

# Snapping Popliteus Tendon Within an Osteochondritis Dissecans Lesion: An Unusual Case of Lateral Knee Pain

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## Abstract

The popliteus muscle is an important structure in the posterior knee, coursing from the distal lateral femoral condyle to the posterior tibia, and it initiates knee flexion, protects the lateral meniscus, and resists tibial external rotation. Abnormalities in the lateral femoral condyle may result in impaired tracking of the popliteus tendon over the lateral femoral condyle, causing pain and a snapping sensation.

We report a case of a snapping popliteus tendon caused by an osteochondral defect of the lateral femoral condyle. We obtained a thorough medical history, performed a detailed physical examination, and performed diagnostic ultrasonography to accurately diagnose the condition. The patient underwent open popliteus tenotomy and tibial tenodesis with excellent results and full return to activity.

Any abnormality of the lateral femoral condyle may predispose patients to snapping popliteus tendon and we believe early diagnosis utilizing ultrasonography imaging and surgical intervention may benefit these patients significantly.

Lateral knee pain with mechanical snapping can be caused by a number of conditions, including iliotibial band friction syndrome, lateral meniscal pathology, lateral compartment osteoarthritis, intra-articular loose body, biceps femoris tendinopathy, or proximal tibiofibular joint instability. Popliteus tendon dysfunction is an uncommon cause of lateral knee pain with mechanical snapping; it was first reported after total knee arthroplasty (TKA) by Barnes and Scott<sup>1</sup> in 1995 with the tendon snapping over the prosthetic femoral condyle, and a further report after TKA by Allardyce and colleagues<sup>2</sup> followed in 1997. Additional cases of popliteus tendon snapping over the lateral femoral condyle due to

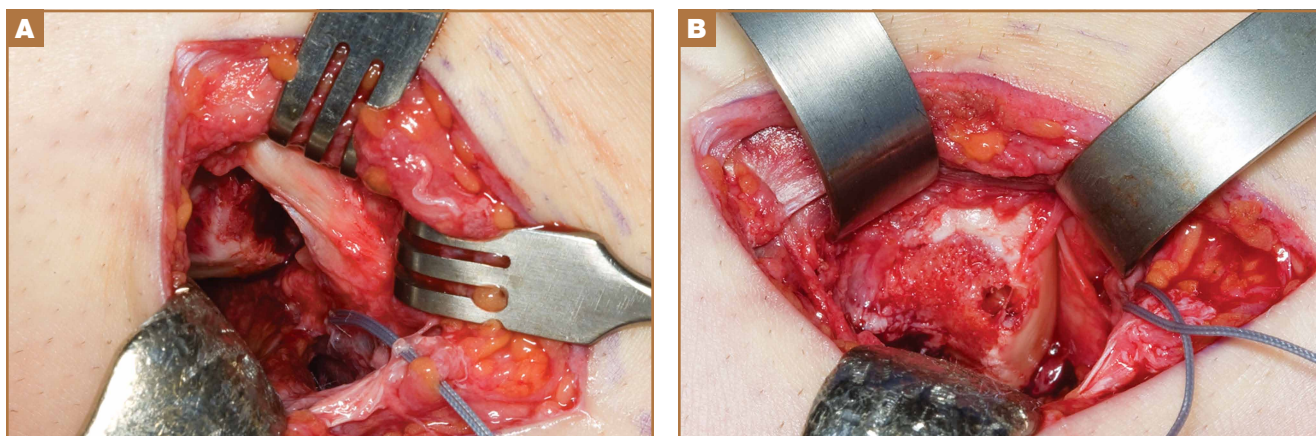
trauma, osteophytic impingement, or prominent popliteus sulcus tubercles have also been described.<sup>3-7</sup>

We report a case of a snapping popliteus tendon within a lateral femoral condyle osteochondral defect after failed fixation of unstable osteochondral fragments. There is a paucity of literature regarding lateral knee pain with mechanical snapping after surgical intervention for osteochondritis dissecans, especially in the adolescent population. We believe it is important for surgeons to be aware of this condition when evaluating lateral knee pain with mechanical symptoms af-

**Figure 1.** Sagittal magnetic resonance imaging with evidence of lateral femoral condyle osteochondritis dissecans fragments fixed with bioabsorbable compression screws.



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**Figure 2.** (A) Intraoperative photograph demonstrates the popliteus tendon anterior to the lateral femoral defect with the knee in extension. (B) Intraoperative photograph of the defect after removal of the prominent anterior margin and resection of a segment of the popliteus tendon.

ter osteochondral fragment repair or removal. The patient provided written informed consent for print and electronic publication of this case report.

### Case Report

A 17-year-old male, multisport athlete with lateral femoral condyle osteochondritis dissecans, underwent bioabsorb-

able screw fixation of 3 unstable osteochondral fragments (**Figure 1**). Eight months later, repeat arthroscopy was necessary to remove one of the fragments that failed to heal. The patient returned 1 week after this procedure complaining of a painful lateral knee snapping sensation. Physical examination was consistent with a snapping popliteus tendon. Diagnostic dynamic ultrasonography revealed a large irregular defect in the posterolateral femoral condyle that engaged a thickened popliteus tendon during knee flexion. The tendon remained seated in the defect until near-terminal extension, at which point it snapped over the prominent distal (anterior) edge.

The patient underwent an open popliteus tenotomy and tibial tenodesis. A 5-cm posterolateral skin incision was made, the iliotibial band was split, and a lateral arthrotomy was performed posterior to the fibular collateral ligament. Direct visualization confirmed the osteochondral defect (**Figure 2A**). Further inspection and palpation of the lateral femoral condyle revealed slight motion of a previously fixed osteochondritis dissecans fragment. A biocompression screw was inserted to further stabilize this fragment. The prominent anterior margin of the existing defect was removed. A 2-cm segment of popliteus tendon was resected, and the remaining tendon was tenodesed to the tibia at the level of the joint line using a suture anchor (**Figure 2B**). The knee demonstrated no posterolateral rotatory instability and could be placed through full range of motion without any evidence of snapping or catching. By 6 weeks after surgery, the pain and snapping were resolved, and the patient returned to full activities, including high school football (**Figure 3**). At 2-year follow-up, the patient had no recurrence of pain or snapping symptoms and was able to participate in high-demand collegiate athletics without restriction, recurrence of symptoms, or instability.

### Discussion

The popliteus tendon inserts at the proximal fifth of the popliteus sulcus on the lateral femoral condyle, located anterior and distal to the origin of the fibular collateral ligament. The aver-



**Figure 3.** Postoperative anteroposterior radiograph depicts the lateral femoral condyle osseous defect and the tibial suture anchor.

age cross-sectional area of the popliteus sulcus is 3.4 cm<sup>2</sup>, and the average cross-sectional area of the attachment of the popliteus tendon is 0.59 cm<sup>2</sup>.<sup>8</sup> The popliteus muscle's fan-shaped origin on the posterior aspect of the proximal tibia is located 10 to 12 cm above the popliteal line. The popliteofibular ligament originates at the inferior aspect of the popliteus musculotendinous junction and inserts into the posterior-superior portion of the fibular styloid process.<sup>8</sup>

Mechanical and electromyographic studies have demonstrated that the primary function of the popliteus is to initiate and maintain internal rotation of the tibia on the femur.<sup>9</sup> This has been described as an "unlocking mechanism."<sup>10,11</sup> Contraction of the popliteus muscle results in lateral rotation of the femur on the tibia, with the lateral femoral condyle being pulled posteriorly. A secondary function of the popliteus muscle is to protect the lateral meniscus by providing rotatory stability during flexion.<sup>12</sup>

Previous literature reports have described popliteus tendon snapping due to traumatic, iatrogenic, or spontaneous causes.<sup>1-7</sup> Cooper<sup>4</sup> reported on 6 patients with snapping popliteus tendon, including 1 adult with osteochondritis dissecans, and Mariani and colleagues<sup>7</sup> described 3 patients with snapping popliteus tendon. The pathoanatomy has been explained by osteophyte impingement or a prominent tubercle on the popliteus sulcus of the lateral femoral condyle impeding the natural movement of the popliteus tendon during knee flexion and extension, causing pain and a "snap" when the tendon rolls over the impeding structure.<sup>4,6</sup>

The diagnosis of snapping popliteus tendon is often difficult to make clinically. A physical examination may have nonspecific findings, including full range of motion, lack of effusion, no ligamentous laxity, and negative McMurray, Noble, and Ober tests. Common physical examination findings include tenderness over the lateral aspect of the knee and an audible, visual, and/or palpable snap or click over the lateral aspect of the knee during knee flexion and extension.<sup>3-5</sup> Radiographs and magnetic resonance imaging of the knee are usually unremarkable but may show lateral condyle osteophytes.<sup>3-5</sup> Perhaps the best imaging technique to aid in the diagnosis of snapping popliteus tendon is ultrasonography. In addition to being noninvasive, portable, and low-cost, the greatest advantage of ultrasonography is that it allows for real-time dynamic visualization of the popliteus tendon snapping out of the popliteus sulcus.<sup>5,13,14</sup> Diagnostic arthroscopy may also be used and is helpful in ruling out other pathology and in visualizing the popliteus tendon directly.<sup>3-5</sup>

Initial treatment of snapping popliteus tendon is conservative management with nonsteroidal anti-inflammatory drugs, activity modification, and physical therapy including therapeutic modalities. If symptoms do not resolve with conservative management, surgical intervention is necessary. Because of the rarity of this condition, there is limited literature regarding ideal surgical technique. Early studies reported resolution of pain and snapping symptoms after total knee arthroplasty with release or resection of the popliteus tendon at the femoral insertion.<sup>1,2</sup> Later reports of surgical intervention in native knees

showed positive outcomes with resolution of pain and snapping symptoms and no significant instability following tenodesis to the lateral femoral condyle.<sup>3,4</sup> Mariani and colleagues<sup>7</sup> reported resolution of symptoms in 2 patients by open deepening of the popliteus sulcus and tenodesis. Krause and Stuart<sup>5</sup> detailed the evaluation and treatment of a 21-year-old woman with chronic snapping popliteus tendon, also reporting relief of pain and snapping with no instability following tenodesis to the proximal portion of the fibular collateral ligament.

Tenodesis of the popliteus tendon to the lateral femoral condyle is performed in order to reapproximate natural anatomy, but concomitant pathology, such as an osteochondral defect, may make this technique unfeasible. In these situations, release or resection of the popliteus tendon with tenodesis to the tibia is an acceptable alternative. Cadaver studies have shown that although isolated sectioning of the popliteus tendon increases external rotation, this does not cause significant posterolateral instability or varus laxity due to the restraint provided by the posterior cruciate ligament and remaining posterolateral and lateral structures, such as the fibular collateral ligament, biceps femoris, and iliotibial band.<sup>15-17</sup> Ferrari and colleagues<sup>17</sup> showed that quadriceps and patellofemoral forces also reduce the external rotation caused by sectioning of the popliteus tendon. Although studies have shown the popliteus to be an important structure in maintaining internal rotation of the tibia, the clinical significance of this is still unclear.<sup>9,15-17</sup> When possible, repair of an isolated popliteus tendon rupture or avulsion is performed owing to its role in maintaining internal rotation of the tibia.<sup>18-20</sup> However, case reports of nonsurgical treatment of isolated popliteus tendon ruptures and avulsions have been published, showing successful functional outcomes without instability in recreational and professional athletes.<sup>21-23</sup> Additionally, Cooper<sup>4</sup> reported positive outcomes without subjective or objective instability after resection of the popliteus tendon in a patient with snapping popliteus syndrome due to an osteochondritis dissecans lesion.

In our patient, ultrasonographic imaging and direct visualization at the time of surgical exploration revealed the popliteus tendon engaging in a posterior, lateral femoral condyle osteochondral defect in the setting of osteochondritis dissecans. The presence of the lateral femoral condyle osteochondral defect made it impossible to resolve the snapping with tenodesis to the femur. Resolution of the patient's symptoms was achieved by resecting a 2-cm segment of popliteus tendon and fixing the remaining tendon to the proximal tibia with a suture anchor. Intraoperative passive knee motion demonstrated resolution of the snapping and no evidence of increased tibial external rotation. The patient was able to resume all activity without restriction by 6 weeks postoperatively and has had no recurrence of symptoms or episodes of instability at 2 years postoperatively.

## Conclusion

Snapping popliteus tendon is an uncommon cause of lateral knee pain with mechanical snapping and may be easily overlooked during examination. Onset may be spontaneous, but

patients may present with a history of osteochondritis dissecans, lateral knee trauma, or prior surgical procedures. The diagnosis can be confirmed by physical examination, dynamic ultrasonography, or surgical exploration. Surgical management with popliteus tenotomy and tibial tenodesis may be curative. Orthopedic surgeons should be aware of the presentation and management of this condition.

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