

UNILATERAL TENSOR FASCIA SURALIS: A CASE REPORT

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Abstract

Anatomical variations in the muscle are commonly encountered which may be due to embryological errors or due to genetic predisposition. We present a case study of an anomalous muscle in the popliteal fossa on the left side of a 65-year old Asian male cadaver in the anatomy lab during routine dissection. The muscle slip was found superficial and close to the roof of the popliteal fossa, attached proximally to the medial aspect of long head of biceps femoris, and distally terminated as a tendon which was merged with the deep fascia over the gastrocnemius. It was then carefully dissected and photographed. Although, the presence of this kind of muscle is asymptomatic and encountered as incidental finding they have been implicated as a potential source of clinical symptoms like palpable swelling, pain in the popliteal region or secondary compression of neurovascular structures in the popliteal fossa.

Key words: Tensor fascia suralis, Anomalous muscle, Biceps femoris, Popliteal fossa

INTRODUCTION:

Biceps femoris is the most lateral muscle of the hamstring muscle complex which has two components (a long head and short head). Variations in the biceps femoris muscle are reported which consists of absence of muscle, supernumerary muscles, deviation from the normal course or an anomalous origin or insertion.^{1,2,3} Accessory muscles occur due to early splitting of the primordium of the muscle.⁴ According to the literature, a muscle which originates from both the semitendinosus and long head of biceps femoris or from either of the above mentioned muscle and inserts into the sural fascia or tendo calcaneus can be termed the Tensor fascia suralis (TFS).^{5,6,7}

TFS is very rare anomalous muscle encountered in the popliteal fossa. The muscle may arise from the distal aspect of any of the hamstring muscle and may insert into the posterior fascia of the leg, into the Medial head of

gastrocnemius or via a long thin tendon onto the superficial aspect of Achilles tendon. The location of TFS muscle is superficial in the popliteal fossa between the semitendinosus and semimembranosus medially and biceps femoris muscle laterally and is innervated by the tibial nerve.³

Majority of the lower limb shows variations that are distributed in a bilateral symmetrical manner. One school of thought is that right and left limbs of an embryo tend to develop as the mirror image. In the present case report, we have discussed a unilateral anatomic variant muscle in the popliteal fossa from embryological, anatomical and clinical bases.

CASE REPORT:

During routine dissection for medical students in anatomy lab, we encountered a variant muscle on the left side of the popliteal fossa in a 65 year old Asian male cadaver. After careful dissection and clearing the boundaries of the

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popliteal fossa a variant muscle was found immediately beneath the popliteal fascia. It was further traced throughout, to locate its attachments and course which originated as a narrow tendinous slip from the medial side of the long head of biceps above the popliteal fossa, 13.3cm from the popliteal crease. The tendinous slip formed a rounded muscle belly which passed medially, superficial to the neurovascular structures present in the popliteal fossa. Inferiorly, the muscle belly formed a tendon which

expanded as aponeurosis and blended with the deep fascia over the gastrocnemius muscle. The muscle belly received its innervation from the tibial nerve on its deeper aspect. The full length of the muscle along with its tendon was 19.3cm and the width was 1.4cm (fig 1). The measurement was taken using calibrated steel tape. This anomalous muscle was present unilaterally and no further variations were detected in the popliteal fossa.

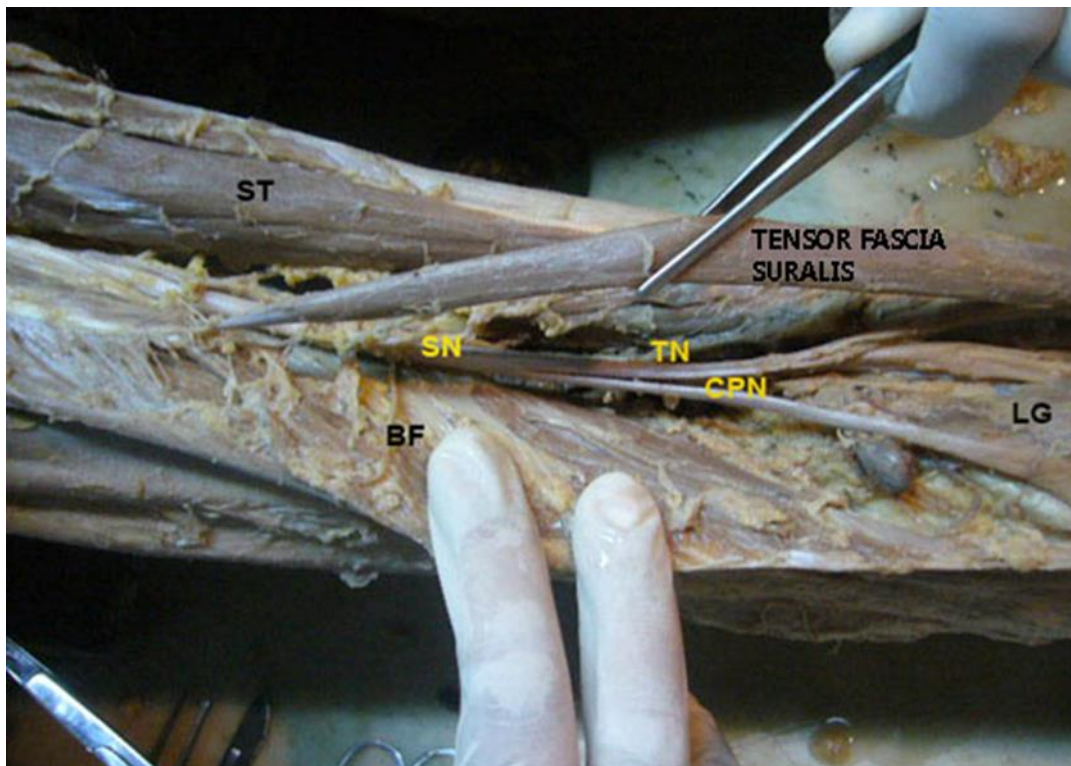


Fig. 1. Illustrates the course and attachment of the tensor fascia suralis. BF- Biceps femoris tendon, ST- Semitendinosus, SN- Sciatic nerve, TN- Tibial Nerve, CPN- Common peroneal nerve, LG- Lateral head of gastrocnemius

DISCUSSION:

Kelch reported the first case of anomalous muscle from the medial border of biceps femoris, forming a bicipital accessorius.⁵ Macalister have cited in his literature a case of variation of biceps flexor cruris (biceps femoris) as it may have a third head arising in common with the middle head

of gastrocnemius. The muscle TFS is defined in Quain's Anatomy, as a muscular slip passing from one of the hamstring muscle to the fascia present at the back of the leg.⁷ Hollinshed called a slip of biceps femoris which inserts to the fascia of the leg as TFS.⁸ An anomalous muscle was reported in the popliteal fossa which has been arising by 2

slips, one from the biceps femoris and other from Semitendinosus and inserting into the Tendocalcaneus.⁹ Based on the literature available and by comparing the present case, we regard this variant muscle in the left popliteal region as TFS. This muscle is different from the Caput tertium or Third head of gastrocnemius since it does not terminate in the lateral and medial head of gastrocnemius.¹⁰ But the innervation of the muscle is from the tibial nerve which matches the nerve supply of the gastrocnemius.

An anomalous muscle was reported which ran transversely from biceps tendon to the medial head of gastrocnemius which received its innervation from common peroneal nerve.^{11,12} Another supernumerary muscle in the popliteal fossa was reported which ran from biceps tendon to the medial head of gastrocnemius but received its nerve supply from lateral sural cutaneous nerve, a branch from the common peroneal nerve.¹³ The above mentioned literature reveals that an abnormal muscle in the popliteal fossa which runs transversely has its innervation from the common peroneal nerve & its branches.

The presence of such variant muscle has its own clinical importance. The anomalous muscle in this case study was present posterior and in close relationship to the sciatic nerve, tibial nerve and popliteal vein. The contraction of TFS muscle in such relation may lead to compression of any of these nerves and vein leading to entrapment neuropathy. The most common hamstring muscle strain is to the long head of biceps femoris which occur mostly at the musculo-tendinous junction of the muscle.^{14,1}

Roger E reported a 20 year old man who had notice painful swelling in the right popliteal fossa. At surgery, an extra 3x5cm fleshy hamstring belly was found, which crossed the

popliteal fossa without compromising the neurovascular structures.¹⁵ Satoh also cited complain about pain in the lower region of popliteal fossa during knee extension, However, pain in the upper region of the popliteal fossa as the knee is flexed is because of popliteal fascia, strongly interwoven with the epimysium of the biceps and semitendinosus. The anomalous muscle in the present study was just beneath the popliteal fascia.¹⁶ Hence this kind of anomalous muscle involvement in the popliteal fossa can be a reason for certain non-specific knee pain and clinically challenge the medical practitioner

Clinically, this type of anomalous musculotendinous structures around the popliteal artery may contribute to the popliteal artery entrapment syndrome.¹⁷ Aside from its clinical presentation, errors in the interpretation of imaging studies could conceivably occur. When prominent, this muscle may be mistaken for a mass or its tendon may be mistaken for aberrant vessels.¹⁸

Embryologically limb bud develops from differentiation of mesodermal somites. Several sequence of apoptosis and growth of muscle primordia occur to determine the configuration of the muscle. Failure of muscle primordia to disappear leads to the presence of an accessory muscle or additional muscle.

Muscles of limbs develop from myogenic precursor cells that arise from ventral dermomyotome of somites. In these precursor cells, muscle regulatory genes like Pax 3 and Myf 5 are activated and transcription factors like Myo D, myogenin and myogenic regulatory factors are expressed. Further growth of muscle occurs by fusion of myoblasts and myotubes and later are invested by connective tissue.¹⁹ Variation of muscle patterns may be a result of altered signaling or stimulus between mesenchymal cells.²⁰

The innervations and vascularization of the TFS were from tibial nerve similar to long head of biceps femoris, agrees with the normal embryologic development of the related dermatomes and myotomes. Tensor Fascia suralis may be a result of prolongation from the tendon of biceps into the sural fascia which represents the muscle existing in lower animals.⁶

CONCLUSION:

The present case will add on to the existing knowledge of tensor fascia suralis. Such variations of muscles may simulate soft-tissue tumors and can result in compressions of the neurovascular structures in the popliteal fossa. Knowledge about such a variant muscle and its relationship to the neurovascular structures in the popliteal fossa should be considered in the diagnosis and management of various procedures in and around the knee.

References

1. Stephanie J Woodley and Richard N Storey. Review of hamstring Anatomy. *Aspetar Sports Medicine Journal*. 432-37.
2. Sosa, MA, Vidal, GA, Sosa, EA and Santos, NM. Revision of variety of biceps femoris muscle . *Braz. J. Morphology. Sci.* 2008;25, 1-4:157-214.
3. Paul A.Sookur, Ali M Naraghi, Robert R Bleakney, Rosy Jalan, Otto chan and Lawrence M White. Accessory Muscles; Anatomy, Symptoms and Radiologic Evaluation. *Radiographics*.2008;28(2):481-99.
4. Keith L. Moore, T.V.N Persuad, Mark G. Torchia. *Before We Born*.
5. Kelch, W.G. Beiträge zur pathologischen Anatomie. 8, s.42, art. 36, Abweichung des Biceps Femoris. C. Salfeld, Berlin.1813;8(42)36
6. Macalister A. Observations on muscular anomalies in human anatomy. Third series with a catalogue of the principal muscular variations hitherto published. *Trans. Roy.Irish Acad. Sci.*1875; 25:1-130.
7. Barry D and Bothroyd JS. Tensor Fasciae Suralis. *J. Anat.*1924;58:382-90.
8. Henry W.; *Hollinshed Text Book of Anatomy*; 1962 edition; Harper & Row publisher; Calcutta;447-448; (1962)
9. Somayaji S.N, Vincent Airy. An anomalous muscle in the region of the popliteal fossa: case report. *J.Anat.*1998;192:307-308.
10. Mitesh R. Dave, vaishalikiranyagin&Samir Anadkat. Unilateral Third/Accessory Head of gastrocnemius muscle: a case report. *Int.J. Morphol.*2012.30(3):1061-1064.
11. Parsons FG.Note on an abnormal muscle in the popliteal space; *Journal of Anatomy*; (1920); 54: 170-178.
12. Keishi Okamoto, Tetsuaki Wakebe, Kazunobu Saiki, Seiji Nagashima. An anomalous muscle in the superficial region of the popliteal fossa, with special reference to its innervation and derivation.2004;186(5-6):555-59.
13. Kim DI1, Kim HJ, Shin C, Lee KS. An abnormal muscle in the superficial region of the popliteal fossa.*AnatSci Int.* 2009 Apr;84(1-2):61-3.

14. Patrick Richard Fraser, Addison Reed Wood, Armando Aviles Rosales. Anatomical variation of the semitendinosus muscle origin. *International Journal of Anatomical variations*.2013;6:225-7.
15. Roger E. Stevenson, Benjamin D. Solomon, David B. Everman. *Human Malformations and related Anomalies*.3rd ed. Oxford University press.2015:327.
16. Satoh M, Yoshino H, Fujimura A, Hitomi J, Isogai S. Three-layered architecture of the popliteal fascia that acts as a kinetic retinaculum for the hamstring muscles.*AnatSci Int*. 2015 Oct 14.[Epub ahead of print]
17. Sowmya S, Meenakshi Parthasarathi, Sharmada KL, Sujana M. Bilateral anomalous muscle in the popliteal fossa & its clinical significance. *Int J Anat Res* 2014, Vol 2(4):614-16.
18. Chason DP, Schultz SM, Fleckenstein JL. Tensor fasciae suralis: depiction on MR images. *AJR Am J Roentgenol*. 1995;165(5):1220-1.
19. Ilayperuma I, Nanayakkara G, Palahepitiya N. Incidence of humeral head of biceps brachii muscle – *Anatomicalinsight*. *Int J Morphol* 2011.29(1):221- 225,
20. Garima Pardhi, Savita Gadekar .Unilateral variation in biceps brachii muscle with four heads. *International Journal of Anatomy and Research*, *Int J Anat Res* 2014, Vol 2(4):777-80.