Technical Note

Percutaneous Lengthening of a Regenerated Semitendinosus Tendon for Medial Hamstring Snapping

Julio Cesar Gali, M.D., Ph.D., Bárbara Lívia C. Serafim, M.S., Samir Alexandre Nassar, M.D., Julio Cesar Gali Filho, M.D., and Robert F. LaPrade, M.D., Ph.D.

Abstract: In this surgical technique article, the authors describe a percutaneous tendon lengthening technique for surgical treatment of a regenerated semitendinosus tendon in snapping syndrome. Snapping syndromes are caused by 2 adjacent anatomic structures having a frictional catching, which may be associated with an audible pop. At the knee, they may have an intra- or extra-articular origin. It is imperative to understand the etiology of the snapping phenomenon to avoid unnecessary surgery.

Snapping syndromes are caused by 2 adjacent anatomic structures having a frictional catching, which may be associated with an audible pop. At the knee, they may have an intra- or extra-articular origin. It is imperative to understand the etiology of the snapping to avoid unnecessary surgery.[1]

Snapping symptoms affect the lateral aspect of the knee in most cases,[2] and occurrence of snapping around the medial side of the joint is more uncommon.[3] The literature includes reports of snapping of the semitendinosus tendon alone[4] or in combination with semimembranosus tendons[5] or the gracilis tendon.[3,6-10] The diagnosis of semitendinosus tendon snapping is difficult to make because of the rare description of this syndrome in the literature. It may be based on the history and findings from a physical examination[8] but may not be possible to detect with magnetic resonance imaging (MRI).[11] In fact, Karataglis et al.[3] and de la Hera Cremades et al.[10] report no MRI abnormalities in their patients.

Routine MRI usually requires a resting position and produces static images that may show abnormal findings with limited precision. Because the snapping phenomenon occurs during movement, dynamic imaging may be superior for diagnostic confirmation and identification of the structure responsible for a patient's symptoms.[1] Dynamic ultrasonography may be a useful tool in the diagnosis of medial hamstring snapping.[1,3,6,7,10-13]

Because of the paucity of scientific data on this phenomenon, the etiology of such symptoms is often undetermined,[8] and surgical procedures for treating this condition are variable.[3-10,13,14]

Surgical Technique

The patient is positioned supine, and examination is conducted after anesthesia has been induced and the tourniquet has been inflated because it can make the tendon snapping more evident. Then flexion and extension movements are performed with the dual purpose of confirming the snapping and locating the origin of the phenomenon. Once the semitendinosus tendon snapping is confirmed and the exact location of its occurrence is checked, we palpate the tendon-thickened area and verify its dimensions (Fig 1).

Afterward, the injured leg is elevated by 1 surgical team member, and the knee is kept at maximum

From Faculty of Medical Science and Health, Catholic University of São Paulo (J.C.G., B.L.C..S.), Sorocaba, Brazil; Núcleo de Ortopedia e Traumatologia Esportiva (J.C.G.F.), Sorocaba, Brazil; Centro Médico Sorocaba (S.A.N.), Sorocaba, Brazil; The Steadman Philippon Research Institute and The Steadman Clinic (R.F.L.), Vail, Colorado, U.S.A.

The authors report that they have no conflicts of interest in the authorship and publication of this article. Full ICMJE author disclosure forms are available for this article online, as supplementary material.

Received September 14, 2018; accepted November 8, 2018.

Address correspondence to Julio Cesar Gali, M.D., Ph.D., Faculty of Medical Science and Health, Catholic University of São Paulo, Sorocaba, Brazil, R. Jouberte Wey 290, Sorocaba-SP, Brazil ZIP 18030070. E-mail: juliogali@globo.com

2212-6287/181146

https://doi.org/10.1016/j.eats.2018.11.004

Fig 1. Intraoperative medial view of the left knee with the patient in the supine position. Palpation of thickened semitendinosus tendon (arrow) is done to verify its length.

extension. Three small horizontal incisions are made to perform percutaneous lengthening of a regenerated semitendinosus tendon. The first incision is made at the most distal part of the thickened semitendinosus tendon. A scalpel with a No. 15 blade is inserted perpendicular to the tendon and is used to perforate the skin and the medial midtendon. The second incision is made about 2.5 cm proximal to the first one. At this time, the lateral middle half of the tendon is resectioned (Fig 2). A third incision is made another 2.5 cm proximal to the second one, and again, the medial middle portion of the tendon is resectioned. Then the knee is gently extended, and the tendon stretches (Fig 3). The tenotomy may be sufficient to result in a complete disappearance of the snapping phenomenon (Video 1).

A single stitch is placed at each incision, and a compressive dressing is applied. The patient is discharged from the hospital on the same day, and full weight bearing is allowed.,

Rehabilitation

The patient is instructed to perform hamstring stretching immediately. One month after the operation, eccentric hamstring strengthening, walking, and cycling are allowed. At 2 months after the operation, jogging and lower extremity strengthening are recommended. Running is allowed at 3 months after the operation, and the patient is released to participate in sports at 4 months after the tendon lengthening.

Fig 2. Medial and posterior intraoperative view of the left knee in extension, with the patient in the supine position, during the third incision for tendon middle portion section (arrow).

Fig 3. Intraoperative medial and posterior view with the patient in the supine position with left knee extended after complete tendon lengthening, showing the 3 percutaneous cuts (arrows).

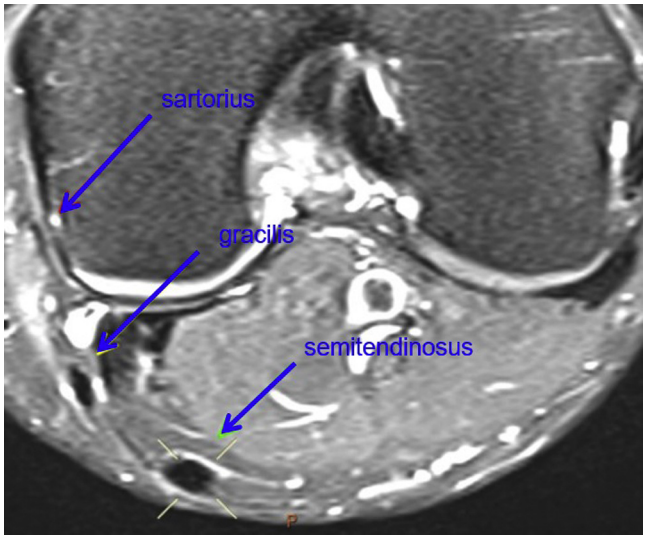

Fig 4. Magnetic resonance imaging showing semitendinosus thickening in a previously harvested tendon for anterior cruciate ligament reconstruction.

Discussion

According to Lyu and Wu,[4] the semitendinosus tendon snapping phenomenon may occur because of an increase in displacement forces or spasm or contracture of the semitendinosus muscle, and if a rupture or loosening of the semitendinosus tendon occurs, fanned-out fibers may decrease the forces contrary to tendon dislocation.

The diagnosis of semitendinosus tendon snapping may be based on the history and findings from a physical examination,[8] but a complete examination may be possible only after anesthesia has been induced and the tourniquet has been inflated. Tendon regeneration may be observed in 67.1% of patients who have undergone an autograft hamstring anterior cruciate ligament reconstruction at 2-year follow-up,[15] and, in our opinion, MRI may show only semitendinosus tendon thickening in patients with a previously harvested tendon for anterior cruciate ligament reconstruction (Fig 4).

Different surgical techniques for semitendinosus tendon snapping have been described, including the following: tendon resection alone,[3,7-10] resection and suture to semimembranosus tendons[4] or to sartorius and semimembranosus tendons,[6] semitendinosus tendon harvesting as done for anterior cruciate ligament reconstruction alone[8] or in combination with semimembranosus tendons partial release,[5] and gracilis tendon plus semitendinosus tendon release from their tibial attachment.[8] Geeslin and Laprade[8] report that semitendinosus tendon release from tibial attachment has been found to alleviate patients' symptoms and result in minimal morbidity, although we presume that it actually works in a manner similar to tendon lengthening.

Table 1. Technique Pearls and Pitfalls

Snapping may occur only after tourniquet inflation.
By palpation, determine the length of the thickened semitendinosus tendon to plan percutaneous lengthening.
During percutaneous lengthening, the scalpel blade should be facing the outer tendon border to avoid inadvertent complete tendon resection.
After tendon lengthening, make sure that tendon snapping has been repaired.

Table 2. Technique Advantages and Disadvantages

Advantages	Disadvantages
Preserves tendon.	May be insufficient to stop the snapping.
Minimally invasive procedure.	Inadvertent complete tendon resection may require additional procedure.
Rapid recovery.	

The technique described in this Technical Note has some risks and limitations, as well as advantages and disadvantages (Tables 1 and 2). One risk is the possible resection of the entire tendon during percutaneous perforation, which may lead to a decrease in flexor strength. Another risk is recurrence of snapping, especially if posterior thigh muscle stretching is not done immediately. One possible limitation is that the technique may not be effective for all patients with regenerated tendon snapping, which may indicate the need for tendon resection or release from tibial insertion.

Percutaneous lengthening of a regenerated semitendinosus tendon is a minimally invasive procedure that may stop the snapping immediately and may allow patients to remain free of symptoms and return to sports participation after they complete the rehabilitation process.

References

1. Guillin R, Marchand AJ, Roux A, Niederberger E, Duvauferrier R. Imaging of snapping phenomena. *Br J Radiol* 2012;85:1343-1353.
2. Guney H, Kaya D, Yilgor C, et al. Semitendinosus snapping: Analysis of movement, electromyographic activities, muscle strength and endurance, motor control and joint position sense. *Muscles Ligaments Tendons J* 2013;3:166-172.
3. Karataglis 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.
4. Lyu SR, Wu JJ. Snapping syndrome caused by the semitendinosus tendon. A case report. *J Bone Joint Surg Am* 1989;71:303-305.
5. Von Dercks N, Theopold JD, Marquass B, Josten C, Hepp P. Snapping knee syndrome caused by semitendinosus and semimembranosus tendons. A case report. *Knee* 2016;23:1168-1171.
6. Bae DK, Kwon OS. Snapping knee caused by the gracilis and semitendinosus tendon. A case report. *Bull Hosp Jt Dis* 1997;56:177-179.

7. Bollen SR, Arvinte D. Snapping pes syndrome: A report of four cases. *J Bone Joint Surg Br* 2008;90:334-335.
8. Geeslin AG, Laprade RF. Surgical treatment of snapping medial hamstring tendons. *Knee Surg Sports Traumatol Arthrosc* 2010;18:1294-1296.
9. Protzman NM, Conkle SB, Busch MF. Snapping knee syndrome of the medial hamstrings. *Orthopedics* 2015;38:e940-e942.
10. de la Hera Cremades B, Escribano Rueda L, Lara Rubio A. Snapping knee caused by the thickening of the medial hamstrings. *Rev Esp Cir Ortop Traumatol* 2017;61:200-202.
11. Asopa V, Douglas RJ, Heysen J, Martin D. Diagnosing snapping sartorius tendon secondary to a meniscal cyst dynamic ultrasound avoids incorrect surgical procedure. *Case Rep Radiol* 2013;2013:813232.
12. Marchand AJ, Proisy M, Ropars M, Cohen M, Duvauferrier R, Guillin R. Snapping knee: Imaging findings with an emphasis on dynamic sonography. *AJR Am J Roentgenol* 2012;199:142-150.
13. Shapiro SA, Hernandez LO, Montero DP. Snapping pes anserinus and the diagnostic utility of dynamic ultrasound. *J Clin Imaging Sci* 2017;7:39.
14. Seino D, Nakayama H, Imamura F, Moro-Oka T, Yoshiya S. Snapping knee caused by the gracilis tendon: A case report with an anatomic study. *Asia Pac J Sports Med Arthrosc Rehabil Technol* 2014;1:77-80.
15. Suijkerbuijk MAM, Reijman M, Oei EHG, van Meer BL, van Arkel ERA, Meuffels DE. Predictive factors of hamstring tendon regeneration and functional recovery after harvesting: A prospective follow-up study. *Am J Sports Med* 2018;46:1166-1174.