

## CASE REPORTS

### **An unusual bifurcation of sciatic nerve deep to Piriformis: Case report with review of literature**

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#### **Introduction**

Sciatic nerve, the thickest nerve in the body, is formed in the pelvis from the sacral plexus. It is comprised of both anterior and posterior divisions of fourth lumbar to third sacral spinal nerves [1]. Having left the pelvis through the greater sciatic foramen, it courses beneath the piriformis and enters the gluteal region. Then it travels over the gamelli, obturator internus and quadratus femoris and descends vertically midway between greater trochanter and ischial tuberosity [1].

During its course in the posterior compartment of the thigh, it divides into tibial and common peroneal nerves. This division is observed to occur usually a hands breath above the knee joint [1]. However, numerous variations have been reported with regard to its course and divisions. Clinical consequences such as entrapment syndromes and failure of regional nerve blocks are known to be associated with variant courses and divisions [2, 3]. Bilateral division of the sciatic nerve deep to the piriformis muscle and a variant course of its common peroneal branch seen on a cadaver is discussed.

#### **Case presentation**

Routine dissection was performed on a self-donated cadaver in the dissection laboratory of the Department of Anatomy, Faculty of Medicine, University of Colombo. The deceased was a 62-year-old man. The cadaver was preserved using Phenoxyethanol as the main preservative. An incision was made along the iliac crest and extended along the dorsal midline in the gluteal region. Piriformis was exposed by dividing gluteus maximus and gluteus medius. It was observed that the sciatic nerve was divided into tibial and common peroneal branches within the true pelvis bilaterally (Figure 1). Having coursed deep to the piriformis, both tibial and common peroneal nerves emerged into the gluteal region inferior to the lower border of piriformis. Piriformis was undivided. Both nerves crossed superior and inferior gamelli, obturator internus and quadratus femoris as they coursed towards posterior thigh. No associated anomalies were found on the cadaver on subsequent dissections.



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## Discussion

Sciatic nerve, the largest branch of the lumbosacral plexus demonstrates numerous variations in its anatomical course and has gained interest of many researchers. These dissimilarities in the course of nerve could occur with sciatic nerve dividing before or after exiting the pelvis (Table 1). In our cadaveric specimen we observed a division before the nerve exit the pelvis deep to the piriformis muscle. Sciatic nerve division commonly occurred after exiting the pelvis than within [4-7]. Guvencer et al., however observed in a 25 specimen study that the prevalence of intrapelvic and extrapelvic divisions of sciatic nerve was almost similar accounting for 48% and 52% respectively [8].

Furthermore, in our study we observed division of sciatic nerve into common peroneal and tibial branches. Although majority of the studies include bifurcation of the nerve similar to our findings, there were cases of trifurcations as well [4, 9, 10]. These reported trifurcations frequently were extrapelvic divisions [4, 9, 10]. In a study done by Anbumani et. al., four fifths of cadavers that had sciatic nerve variations were bilateral, while one fifth was unilateral [11]. In our dissection the variation was present bilaterally. In some instances the high divisions in sciatic nerve components rejoined in the mid-thigh [12] which was not observed in our case.

In its intrapelvic path sciatic nerve holds a neighboring relationship with piriformis. In 1937 Beaton and Anson's first described six ways of how the sciatic nerve can emerge in relation to piriformis muscle (Figure 2) [13]. These

are: undivided nerve below undivided piriformis muscle (type A), division below and between the piriformis divisions (type B), divisions above and below the undivided piriformis (type C), undivided nerve between divided piriformis (type D), divisions above and between the piriformis divisions (type E) and undivided nerve above the undivided piriformis (type F) [13]. However, Beaton and Anson did not observe variation types E and F in their study.

Site at which the sciatic nerve divides near piriformis is surgically important when treating piriformis syndrome [2]. In majority of cases sciatic nerve followed a typical anatomical course or "a normal course" appearing undivided below undivided piriformis in 83.1% of individuals, while 16.9% had deviations from the said presentation [14]. Second commonest presentation was presence of one division through the piriformis and one component below the muscle [8, 13, 15]. Guvencer et, al., reported common peroneal nerve emerging above piriformis with tibial nerve emerging below piriformis in 8% out of 24% of high sciatic nerve divisions [8]. The various study findings in relation to Beaton and Anson classification is summarized in Table 2. According to these classifications, when there is a division of the sciatic nerve in the gluteal region, the common peroneal nerve usually pierces piriformis or emerges above the muscle to run superficial to the piriformis. Nevertheless, in our case we observed that both tibial and peroneal components divided deep to piriformis, and the common peroneal nerve continued to course deep to the muscle

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accompanying the tibial nerve, to emerge below the lower border of the piriformis. To our knowledge this anatomical variation is a very rare presentation and is a deviation from the Beaton and Anson's classification.

### Conclusion

Bilateral division of the sciatic nerve deep to the piriformis muscle is usually associated with the peroneal nerve coursing superficial to the muscle. However, a rare variant course of the common peroneal branch deep to the muscle in a case of a sciatic nerve division in the gluteal region is reported in this case.

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### References

1. Standring, *Gray's anatomy, The Anatomical Basis of Clinical Practice*. 41 ed. 2015: Elsevier Health Sciences.
2. Naveena, S. and S. Shabana, *Patterns of sciatic nerve bifurcation and their clinical relevance*. Int J Anat Res, 2017. 5(1): p. 3622-3624.
3. Pećina, M., *Contribution to the etiological explanation of the piriformis syndrome*. Cells Tissues Organs, 1979. 105(2): p. 181-187.
4. Adibatti, M. and V. Sangeetha, *Study on variant anatomy of sciatic nerve*. Journal of clinical and diagnostic research: JCDR, 2014. 8(8): p. AC07.
5. Gabrielli, C., et al., *Inferior gluteal nerve course associated to the high division of the sciatic nerve*. Rev Chil Anat, 1997. 15(1): p. 79-83.
6. Ugrenović, S.Z., et al., *The level of the sciatic nerve division and its relations to the piriform muscle*. Vojnosanitetski preglod, 2005. 62(1): p. 45-49.
7. Patel, S., et al., *A variation in the high division of the sciatic nerve and its relation with piriformis muscle*. Natl J Med Res, 2011. 1(2): p. 27-30.
8. Güvençer, M., et al., *Anatomic considerations and the relationship between the piriformis muscle and the sciatic nerve*. Surgical and radiologic anatomy, 2008. 30(6): p. 467.
9. Sawant, S.P., *A case report on the bilateral trifurcation of the sciatic nerve and its clinical significance*. World Res J Orthop, 2013. 1(1): p. 7-10.
10. Nayak, S., *An unusual case of trifurcation of the sciatic nerve*. Neuroanatomy, 2006. 5: p. 6-7.
11. Anbumani, T., A. Thamarai Selvi, and S. Anthony Ammal, *Sciatic nerve and its variations: an anatomical study*. Int J Anat Res, 2015. 3(2): p. 1121-7.
12. Aparna, G., *High division of sciatic nerve with an associated variation in the origin of superior and inferior*

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- gluteal nerves: A case report.* Int J Anat Res 2015. 3(3): p. 1278-1280.
13. Beaton, L.E. and B.J. Anson, *The relation of the sciatic nerve and of its subdivisions to the piriformis muscle.* The Anatomical Record, 1937. 70(1): p. 1-5.
  14. Smoll, N.R., *Variations of the piriformis and sciatic nerve with clinical consequence: a review.* Clinical Anatomy: The Official Journal of the American Association of Clinical Anatomists and the British Association of Clinical Anatomists, 2010. 23(1): p. 8-17.
  15. Berihu, B.A. and Y.G. Debeb, *Anatomical variation in bifurcation and trifurcations of sciatic nerve and its clinical implications: in selected university in Ethiopia.* BMC research notes, 2015. 8(1): p. 633.
  16. Lewis, S., et al., *Anatomical variations of the sciatic nerve, in relation to the piriformis muscle.* Translational Research in Anatomy, 2016. 5: p. 15-19.
  17. Kotian, S.R., et al., *Variations of the sciatic nerve and its relation with the piriformis muscle in South Indian population.* Journal of Experimental and Integrative Medicine, 2015. 5(3): p. 144-8.
  18. Pokorný, D., et al., *Topographic variations of the relationship of the sciatic nerve and the piriformis muscle and its relevance to palsy after total hip arthroplasty.* Surgical and Radiologic Anatomy, 2006. 28(1): p. 88-91.
  19. Saritha, S., K. Praveen, and G. Supriya, *Anatomical variations in the bifurcation of the sciatic nerve, a cadaveric study and its clinical implications.* Anat Physiol, 2012. 2(5): p. 1-4.

## Tables

Table 1

Name of researchers	Level of division	
	Before exiting pelvis	After exiting pelvis
Lewis et al.,[16]	11.8% (12/102)	88.2% (90/102)
Guvencer et al.[8]	48.0% (24/50)	52.0% (26/50)
Kotian et al.[17]	53.3% (32/60)	45.0% (27/60)
Pokomy D et al.[18]	20.9% (19/91)	79.1% (72/91)

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Table 2: Anatomical variations associated with high division of sciatic nerve

Author and year Types [13]	Beaton and Anson 1937 [13]	Samara et al 2016 [16]	Saritha et al 2012 [19]	Pokorny et al 2006 [18]
A – Undivided nerve below undivided piriformis	84.2%	89% (90/102)	88% (1329/1510)	79.1% (72/91)
B – Divided nerve below and between piriformis divisions	11.7%	8.8% (9/102)	11% (166/1510)	14.3% (13/91)
C – Divided nerve above and below undivided piriformis	3.3%	2.9% (3/102)	0.86% (13/1510)	4.4% (4/91)
D – Undivided nerve between divided piriformis	0.8%	0%	0.13% (2/1510)	2.2% (2/91)
E – Divided nerve above and between the piriformis divisions	0%	0%	0%	0%
F – Undivided nerve above the undivided piriformis	0%	0%	0%	0%

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## Figures

Figure 1: Cadaveric dissection showing the bifurcated sciatic nerve emerging below the piriformis.

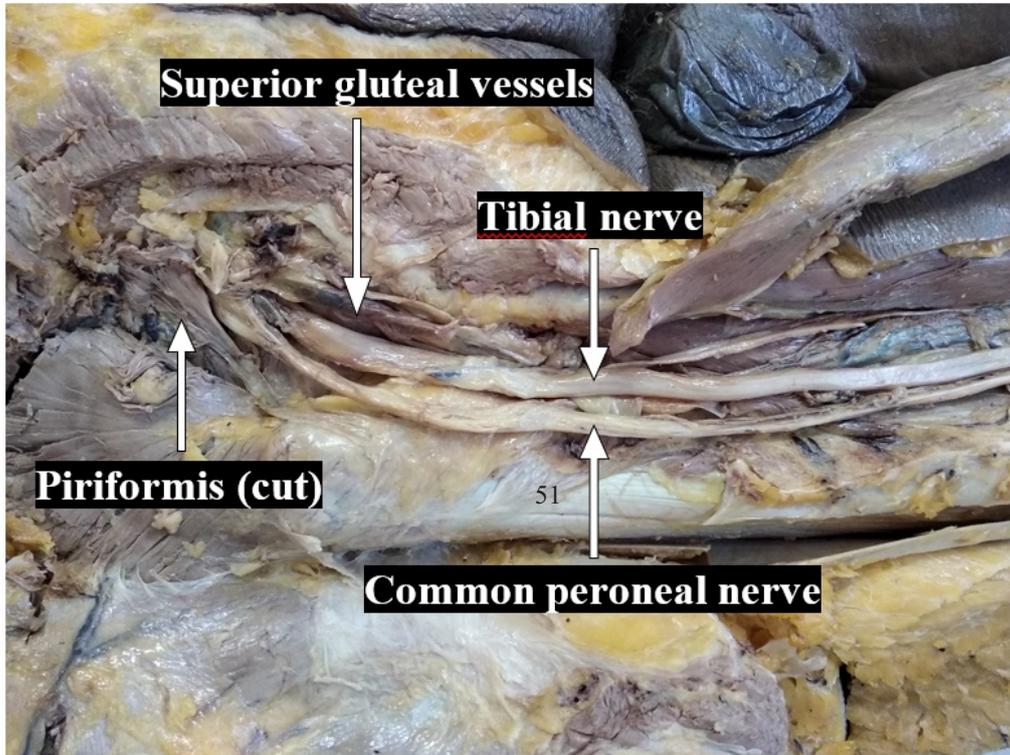


Figure 2: Anatomical variations of division and course of the sciatic nerve with relation to piriformis. This classification was originally described by Beaton and Anson [13].

