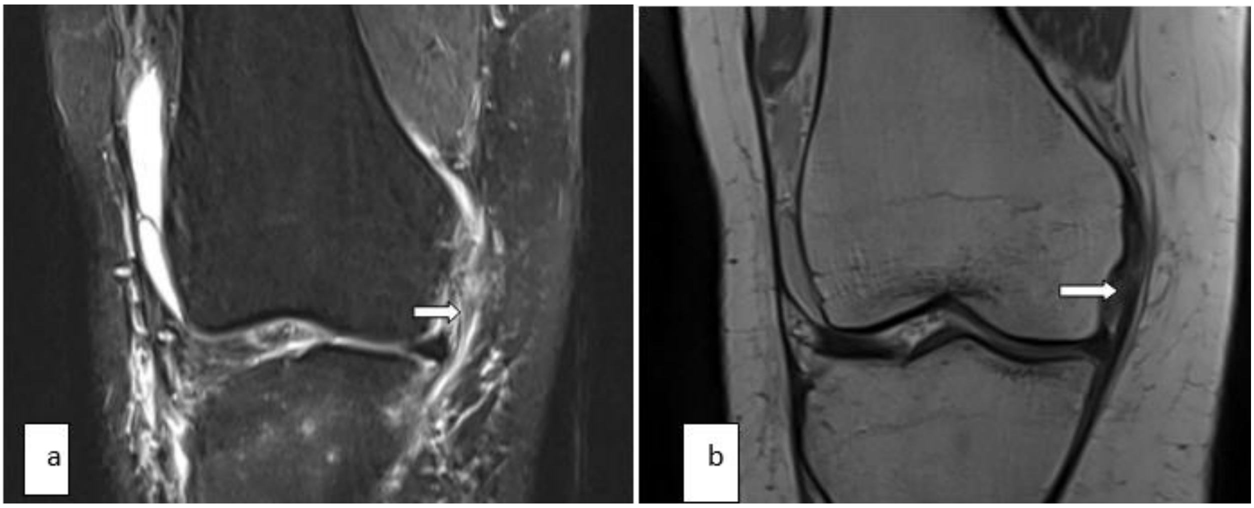

Figure 22: Grade II SPRAIN Medial Collateral Ligament: a) T2FS CORONAL b) PD CORONAL

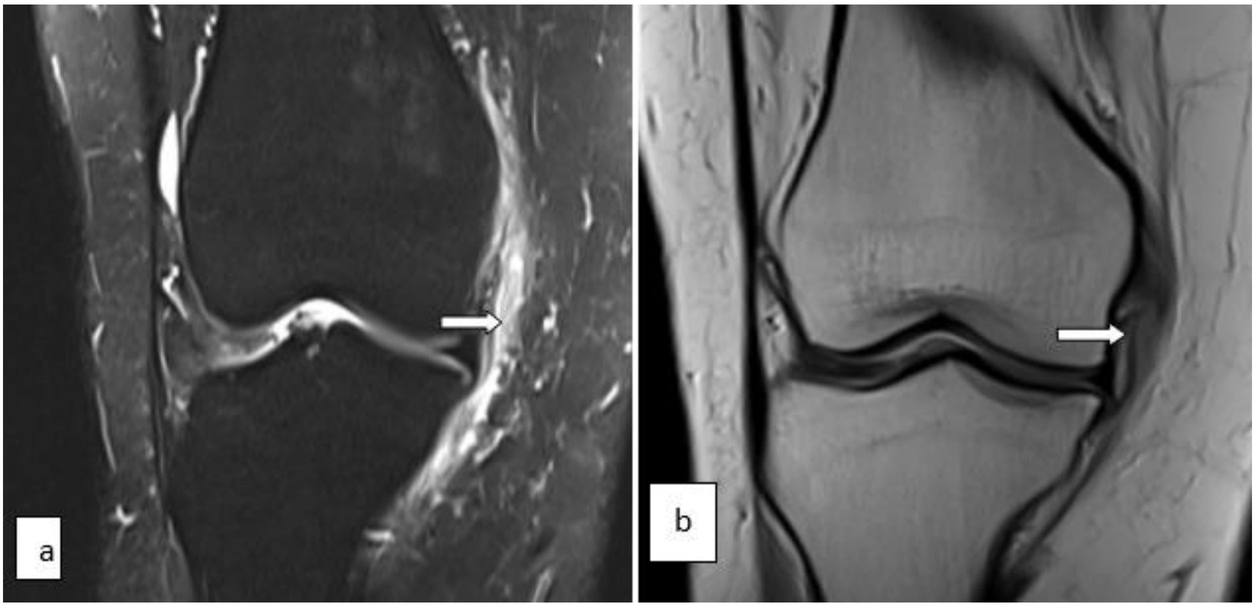

Figure 23: Grade 3 MCL tear there is complete discontinuity of the ligament in its mid segment with fluid within the rest of the ligament and surrounding it a) T2FS CORONAL b) PD coronal

The lateral collateral ligament (LCL)

Lateral collateral ligament is located on the lateral side of the knee and plays a critical role in stabilizing the knee against varus forces. It forms part of the posterolateral corner of the knee and is situated within the deep layer of the lateral aspect of the joint, which is divided into three layers. The LCL originates from a bony depression slightly posterosuperior to the lateral femoral epicondyle and inserts on the anterolateral aspect of the fibular head. The LCL is typically cord-like and measures approximately 50 mm in length (Fig 24) [20, 36, 37].

Isolated LCL injuries usually result from lower-velocity trauma and mechanisms such as external rotational stress in full extension, varus force applied in extension or mild to moderate flexion, or a posterolaterally directed impact to the anteromedial tibia when the knee is extended. LCL injuries can range from mild sprain (Fig 25) to complete disruption and avulsion injuries (Fig 26).

MRI is the preferred imaging modality for evaluating LCL injuries, as it enables accurate localization and grading of the injury. It also helps assess concomitant ligamentous or meniscal injuries. The LCL is best visualized on coronal MRI images [20].

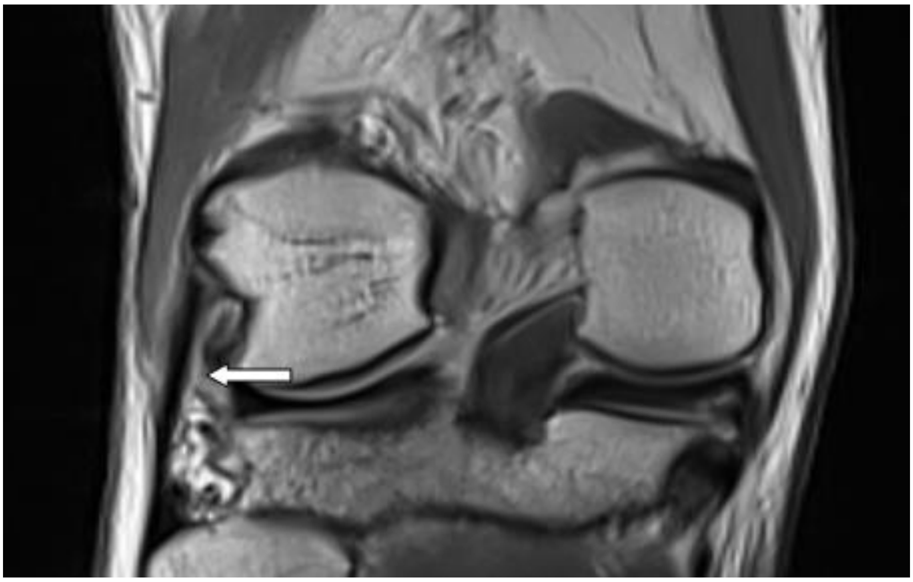

Figure 24: Normal Lateral Collateral Ligament a) PD CORONAL

Figure 25: Lateral collateral ligament sprain a) T2 FS CORONAL b) PD CORONAL

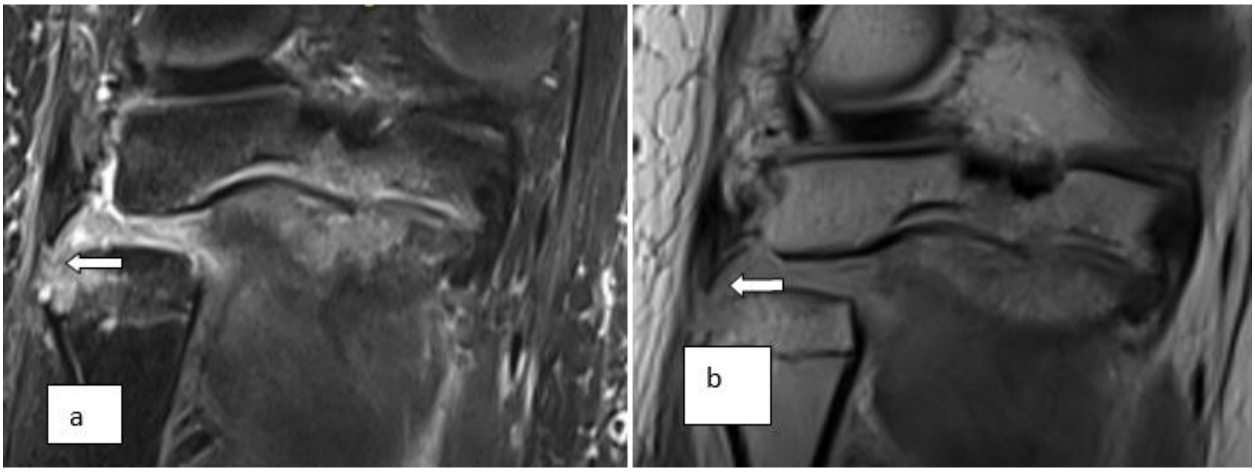

Figure 26: Avulsion of fibular attachment of Lateral collateral ligament. a) T2FS CORONAL b) PD CORONAL

Osteoarthritis

Knee osteoarthritis is the most common chronic joint disease and one of the leading causes of long-term disability worldwide [38, 39]. It is usually an age-associated condition, with a peak prevalence in the elderly population, Knee osteoarthritis usually presents with a typical symptomatic triad including (1) gradual onset of pain that worsens with activity and abates with rest, (2) stiffness in the morning or following daytime inactivity, and (3) limited range of motion and function restriction [38].

MRI is considered superior for the evaluation of joints, multidetector computed tomography (CT) is more effective in the detection of bone injuries and postoperative assessment with hardware implantation. Hyaline articular cartilage has a complex structure that provides unique mechanical properties of resistance to compressive loads. It is composed of chondrocytes, type II collagen, and a hydrated matrix rich in proteoglycan, which possess water-binding properties thanks to highly negatively charged glycosaminoglycan side chains. The collagen network is the principal source of tensile and shear strength and is organized in specific zones: (1) the surface zone with tangentially aligned fibril, (2) a transitional zone with randomly aligned fibrils, and (3) a deep radial zone with fibrils aligned perpendicular to the articular surface. High glycosaminoglycan content and collagen fiber integrity are essential for the mechanical functions of healthy cartilage [40, 41].

A decrease in proteoglycan size and glycosaminoglycan (GAG) content, with elevation in water content and mobility, are the earliest events in the development of cartilage degeneration, accompanied immediately after, by the breakdown and disorganization of the collagen fiber network. MRI is the most widely used technique to study the morphology of the whole joint and to identify pathological alterations, such as articular cartilage degeneration(Fig 27), meniscal tears, ligament abnormalities, subchondral bone lesions (Fig 28) subchondral marrow lesions, and also bone edema(, synovial thickening, joint effusion, and damage to the surrounding soft tissue[41, 42] .Conventional MR imaging of the knee include fast spin-echo proton-density (PD) weighted sequences, which offer excellent anatomical details and T2-weighted sequences, which help in recognition of surface defects of the cartilage, thanks to the ability to study the cartilage–synovial fluid interface, enhancing the difference of contrast between them. Eventual fat suppression sequences can be obtained to better identify marrow edema.

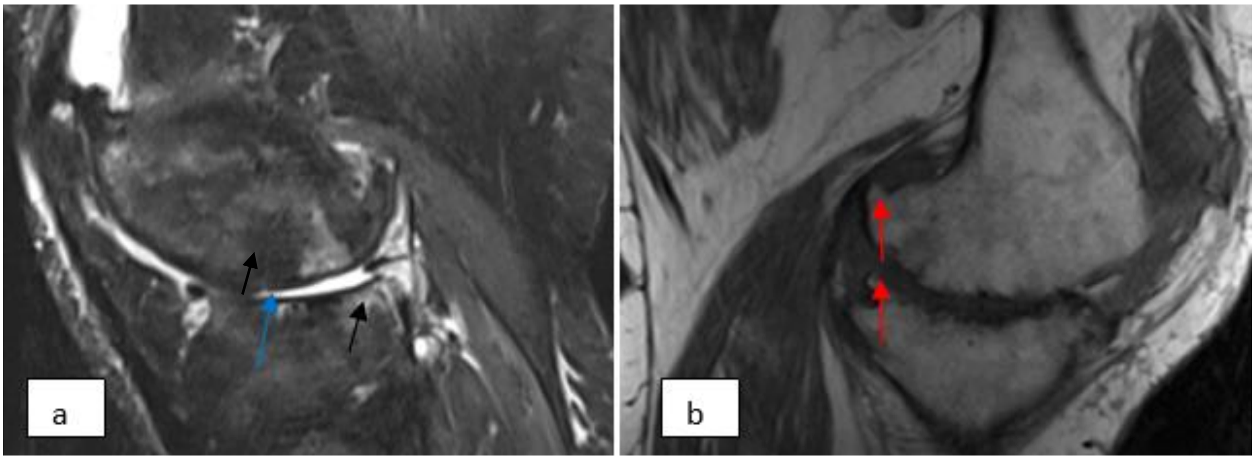

Figure 27: a) T2 FS SAG showing complete loss of cartilage with reduction in joint space (blue arrow) and subchondral bone marrow edema (black arrow) b) PD SAG reduction in the tibio-femoral joint space with loss of cartilage and shows marginal osteophytes (red arrow).

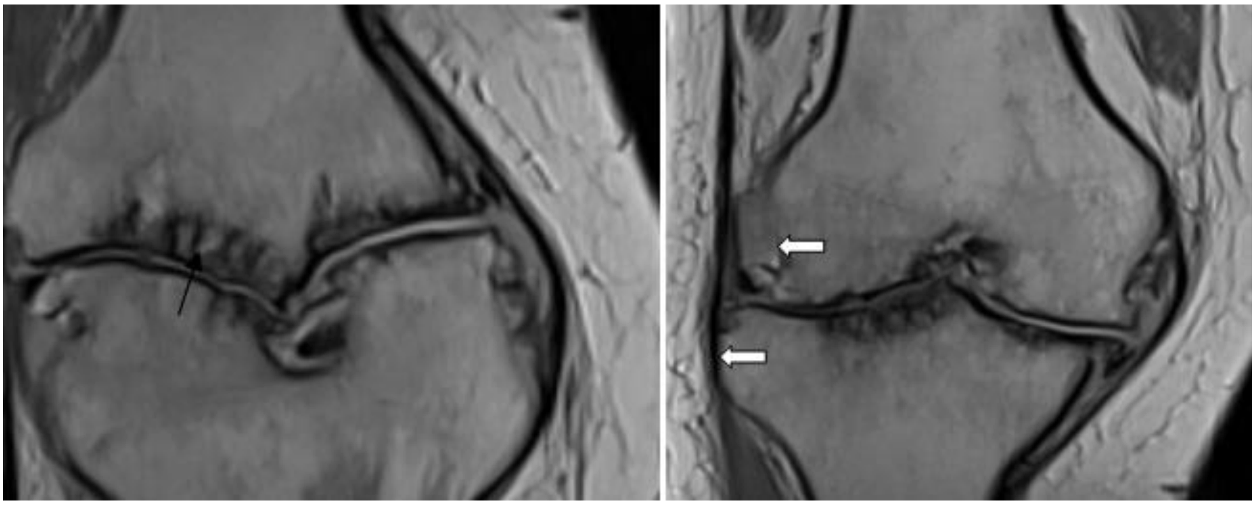

Figure 28: There is lateral subluxation of tibia with respect to femur (white arrow) with cortical irregularity (black arrow) and geodes PD CORONAL.

3. Conclusions

MRI plays a significant role in diagnosis of internal derangements of the knee, detection of the bone marrow oedema-like signal pattern, and radiographically occult factures. MRI enables superb evaluation of the bones, ligaments, menisci, articular cartilage, tendons, synovium, and periarticular soft tissues of the knee joint, and guides orthopaedic treatment planning.

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