[Orthopaedic Surgery]

Magnetic Resonance Imaging Double Popliteus Tendon Sign: A Case Report

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The double popliteus tendon sign is seen on sagittal magnetic resonance imaging (MRI) of the knee as a low-signal-intensity band parallel to the popliteus tendon at the level of the popliteus hiatus. It is the result of a displaced complex flap tear of the lateral meniscus. This type of displaced meniscal tear can be easily missed on MRI, unless the clinician is aware of its existence and significance and is familiar with its MRI appearance.

Keywords: Meniscal tear, MRI, Flap fragment, popliteus, knee arthroscopy

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The meniscus, once thought a vestigial structure, has been shown to play a key role in joint stability, load sharing, load transmission, and shock absorption,[9] as well as in nutrition and lubrication of articular cartilage.[2,3,5] Medial and lateral meniscal tears are common knee injuries with potentially devastating consequences, which can result in chronic pain, effusion, and progressive osteoarthrosis.

Meniscal tears can be divided into 2 broad categories: traumatic and degenerative. Traumatic tears tend to occur in younger patients after deep bending or twisting injuries secondary to athletic participation. Acute traumatic tears are usually peripherally located and therefore more amenable to repair. These tears are frequently associated with ligamentous injuries in younger athletes and are seen in up to 50% of all anterior cruciate ligament tears. The geometry of these meniscal injuries varies but usually demonstrates only 1 tear pattern (ie, edge fraying, radial, parrot beak, vertical, bucket handle, horizontal cleavage, or flap tears).

Degenerative meniscal tears usually occur in older patients. Such tears are most frequently insidious in onset and generally complex in appearance, involving multiple tear planes and patterns. Because of age-related meniscal degeneration and injury complexity, degenerative meniscal tears are usually not repairable.[4]

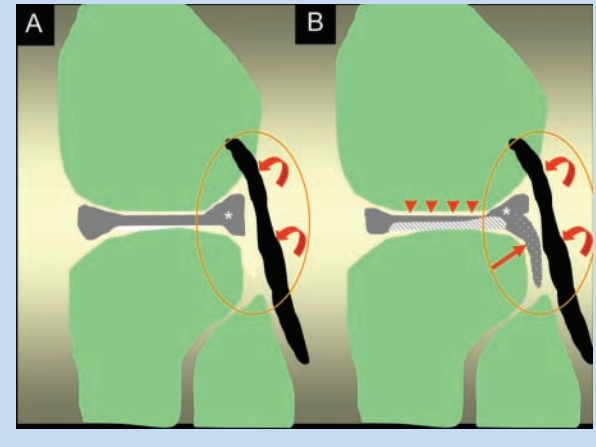

Figure 1. Double popliteus tendon sign: A, normal anatomy; B, complex undersurface flap tear of the lateral meniscus, with the lower leaflet meniscal fragment (straight arrow) displaced into the popliteus hiatus, paralleling the popliteus tendon (curved arrows). Notice the intact upper leaflet of the lateral meniscus (arrowheads). Asterisks indicate posterior horn lateral meniscus.

Displaced meniscal fragments can be easily missed on MRI, particularly if they are found in unusual locations. If not reduced, the displaced meniscal fragment may undergo maceration and result in knee locking and lack of full extension. It is important to identify the location of displaced

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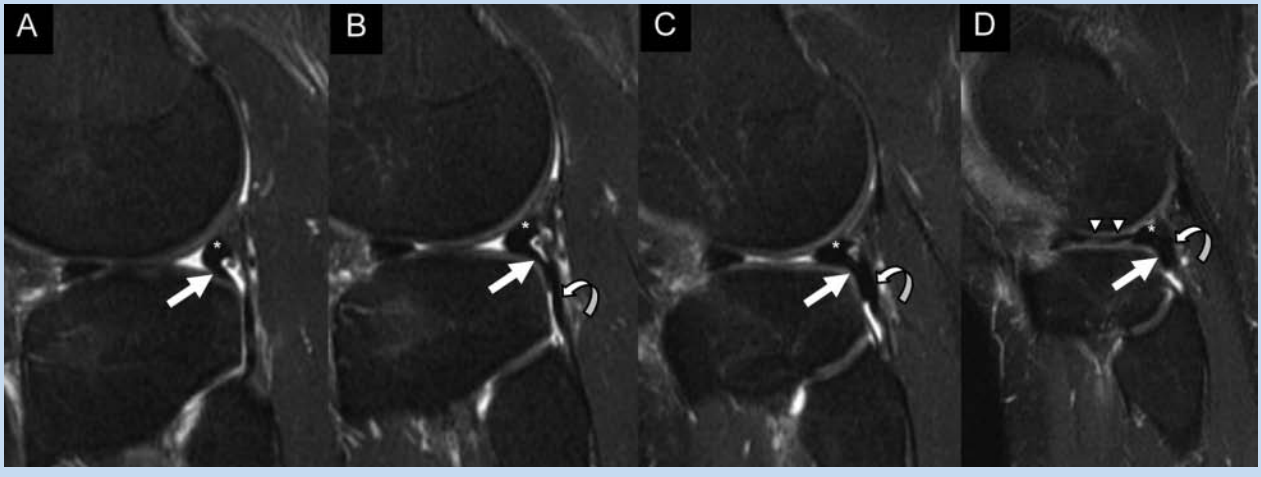

Figure 2. Double popliteus tendon sign. Sequential sagittal proton density fat-suppressed images (A-D) show a complex undersurface flap tear of the lateral meniscus, with the lower leaflet meniscal fragment (straight arrows) displaced into the popliteus hiatus, paralleling the popliteus tendon (curved arrows). Notice the intact upper leaflet of the lateral meniscus (arrowheads). Asterisks indicate posterior horn lateral meniscus.

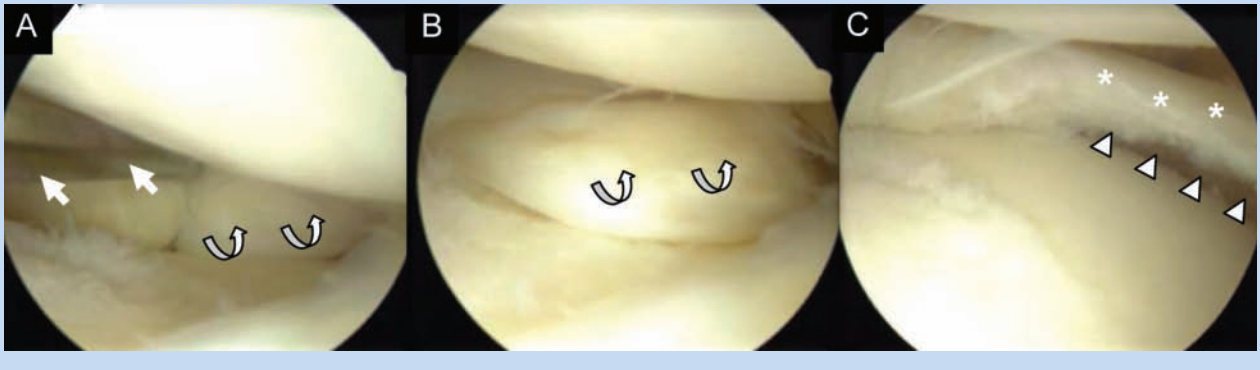

Figure 3. Arthroscopic images through the inferolateral view portal: A, probe (straight arrows) pulling the displaced flap tear fragment (curved arrows) back into the lateral compartment; B, the reduced undersurface complex flap tear fragment (curved arrows); C, post partial meniscectomy with debridement of the meniscal fragment. Notice the undersurface void within the body and posterior horn (arrowheads). Asterisks indicate intact upper leaflet of the body of the lateral meniscus.

meniscal fragments on preoperative MRI to facilitate knee arthroscopy and improve treatment.

This is a unique case of complex flap tear of the lateral meniscus, with a portion of the displaced meniscal flap fragment lodged in the popliteal hiatus, giving a double popliteus tendon sign on MRI.

CASE REPORT

A 25-year-old man presented with left knee pain and swelling after an exercise-related injury. The patient felt a "popping" sensation in his left knee with immediate discomfort after rising from a deep squat with 300 lbs (136 kg) on his back. He was diagnosed acutely with a lateral meniscal tear and declined surgery at that time. Approximately 13 months after the initial injury, the patient began having recurrent knee effusions, decreased ability to participate in sports activities, and a catching episode.

Physical examination revealed tenderness to palpation along the posterior lateral aspect of the left knee joint line. He had a positive McMurray test, with pain elicited at the lateral joint line, a small joint effusion, and mild quadriceps atrophy. MRI revealed a displaced flap tear of the lateral meniscus. The displaced fragment was visualized on the sagittal series in the popliteal hiatus, resulting in a double popliteus tendon sign (Figure 1). In the sagittal plane, the normal anterior and posterior horns of the lateral meniscus are equivalent in size. In this case, the posterior horn was smaller, with blunting

and foreshortening in the sagittal plane and with absence of the anterior half of the posterior horn, which heightened the suspicion for a displaced flap (Figure 2A, 2B). The flap tear originated anteriorly along the body segment and hinged on the posterior horn. The tear involved the undersurface of the meniscus, while the upper component remained intact (Figure 2).

Diagnostic arthroscopy demonstrated a complex tear of the lateral meniscus, with a portion of the flap meniscal fragment lying in the popliteal hiatus, just anterior to the popliteus tendon (Figure 3). The displaced flap fragment was the lower leaflet component of a horizontal meniscus tear, with the upper leaflet still intact and attached to the capsule. The flap was reduced into the lateral compartment. The meniscus was fibrotic and deformed secondary to chronic displacement. A partial lateral meniscectomy was required.

DISCUSSION

The concave superior meniscal surface enhances contact with the curvilinear-shaped femoral condyle. The flat undersurface of the meniscus increases contact with the tibial plateau, increasing femorotibial joint congruity and stability.[1,7,8] The lateral meniscus transmits a greater proportion of the load on the lateral side of the knee than on the medial side, where the load is shared equally by the medial meniscus and the articular surface.[6]

In summary, the double popliteus tendon sign is a low-signal-intensity band paralleling the popliteus tendon at the level of the popliteus hiatus on sagittal MRI, which has continuity with the posterior horn of the lateral meniscus. It represents the displaced fragment of a complex flap tear of the lateral meniscus.

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