

[Primary Care]

Semimembranosus Tendinopathy: One Cause of Chronic Posteromedial Knee Pain

William E. Bylund, BS,* and Kevin de Weber, MD

Context: Semimembranosus tendinopathy (SMT) is an uncommon cause of chronic knee pain that is rarely described in the medical literature and may be underdiagnosed or inadequately treated owing to a lack of understanding of the condition.

Evidence Acquisition: A search of the entire PubMed (MEDLINE) database using the terms *knee pain semimembranosus* and *knee tendinitis semimembranosus*, returned only 5 references about SMT—4 case series and 1 case report—and several relevant anatomical or imaging references.

Results: The incidence of SMT is unknown in the athletic population and is probably more common in older patients. The usual presentation for SMT is aching posteromedial knee pain. Physical examination can usually localize the area of tenderness to the distal semimembranosus tendon or its insertion on the medial proximal tibia. In unclear cases, bone scan, magnetic resonance imaging, or ultrasound may distinguish SMT from other causes of posteromedial knee pain. Treatment should begin with relative rest, ice, nonsteroidal anti-inflammatory drugs, and rehabilitative exercise. In the minority of cases that persist greater than 3 months, a corticosteroid injection at the tendon insertion site may be effective. Surgery to reroute and reattach the tendon is rarely needed but may be effective.

Conclusion: SMT is an uncommon cause of knee pain, but timely diagnosis can lead to effective treatments.

Keywords: semimembranosus; tendonitis; knee

In comparison to anterior and lateral knee pain, chronic posteromedial knee pain is a relatively uncommon entity. Causes of pain in this area include medial meniscal tears, osteoarthritis, tendinopathy or bursitis of the pes anserine, popliteal (baker's) cysts, strain of the medial head of the gastrocnemius muscle, popliteus muscle strain, medial collateral ligament sprain, and semimembranosus tendinopathy (SMT), among others. The last, SMT, is relatively uncommon in this location but is by no means rare, and the astute clinician should be aware of the condition to avoid delay of diagnosis and treatment.

ANATOMY AND PATHOPHYSIOLOGY

The semimembranosus (SM) muscle originates from the lateral aspect of the ischial tuberosity, runs down the posteromedial aspect of the thigh, inserts at the posteromedial aspect of the

knee, and flexes the knee. The muscle belly ends just above the knee joint and forms a thick rounded tendon distally, which passes medial to the medial head of the gastrocnemius but lateral to the smaller semitendinosus tendon. Figures 1-3 show the relevant anatomy. The SM tendon usually has several insertions.⁴ The main (direct) head inserts at the posteromedial tibial plateau, just posterior to the medial collateral ligament (MCL). The most anterior insertion (pars reflexa) turns anteriorly almost 90° and passes beneath the MCL to insert on the tibia just below the medial joint line. Minor insertions include those to the posterior aspect of the medial femoral condyle and the fascia of the popliteus muscle posteriorly.⁴ There is a U-shaped bursa that surrounds the distal SM tendon, separating the distal aspects of the tendon from the medial tibial plateau, MCL, and semitendinosus.¹²

SMT usually develops at the main (direct) head, at reflected insertions, or in the distal tendon. During repetitive knee

From the Uniformed Services University, Great Falls, Virginia

*Address correspondence to William E. Bylund, BS, Uniformed Services University, 327 Canterwood Lane, Great Falls, VA (s10wbylund@usuhs.mil).

No potential conflict of interest declared.

DOI: 10.1177/1941738109357302

© 2010 The Author(s)

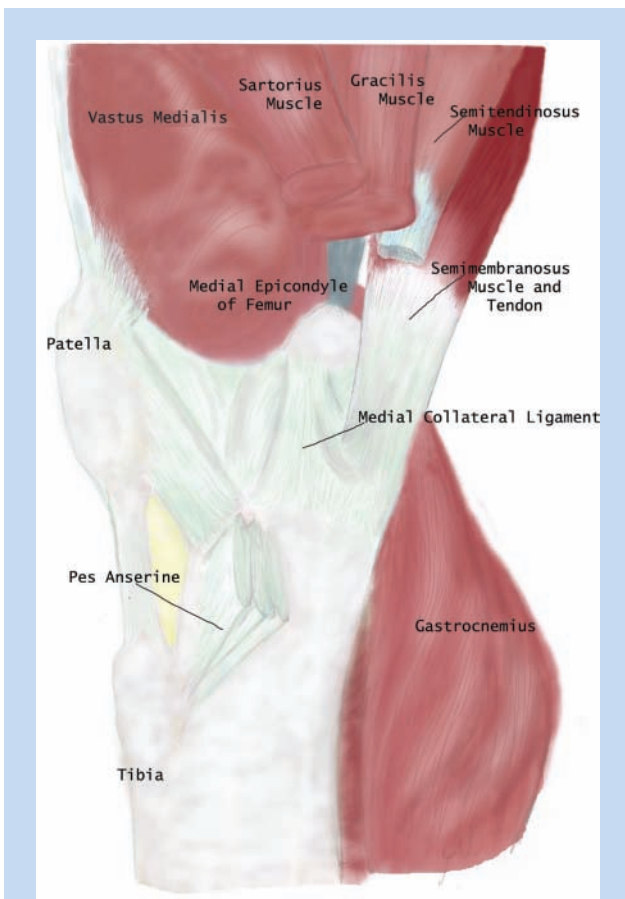


Figure 1. Medial view of the knee, highlighting the semimembranosus and its direct insertion to the medial tibial plateau.

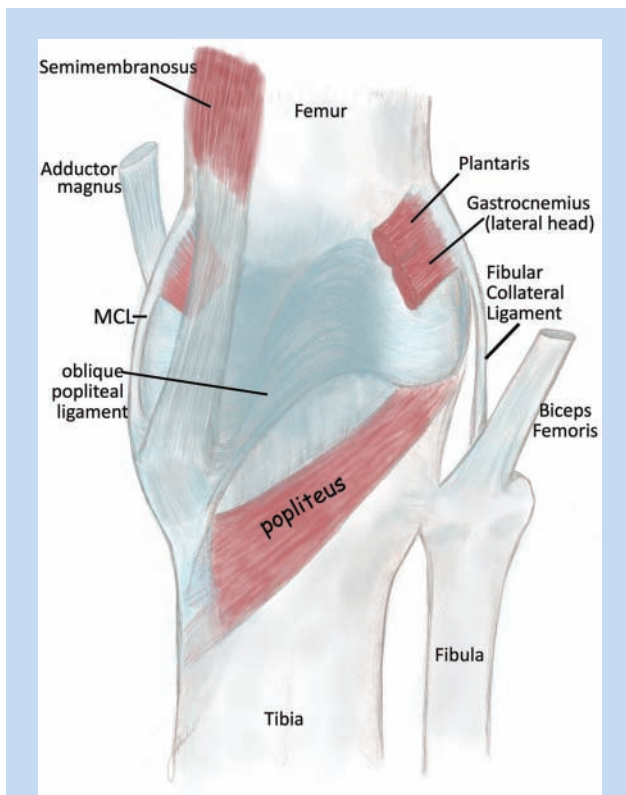


Figure 2. Posterior view of a right knee, emphasizing the direct semimembranosus insertion. Also visualized are the minor insertions to the oblique popliteal ligament and the popliteal fascia.

flexion, the SM tendon is subjected to increased friction from the adjacent joint capsule, medial femoral condyle, medial tibial plateau, and semitendinosus tendon.^{3,13} Friction and repetitive eccentric tendon loading can lead to degenerative changes in the tendon and its insertions and irritation of the bursa.^{1,13}

CLINICAL PRESENTATION

Two patient types are predisposed to developing SMT. Young avid endurance athletes can develop SMT as a primary disorder owing to overuse. More commonly, though, SMT develops in middle-aged to older patients. Other knee pathology often coexists, which may confuse the clinical picture and perhaps be involved in the cause. Chondromalacia and degenerative medial meniscal tears are the 2 most common associations.¹¹ Elderly patients with osteoarthritis (OA) can develop SMT in the anterior reflected tendon insertion secondary to adjacent osteophytes on the joint line. These patients also frequently suffer from concomitant pes anserine tendonitis.⁴ Total knee replacement components can also cause secondary SMT.⁵ Some authors have noted a high predilection for females,^{4,13} but others have not.¹¹ One might hypothesize that this is related

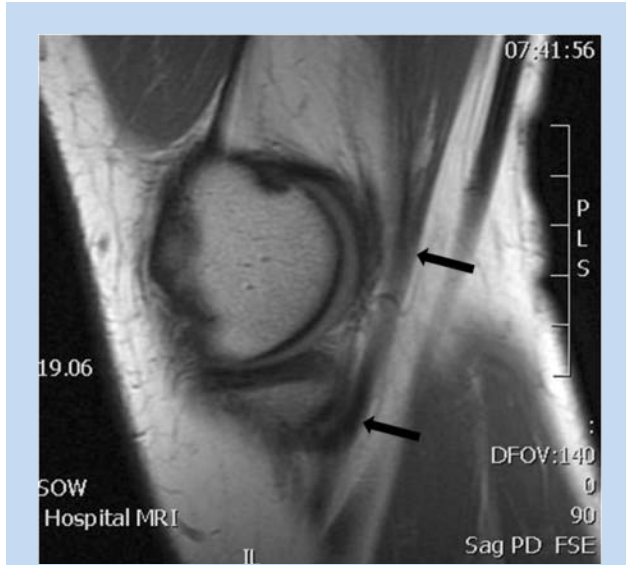


Figure 3. MRI of knee showing a normal semimembranosus tendon (arrows) and its insertion into the proximal medial tibia.

Table 1. Differential diagnosis of posteromedial knee pain.^a

Differential Diagnosis	Comments
Meniscal tears (medial)	May be concomitant with SMT; positive provocative tests and joint line tenderness
Semimembranosus bursitis	Usually detectable on magnetic resonance imaging and/or clinical exam; may be concomitant with SMT
Snapping knee syndrome	Palpable snap between semitendinosus and gracilis tendons
Pes anserine bursitis	Localized more anteriorly and distally than SMT, medial to tibial tuberosity ^{4,12}
Medial collateral ligament strain (chronic)	Valgus stress causes laxity and/or pain; history of acute knee injury
Osteoarthritis (medial compartment)	Abnormal radiographs; may be concomitant with SMT
Popliteal (baker's) cyst	Posterior mass, variable size and location
Tibial osteonecrosis	Rare cause of posteromedial pain ⁸ ; abnormal radiographs
Popliteus muscle strain	Pain reproduced with resisted external rotation of tibia

^aSMT, semimembranosus tendinopathy.

to increased valgus stress and the Q angle present in women. Similarly, overpronation of the foot may cause increased valgus stress. Both conditions may increase friction between the medial femoral condyle and the SM tendon,¹² but no studies have evaluated any of these variables as risk factors for SMT.

The presentation of SMT can be variable but usually consists of an insidious, progressive ache in the posteromedial knee. The pain may be severe in its acute form following a relatively sudden increase in endurance activity, such as cycling or running. Patients usually localize the pain at the posteromedial knee at the direct insertion, but pain may radiate proximally up the posteromedial thigh or distally to the medial calf. Symptoms increase with activities that involve significant hamstring activation: running, cycling, walking down stairs, or sudden deep knee flexion.

On examination there is tenderness to palpation of the SM tendon near its tibial insertion site (or sites) or slightly more proximally.^{9,11} Resisted flexion of the knee at 90° can make the SM tendon more prominent for easier palpation. Passive internal tibial rotation of a knee flexed at 90° may localize the pain.¹³ Passive deep flexion of the knee may also exacerbate the pain as the affected tendon and/or insertion becomes impinged by adjacent structures. The hip, ankle, and foot morphology should be evaluated for biomechanical features that can predispose to SM tendon overuse.

DIFFERENTIAL DIAGNOSIS

Several conditions can cause pain in the medial aspect of the knee and should thus be considered, including chronic MCL sprain, popliteal (baker's) cyst, popliteal muscle strain, pes anserine bursitis, and tibial osteonecrosis. Other conditions

may predispose to, or be concomitant with, SMT, such as medial compartment OA, medial meniscal tears, SM bursitis, or “snapping knee” syndrome. This last condition is caused by subluxation of the gastrocnemius and SM tendons and typically presents in avid athletes.^{2,7} Table 1 lists conditions in the differential diagnosis and some of their distinguishing features.

IMAGING

When the diagnosis is uncertain after a history and physical examination or when concomitant pathology is suspected, imaging may be of benefit. Plain films will usually result in negative findings for SMT, however, and advanced imaging may be necessary. Bone scans can show increased radiotracer uptake at the posterior medial tibial plateau near the insertion site of the SM.¹¹ MRI is useful in ruling out other causes of medial knee pain, including SM bursitis.^{3,6,12} Unfortunately, MRI has poor accuracy for pathology of the posterior horn of the medial meniscus. This region is also the most difficult to visualize during arthroscopy.^{3,6,10} Ultrasound in the hands of an experienced clinician may also be useful. Findings suggestive of SMT include thickening of the SM tendon, degenerative tendinopathy at the site of clinical tenderness, and surrounding bursal fluid. Figure 4 shows relevant anatomy in the area of a symptomatic patient. Local anesthetic injection, with or without ultrasound guidance, can be helpful in confirming the diagnosis.

TREATMENT

Initial conservative treatment for SMT includes relative rest from painful activities, ice, pain-relieving modalities, a short

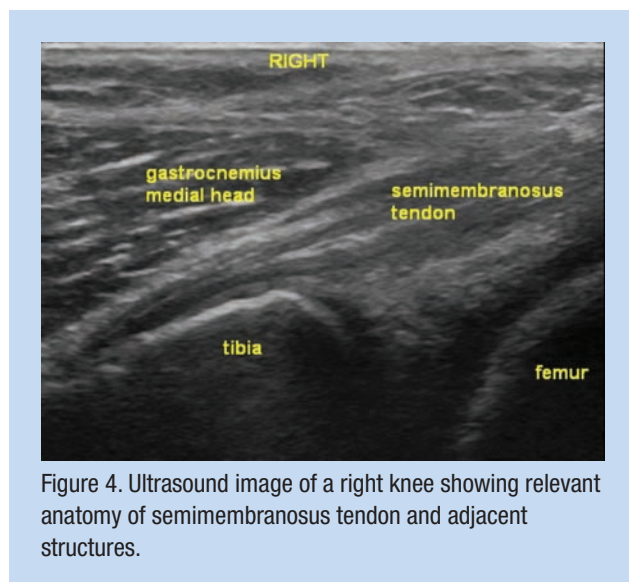


Figure 4. Ultrasound image of a right knee showing relevant anatomy of semimembranosus tendon and adjacent structures.

course of nonsteroidal anti-inflammatory drugs, and physical therapy that includes hamstring strengthening and stretching exercises.^{9,11,13} In our opinion, SMT may benefit from proper shoe fit to prevent overpronation. Specifically, a medial heel lift may be beneficial in patients with genu valgum. In more than 90% of cases, the condition will heal without further intervention.^{11,13} If standard conservative treatment is delayed because of inaccurate diagnosis, symptoms may persist. Weiser¹³ treated 100 patients with SM insertion syndrome with injection of 3 mL of 2% lidocaine and 10 mg triamcinolone at the SM tendon insertion. The needle was advanced until encountering bone. In 58 patients, a single injection at the insertion site was effective in relieving symptoms. The remaining patients required up to 3 injections, and only 9 did not experience significant relief.^{4,9,13}

Successful operative treatment has been described in recalcitrant cases of SMT after failure of conservative treatment for a minimum of 3 months.¹¹ Ray et al described a SM-rerouting procedure that places the SM tendon adjacent to the posterior border of the MCL, in an attempt to relieve the chronic irritation of the SM tendon at the posterior medial corner. In all 10 surgical cases, the posterior medial knee pain resolved in 24 months. In 1 patient, patellofemoral symptoms remained.¹¹

Elderly patients may develop SMT in the reflected portion of the insertion owing to irritation by adjacent osteophytes from OA.⁴ Excision of the reflected insertion has been successful in patients with isolated SMT, but in cases with coexistent pes anserine pathology, results were only fair.⁴ In cases of SMT caused secondary to total knee arthroplasty, excision of the SM tendon has been performed.⁵ Complete excision of any insertion is not recommended for young active individuals, given that the SM plays an important physiologic role.^{4,5,11} Addressing only comorbid intra-articular pathology may allow SMT to resolve with subsequent conservative management.¹¹

Extracorporeal shock wave lithotripsy has been used for other insertional tendinopathies, but there is currently no evidence on the effectiveness of this modality on SMT. The same is true of platelet-rich plasma therapy and autologous blood injections.

ILLUSTRATIVE CASE

A 24-year-old man presented with persistent posteromedial right knee pain. Before injury, he often ran more than 50 miles per week. The patient initially had severe pain with a limp but did not seek care, because the pain gradually improved with relative rest. The pain never subsided completely, and strenuous activity continued to cause aching pain, sometimes radiating proximally. On exam, there was palpable tenderness of the SM tendon at the direct head SM insertion and mild pain at that location with resisted flexion. An MRI was obtained, which showed only a small posterior horn meniscal tear. Physical therapy for hamstring tendinopathy was pursued with minor relief of symptoms. Almost a year after the onset of pain, arthroscopy was performed and revealed an enlarged patellar plica but no meniscal damage. The plica was removed, but the posteromedial knee pain returned 1 month following surgery, shortly after the patient attempted running. Physical therapy was continued without significant change in posteromedial knee symptoms. Two corticosteroid injections near the insertion of the direct head were performed a few months apart, with some short-term relief. Persistent intermittent aching pain continued to persist 2 years after initial onset, depending on activity level. However, the patient did not feel the mild pain warranted any surgical intervention.

CONCLUSIONS

SMT may be more common than what is apparent in the medical literature, mainly because of clinicians' lack of awareness of this entity. Early diagnosis by careful history, thorough examination, and imaging studies in select cases will ideally result in early successful conservative therapy or operative management of concomitant underlying pathology.

REFERENCES

1. Benjamin M, Toumi H, Ralphs R. Where tendons and ligaments meet bone: attachment sites ("entheses") in relation to exercise and/or mechanical load. *J Anat.* 2006;208:471-490.
2. Bollen SR, Arvinitie D. Snapping pes syndrome: a report of four cases. *J Bone Joint Surg Br.* 2008;90:334-335.
3. Demeyere N, De Maeseneer MP, Van Roy P. Imaging of semimembranosus bursitis: MR findings in three patients and anatomical study. *JBR-BTR.* 2003;86(6):332-334.
4. Halperin N, Oren Y, Hendel D, Nathan N. Semimembranosus tenosynovitis: operative results. *Arch Orthop Trauma Surg.* 1987;106:281-284.
5. Hendel D, Weisbord M, Garti A. Semimembranosus tendonitis after total knee arthroplasty: good outcome after surgery in 6 patients. *Acta Orthop Scand.* 2003;74(4):429-430.
6. Hill C, Daniel G, Chaisson C, et al. Periarticular lesions detected on magnetic resonance imaging: prevalence in knees with and without symptoms. *Arthritis Rheum.* 2003;48(10):2836-2844.
7. Kartagalis D, Papadopoulos P, Fotiadou A, Christodoulou AG. Snapping knee syndrome in an athlete caused by the semitendinosus and gracilis tendons: a case report. *Knee.* 2008;15:151-154.

8. Lotke P, Ecker M. Osteonecrosis-like syndrome of the medial tibial plateau. *Clin Orthop Relat Res*. 1984;176:148-153.
9. Maffulli N, Renstrom P, Leadbetter W. *Tendon Injuries: Basic Science and Clinical Medicine*. New York, NY: Springer; 2005.
10. Quinn SF, Brown TF. Meniscal tears diagnosed with MR imaging versus arthroscopy: how reliable a standard is arthroscopy? *Radiology*. 1991;181:843-847.
11. Ray M, Clancy W, Lemon R. Semimembranosus tendonitis: an overlooked cause of medial knee pain. *Am J Sports Med*. 1988;16:347.
12. Rothstein CP, Laorr A, Helms CA, Tirman PFJ. Semimembranosus-tibial collateral ligament bursitis: MR imaging findings. *AJR Am J Roentgenol*. 1996;166:857-877.
13. Weiser H. Semimembranosus insertion syndrome: a treatable and frequent cause of persistent knee pain. *Arch Phys Med Rehabil*. 1979;60:317-319.

For reprints and permissions queries, please visit SAGE's Web site at <http://www.sagepub.com/journalsPermissions.nav>.