

## A Study of Variations of the Sciatic Nerve

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### Abstract

**Introduction:** Thickest nerve arising from sacral plexus is Sciatic Nerve which finally bifurcates to common fibular and tibial nerve in between pelvis and knee pit or popliteal fossa. These divisions of sciatic nerve shows variations which may be associated with many problems like foot drop, sciatica, sleeping foot, piriformis syndrome, etc. **Objectives:** To find out the differences of sciatic nerve and their relationship with associated clinical conditions and to correlate findings of our study with the already available literature regarding the same. **Materials and Methods:** The study material used was thirty-two formalin fixed cadavers which belonged to the Anatomy department of Maharishi Markandeshwar Medical College & Hospital, Kumarhatti, Solan (H.P) and Department of Anatomy, JNUIMSRC, Jaipur (Rajasthan). This includes twenty-eight male cadavers and four female cadavers. A total of Sixty-four gluteal regions were dissected exposing the gluteus maximus muscle. Structures under the cover of Gluteus maximus were observed and recorded along with bifurcation of sciatic nerve with respect to Piriformis muscle. **Results:** In the present study, normal anatomy of sciatic nerve and piriformis was observed in 50 specimens (78%). Differences in bifurcation of sciatic nerve and piriformis muscle was observed in 14 specimens (22%). In our study, 78% (50 regions) belongs to category I, 12.5% (8 regions) to category II, 3% (2 regions) belongs to category III and 1.56% (1 region) belongs to category VI as per Beaton and Anson's classification. In 4.6 % (3 specimens) common peroneal & tibial component of sciatic nerve runs separately throughout the course after arising separately from ventral and dorsal divisions of sacral plexus. **Conclusion:** Discrepancies at the level of divisions of sciatic nerve are common and their proper knowledge helps in early identification and thus treating conditions like sciatic nerve entrapment or neuropathies and other clinical conditions which ultimately reduce the complications and socio morbidities.

**Keywords:** Division, Piriformis, Sciatic Nerve.

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### Introduction

The sciatic nerve is the largest nerve of the lumbosacral nervous plexus (L4-S3), lies inferior to the piriformis muscle [1]. It passes downwards in the dorsal aspect of the thigh and bifurcates into the tibial and common fibular components in knee pit or though popliteal fossa [2, 3]. In pelvic region, the variations mostly originate during developmental period, so embryologically they are separate entities. Origin of Piriformis is from S2, S3, S4 segments of sacrum, sacrotuberous ligament and upper margin of greater sciatic notch and then along with the sciatic nerve, it leaves the greater sciatic foramen and got inserted to greater trochanter of femur [1].

Beaton and Anson classification listed below:

Category I: sciatic nerve beneath muscle

Category II: branches of sciatic nerve between and beneath the muscle

Category III: one branch of sciatic nerve above and other below muscle

Category IV: sciatic nerve between heads

Category V: one branch of sciatic between and another above heads Category VI: sciatic nerve above the muscle [4,5]

Nerve compression, resulting in piriformis syndrome occurs mainly because of discrepancies in bifurcation of sciatic nerve with respect to Correspondence

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to piriformis. Partial block of sciatic nerve may occur while administering anaesthesia (popliteal block) because of High division of sciatic nerve. Clinical manifestations vary depending upon type of variation.

### Materials & Methods

Study material used is thirty-two formalin fixed cadavers which belongs to the Anatomy department of MM MCH (Maharishi Markandeshwar Medical College & Hospital), Kumarhatti, Solan and Department of Anatomy, JNUIMSRC, Jaipur. This study includes twenty-eight male cadavers and four female cadavers. A total of Sixty-four gluteal regions were dissected exposing the gluteus maximus muscle. Structures under the cover of Gluteus maximus were observed and recorded along with bifurcation of sciatic nerve with respect to piriformis.

### Results

Study material used is thirty-two formalin fixed cadavers comprising of sixty-four specimens at lower limbs. Fifty regions (78%) showed sciatic nerve and piriformis muscle in its normal anatomy. Fourteen regions (22%) showed discrepancies in the sciatic nerve (Table 1)

Table 2 depicts the interpretation of the variations of the sciatic nerve with respect to piriformis muscle. Out of thirty two cadaver studied, seven cadavers (22%) showed variations in the sciatic nerve, In our study, 78% (50 regions) belongs to type I, 12.5% (8 regions) to type II, 3% (2 regions) belongs to type III category and 1.56a (1region) belongs to type VI as per Beaton and Anson's classification.

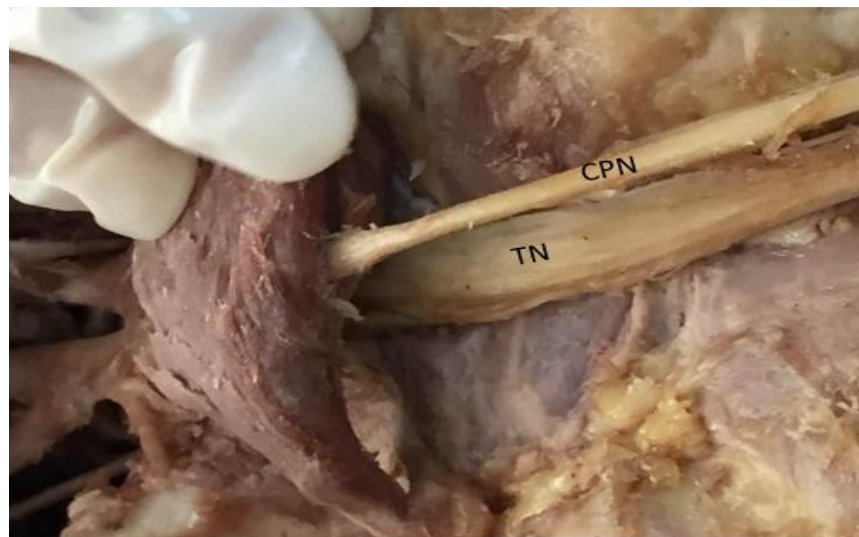
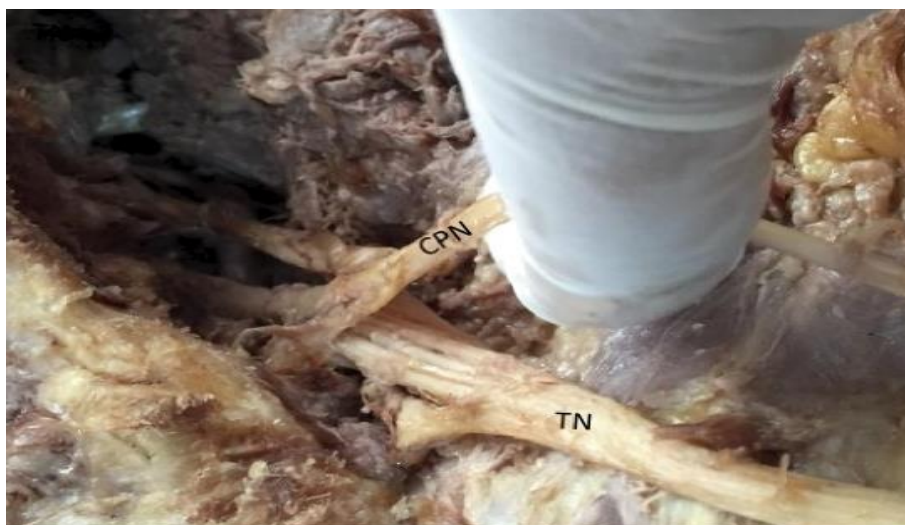
And 4.6 to (3 specimen s) common peroneal & tibial component of sciatic nerve runs independently throughout the course after arising separately from ventral and dorsal divisions of sacral plexus.

**Table 1: Number & percentage of normal & variation in sciatic nerve specimens**

S.N o.	Number of Specimens (Limbs)	Percentage (%)
1. Normal	50	78%
2. Variations	14	22%
Total	64	100%

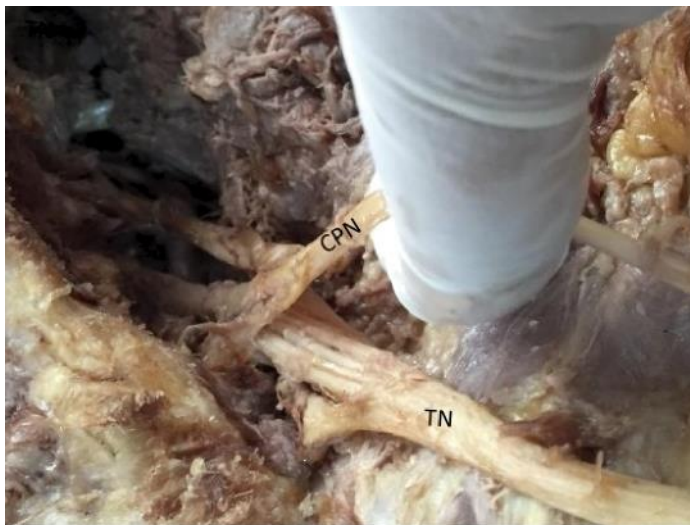
**Table 2: Sciatic nerve and piriformis muscle variations**

Types of sciatic nerve and piriformis muscle variations	Count of specimens with variations of sciatic nerve	Variation Percentage (%)
Undivided nerve (sciatic) below undivided muscle (piriformis)	50	78%
CPN permeates the piriformis and TN emerges below the piriformis	8	12.5%
CP N emerges above and TN below the piriformis	2	3%
Undivided nerve (Sciatic Nerve) above undivided muscle (Piriformis)	1	1.56%
High division of sciatic nerve	3	4.8%

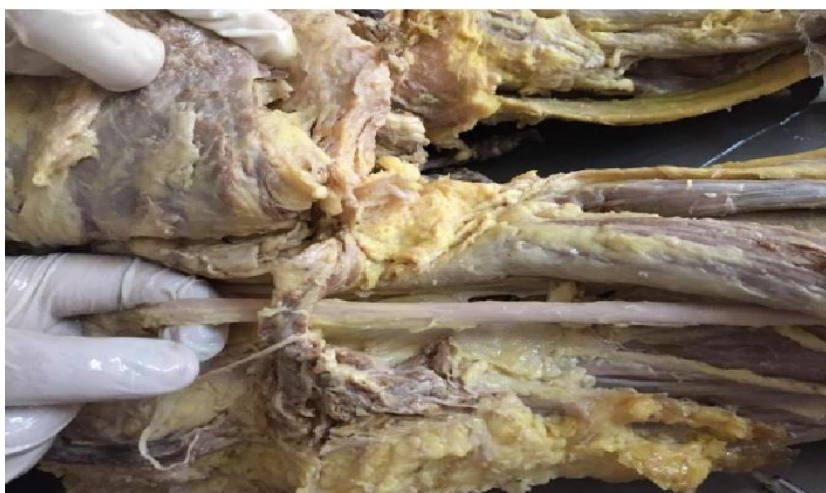
**Fig. 1: Common peroneal (CPN) permeates piriformis and tibial nerve (TN) emerges below the piriformis****Fig. 2: Common peroneal (CPN) emerges above and tibial nerve (TN) emerges below the piriformis**



**Fig. 3: Common peroneal & tibial component of sciatic nerve runs independently throughout the course after arising separately from ventral and dorsal divisions of sacral's plexus**



**Fig. 4: Sciatic nerve (SN) above the Piriformis**



**Fig. 5: Sciatic nerve (SN) below the Piriformis**

### Discussion

Ventral and Dorsal divisions of L4 to S3 spinal nerves forms Sciatic nerve by the close downward displacement of large dorsal (common peroneal) and the ventral (tibial) components during development and hence both the components detached from each other at various levels from their emergence.<sup>4-6</sup> Numerous researches are available in the past regarding the sciatic nerve discrepancies. Common Peroneal and Tibial nerve may arise right from the sacral plexus as distinct entities.<sup>5</sup>

The present study shows 3 specimens (4.6 P<) common peroneal & tibial component of sciatic nerve runs independently throughout the course after emerging separately from ventral and dorsal roots of sacral plexus which are visible in gluteal region. 2.22% of study

material showed both the branches of Sciatic nerve emerge separately beneath the piriformis muscle in a study done by Shewale et al.<sup>13</sup>

### Conclusion

In compression neuropathy the symptoms usually depend upon the level of nerve involvement; whether the entire nerve is involved or one or two of its divisions and the latter is more in high divarication of nerve. Diagnosis and treatment would be different with the compression of tibial/ common fibular division of sciatic nerve as compared to the compression of the entire sciatic nerve and there is also the possibility of block failure. Proper knowledge of these discrepancies will help in identifying and curing complications we come across in various streams of orthopedics, neurology, radiology, anesthesia, physiotherapy etc.

**Table 3: Comparison of variations of sciatic nerve with other studies**

Investigator Name	Category I	Category II	Category III	Category IV	Category V	Category VI
Beaton and Anson [7] 120 cadavers	84.20%	11.70%	3.30%	0.80%		
Beaton and Anson [8] 240 cadavers	90%	7.10%	2.10%	0.80%		
Sayson et al [9]						One case
Uluotku & Kurtoglu [10] 25 fetuses	74%	16%	10 %			
Ozaki et al [11]						One case
Pokorny et al [12] 91 cadavers	79%	14.30%	4.40%	2.20%		
Present Study	78%	12.5%	3%			One case

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