



Case Report

A rare case of bilateral higher division of sciatic and common peroneal nerves

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Abstract

The sciatic nerve arises from the lumbosacral plexus containing tibial and common peroneal components in a common fascial sheath. Usually, it splits at the popliteal fossa's tip into the tibial and common peroneal nerves. It is essential to know about these rare variants due to their significant clinical application. Although several variations have been reported earlier, we describe a rare finding of two similar variations (higher division of sciatic nerve and common peroneal nerves) in bilateral lower limbs of a human male cadaver.

Keywords: Bilateral higher division, Sciatic and common peroneal, Deep gluteal syndrome

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1. Introduction

The biggest human nerve is the sciatic nerve (SN) and supplies the lower limbs. It comes from ventral rami of lumbosacral plexus with contribution from four and five lumbar roots and first to third sacral roots.¹ It leaves the pelvis through the larger sciatic foramen, which is located below the piriformis muscle. Along with other neurovascular Structures, it further lies in between ischial tuberosity and greater trochanter and progresses downwards in the thigh's posterior compartment. In most cases it divides into the common peroneal nerve (CPN) and tibial nerve (TN). The division occurs at the popliteal fossa's superior angle about 0 to 115 mm above the crease of popliteal fossa.² There may be higher sciatic nerve division and rarely below it. TN supplies the posterior compartment of leg, and the sole of the foot is supplied by its terminal branches. The CPN further splits into superficial and deep peroneal nerves at the fibula's neck, which supply the anterior and lateral compartments of the leg.

Substantial variations are seen in the sciatic nerve division. Higher division of sciatic nerve is a common occurrence, and it can divide anywhere in the thigh or gluteal

region. High SN division can be unilateral or bilateral, causing nerve compression which may leads to piriformis syndrome. A different course of SN may result in unintentional harm during surgeries in the gluteal area. Accidental injury of sciatic nerve causes paralysis of the thigh muscles and sensory disturbances in that region.³ This variant manifests as sciatica, piriformis syndrome, inadvertent nerve damage while administering intramuscular gluteal injections deeply.⁴ Ventral tributary of the ventral rami of L4 to S3 spinal nerves forms the tibial part, whereas the dorsal tributary of the ventral rami of L4 to S2 spinal neurons forms the common peroneal part.¹ The point at which sciatic nerve divides into common peroneal and tibial nerve varies. Most typical location is towards the tip of the popliteal fossa, near the confluence of the lower and middle third of thigh. The sciatic nerve is clinically significant because total sciatic nerve palsy leads to flail foot and substantial difficulties while moving.⁵ The division might occur anywhere from pelvis to the tip of the popliteal fossa.^{1,6} The nerve is prone to get injured during posterior hip dislocation, external compression, and inadvertant gluteus maximus injections.^{7,8}

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Knowledge of such diversity and variances in the SN course is critical for surgeons planning surgeries of gluteal area.

2. Case History

While dissecting a male cadaver during dissection hours in the department of Anatomy, this variation of SN was observed. In both lower limbs, we observed a high up division of the SN at the gluteal area and a higher division of the CPN at the popliteal fossa. Left sciatic nerve passed between two heads of the piriformis muscle and divided immediately below it. The right SN nerve was divided 2 cm beneath the inferior border of piriformis in the gluteal region. Division of left and right CPN occurred 7 and 4 cm proximal to lateral joint line of the knee, respectively. Branches supplied the leg muscles as described in normal anatomy. The right sural nerve arose from the CPN and was observed to be unusually thickened. The TN in both limbs was found to follow its usual course and innervation. According to Beaton and Anson’s classification, it was a type IV variation on the left side and type I variation on the right side.³⁷ (Figure 1, Figure 2)

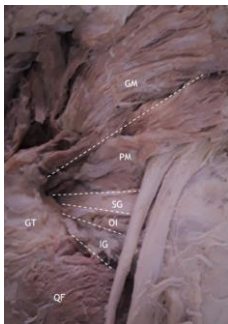


Figure 1: Undivided sciatic nerve between the head of the piriformis on left limb. GM-Gluteus medius; PM- Piriformis; SG- Superior Gamellus; OI- Obturator internus; IG- Inferior gamellus; QF- Quadratus femoris

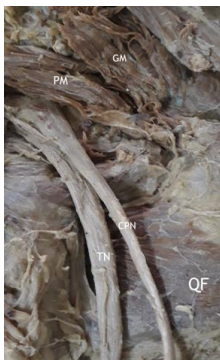


Figure 2: Undivided sciatic nerve below undivided piriformis. GM- Gluteus medius; PM- Piriformis; CPN- Common peroneal nerve; TN- Tibial nerve; QF- Quadratus femoris

3. Discussion

Variations in sciatic nerve division are not rare. The literature mentions division at various locations, including pelvic area, gluteal region, middle of back of the thigh, tip of the popliteal fossa, and below the popliteal fossa.⁹ Higher bifurcations and trifurcations of the SN have been reported.¹⁰ According to Beatons classification we found type IV variation on the left side and type I variation on the right side (Table 1).

Table 1: Beaton LE et al.¹¹ classified the variations of the SN and piriformis as:

I	Undivided sciatic nerve passes	Below undivided piriformis
II	Sciatic nerve divides	Between and below heads of piriformis.
III	Sciatic nerve divides	Above and below undivided piriformis.
IV	Undivided sciatic nerve goes	Between the heads of the piriformis.
V	Divisions of the sciatic nerve	Between and above heads.
VI	Undivided sciatic nerve passes	Above undivided muscle
VII	Sciatic nerve passes	Below superior gemellus

A 48% incidence of SN high division has previously been observed.¹² The independent presence of the nerves during embryonic development is thought to be the probable cause of this pelvic division. The degree of neurological deficit in sciatic neuropathy is influenced by the level at which the SN is divided. For example, a division in the gluteal area or close to the popliteal fossa may cause just one of the two divisions to be involved in popliteal fossa injuries. It may leads to failure of SN block while conducting popliteal block anesthesia.³

Piriformis syndrome.^{13,14} is one of the causes of non-discogenic sciatica due to the entrapment of SN in muscle fibers of the piriformis muscle. Now it comes under a new, broader term, 'The Deep Gluteal Syndrome' which has been described for the various causes of entrapment of the SN in the deep gluteal space.¹³ The clinical features differ according to the relation of the sciatic nerve and its divisions with the piriformis muscle. Superior gamellus syndrome has also been described in literature wherein the SN passes below superior gamellus.¹³

While performing pelvic, hip, or gluteal surgeries, the higher division of SN should be kept in mind to avoid iatrogenic damage to the nerves. Sciatic nerve blocks, especially popliteal block, can fail due to the higher division of the SN¹⁵ Orthopedic procedures like CPN decompression at the fibular head, osteotomies, biopsies run the risk of injury to CPN if anatomical variations are overlooked. Nerve blocks performed on CPN and its branches for ankle and foot

surgeries can also fail. Peripheral nerve block of lower limb based on land mark and/or nerve stimulator guided techniques which are based on the assumption of normal anatomy may fail in such cases of variant anatomy of SN and its branches especially in resource-limited setting where point of care ultrasound may not be available.

4. Conclusion

Higher division of the Sciatic nerve and its branches is not a rare phenomenon and should be looked out for in clinical practice. This has application in the fields of anaesthesia, physical medicine and rehabilitation, orthopaedics, surgery and radiology.

5. Source of Funding

None.

6. Conflicts of Interest

There are no conflicts of interest

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