The exact structure and function of the popliteus muscle have been debated for decades, which makes its proper role a clinical enigma. Popliteus dysfunction may significantly contribute to knee dysfunction, but proper assessment and treatment procedures are not widely recognized. The purpose of this report is to review the functional anatomy of the popliteus muscle, highlight signs and symptoms related to popliteus dysfunction, and review a manual therapy approach for resolution of symptoms.

Anatomy and Function

The popliteus is a small muscle located on the posterolateral aspect of the knee (Figure 1). It has been described as having a reversed orientation, with a proximal tendinous origin and a distal muscular insertion. The distal insertion has a triangular shape that covers the posterior aspect of the proximal tibia and forms the floor of the popliteal fossa. It lies deep to the posterior knee musculature and the neurovascular bundle. The proximal origin is composed of three separate tendinous attachments. The primary attachment is the popliteal tendon (A), which originates beneath the lateral collateral ligament (LCL) on the lateral femoral condyle. The tendon passes downward at an angle of approximately 45° through the femoral sulcus to connect with the muscle belly (D). The popliteus tendon’s primary attachment is located posterior to the LCL in knee extension, but it moves under the LCL as the knee moves in flexion. The second attachment is to the posterior horn of the lateral meniscus (B), and a third area of tendinous attachment is commonly referred to as the popliteofibular ligament (PFL; C), which adheres tightly to the fibular head.

The popliteus internally rotates the tibia on the femur in an open kinetic chain action and externally rotates the femur on the tibia in a closed kinetic chain condition. It is believed to initiate knee flexion from a fully extended position by reversing the screw-home mechanism at the end-range of knee extension. During the extension screw-home mechanism, the larger medial femoral condyle produces external rotation of the tibia through the last 5° – 7° of extension. The popliteus is believed to play an important role in the maintenance of the relative positions of knee...
Identification of Dysfunction

Although there are several documented types of popliteus pathology, dysfunction is not always associated with chronic or acute trauma to the muscle itself. Knee trauma or post-surgical complications can produce debilitating popliteus spasm. Regardless of its etiology, identification of popliteus dysfunction is essential for resolution of associated symptoms and restoration of normal knee function.

Popliteus dysfunction is often identified by a deficit in knee extension, particularly in the final 5° and the apparent lack of screw-home phenomenon. The Helfet Test\textsuperscript{6,8} provides a clinical assessment of the screw-home mechanism (Figure 2). Other signs and symptoms associated with popliteus dysfunction are posterolateral knee pain (possibly induced by an effort to fully extend the knee), palpable tenderness along the path of the popliteus tendon to the muscle belly, decreased pain with manually assisted external tibial rotation during active terminal knee extension, and pain in response to manually resisted internal tibial rotation.

Manual Massage Technique

There are two factors to consider before performing manual therapy on the popliteus muscle. First, the clinician should be cognizant of the location of the neurovascular bundle and should take care to avoid the application of deep pressure at the center of popliteal fossa. Excessive pressure on the neurovascular bundle can produce significant pain. Second, the clinician should begin with massage of the superficial structures (i.e., hamstrings, gastroc-soleus complex, and IT band) to facilitate relaxation of the overlying musculature thereby enhancing manual access to the popliteus. On the basis of our clinical experience, the authors recommend 5 to 10 minutes of general petrissage.

Place the patient in a prone position with the knee flexed at 30° to relax the surrounding musculature (Figure 3).\textsuperscript{9} Figure 4 illustrates the anatomical reference points necessary to locate the popliteus. Begin by palpating the lateral femoral epicondyle (item 1) and the fibular head (item 3). The popliteus tendon passes from the lateral epicondyle to the popliteus muscle at a 45° angle above the fibular head (item 2). The popliteus tendon emerges from beneath the biceps femoris tendon (line C) at approximately the length of the distal phalanx of the thumb from the fibular head and passes diagonally to the muscle belly (line B).\textsuperscript{10} The muscle is most accessible near the convergence of the medial and lateral heads of the gastrocnemius (item 2). The

---

**Figure 2**  
Helfet test clinical exam for screw-home mechanism.

**Figure 3**  
Patient prone with knee flexed to 30° to relax the gastrocnemius.
A clinician can effectively manipulate the popliteus by following the described path of the popliteus tendon to the muscle belly (line B).

Due to its deep anatomical location, the popliteus is not always palpable; however, the clinician may feel a rope-like structure in the area between the point where the popliteus tendon emerges from beneath the biceps femoris tendon to the convergence point of the lateral and medial heads of the gastrocnemius when the popliteus is in spasm. When this is rope-like structure is not palpable, the clinician must rely upon knowledge of the anatomical location of the musculo-tendinous structure.

Two types of massage are recommended for the treatment of popliteus spasm. The clinician should begin with kneading massage along the path of the popliteus tendon to the muscle belly (Figure 5). Using the thumb to apply pressure, move from the biceps femoris tendon to the popliteus muscle belly and back to the starting point with slow and deliberate strokes for a period of five to ten minutes. A more aggressive manual technique of cross friction massage may also be utilized (Figure 6). The clinician should apply strokes across the popliteus tendon, in a path that is perpendicular to the tendon’s orientation, along the entire length of the popliteus tendon and muscle. Because this technique may cause discomfort and persistent soreness, its performance should be limited to 5 minutes.

Following manual therapy, popliteus symptoms and knee mechanics should be revaluated. An immediate return of the normal screw-home mechanism during active terminal knee extension is often observed; however, there may be some residual discomfort associated with the treatment.

If the knee mechanics are not improved, there are numerous pathologies to consider (i.e., meniscus lesion, biceps femoris strain, capsular tightness, and/or quadriceps dysfunction). Popliteus dysfunction is just one possible contributory factor. The proper application of manual therapy techniques may alleviate symptoms, or they may serve a diagnostic purpose that guides the clinician to investigate other possible causes of knee symptoms.
Conclusion

There is disagreement in the literature concerning details of the anatomy and function of the popliteus muscle; however, it is considered to be a primary contributor to maintenance of knee positioning during locomotion, and it clearly plays a role in reversal of the screw-home phenomenon when the knee flexion is initiated from a fully extended position. Spasm of the popliteus may be a cause of posterior knee pain and the inability to actively extend the knee through the final 5° of extension. Following identification of popliteus dysfunction, the application of the manual therapy techniques can sometimes provide immediate relief of symptoms.

References


Trey Morgan and Thomas Palmer are with the Athletic Training Education Program at Northern Kentucky University. E-mail: morgant@nku.edu; palmarT1@nku.edu.
Stevie D. Stevens is with Wellington Orthopedic & Sports Medicine in Cincinnati, OH.