

# Cadaveric Study of the Mode of Termination of the Sciatic Nerve in a Malian Population: Cases of Trifurcation and Hexafurcation

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## ABSTRACT

**Introduction:** the sciatic nerve is the largest nerve in the body. It originates in the pelvis, then descends in the gluteal region and in the posterior region of the thigh, before ending in the popliteal fossa giving rise to the tibial nerve and the common peroneal nerve. It is the most frequently injured nerve.

**Materials and methods:** this was a cross-sectional study, carried out at the anatomy laboratory of the Faculty of Medicine and Odontostomatology of Bamako, ranging from December 2019 to April 2021. The sciatic nerve was dissected 74 times in 37 cadaveric subjects (29 men and 8 women).

**Results:** the classic termination mode (the sciatic nerve terminates giving the tibial nerve and common peroneal nerve) was most frequently encountered with a prevalence of 82.43%. Anatomical variations were noted in 17.57%. Among these variations, trifurcation (termination in three branches) of the sciatic nerve was observed in 16.22%. Hexafurcation (six-branch termination) of the sciatic nerve was observed in 1.35%.

**Conclusion:** anatomical variations in the mode of termination of the sciatic nerve are not uncommon. The most common of these variations is the trifurcation in which the sciatic nerve ends up giving the tibial nerve, the common peroneal nerve and a third branch which is variable. Knowledge of these variations is important for surgeons when treating popliteal artery aneurysm, popliteal vessel fistula and popliteal fossa cysts.

**Keywords:** Sciatic nerve; Tibial nerve; Common peroneal nerve; Bifurcation; Trifurcation; Hexafurcation.

## Introduction

The sciatic nerve is the largest nerve in the body. It is formed by the convergence and union of the ventral branches of the spinal nerves of the sacral plexus at the level of the lower border of the piriformis muscle. It emerges under the piriformis muscle, descends obliquely down and out into the gluteal region, between the ischial tuberosity and the greater trochanter, then descends vertically into the posterior compartment of the thigh. It usually ends at the upper corner of the popliteal fossa, dividing into the tibial and common peroneal nerves. It innervates the posterior thigh muscles, all the muscles of the leg and foot, and the skin of most of the leg and foot. It provides articular branches to all joints of the pelvic limb<sup>1</sup>.

The sciatic nerve is the most frequently injured nerve<sup>2</sup>.

Few studies have been done on how the sciatic nerve terminates. To our knowledge, there are only two studies which have been carried out on the mode of termination of the sciatic nerve in Africa, one carried out in an Ethiopian population by Berihu and Debeb<sup>3</sup>, the other in a Nigerian population by Amasiatu *et al*<sup>4</sup>.

This work is the first to study the mode of termination of the sciatic nerve in Mali.

We undertook this study with the general objective of studying the mode of termination of the sciatic nerve by cadaveric dissection in a Malian population. The specific objectives were to:

- Determine the mode of termination of the sciatic nerve in a Malian population;
- Specify the terminal branches of the sciatic nerve in a Malian population.

## Materials and Methods

This was a cross-sectional study, which took place at the anatomy laboratory of the Faculty of Medicine and Odontostomatology (FMOS) of Bamako, over a period of 16 months from December 2019 to April 2021. Seventy-four sciatic nerves were dissected and photographed in 37 cadaveric subjects including 29 men and 8 women. Were included in this study any cadaveric subject not presenting trauma or operative scar in the gluteal region, the posterior region of the thigh and the popliteal fossa. Cadaveric subjects with trauma or operative scar in the gluteal region,

posterior thigh region and popliteal fossa were not included in this study.

The nerve was approached by making four skin incisions, three of which were transverse and one vertical. The first transverse incision passed through the top of the iliac crest, the second passed four finger across above the femoral condyles, the third passed four finger through below the tibial condyles. The vertical incision went through the middle of the previous incisions. After these incisions, the skin was dissected and folded in and out. Next, the gluteus maximus muscle was incised near its insertion on the femur and folded in. The sciatic nerve was exposed and dissected from top to bottom (from the gluteal region to the popliteal fossa) as well as its terminal branches. After these dissections, the photos were taken. The following data were noted: the sex of the cadaveric subject, the dissected side, the mode of termination of the sciatic nerve, the terminal branches of the sciatic nerve, and the laterality of the termination mode.

The data were entered and analyzed using the Epi info software. Fisher's test was used to compare data by sex, side, and laterality.

**Results**

The classic termination mode (the sciatic nerve terminates giving the tibial nerve and common peroneal nerve) (figure 1) was noted in 61 cases (82.43%), of which 59 cases (79.73%) bilaterally and 2 cases (2.7%) unilaterally.

Anatomical variations were noted in 13 cases (17.57%). Among these variations, trifurcation (termination in three branches) of the sciatic nerve (figure 2) was observed in 12 cases (16.22%) including 10 cases (13.51%) bilaterally and 2 cases (2.7%) unilaterally. The three terminal branches were in 5 cases (6.76%), the tibial nerve, the common peroneal nerve and a trunk common to the communicating peroneal and lateral sural cutaneous nerves (figure 2a); in 5 cases (6.76%), they were the tibial, common peroneal and communicating peroneal nerve (figure 2b); and in 2 cases (2.7%) they were the tibial, common peroneal and sural nerve. A hexafurcation (termination in six branches) of the sciatic nerve (figure 3) was noted in 1 case (1.35%) in a man on the right. The six terminal branches were the tibial, common peroneal, lateral sural cutaneous, medial sural cutaneous, communicating peroneal nerves, and soleus muscle nerve.

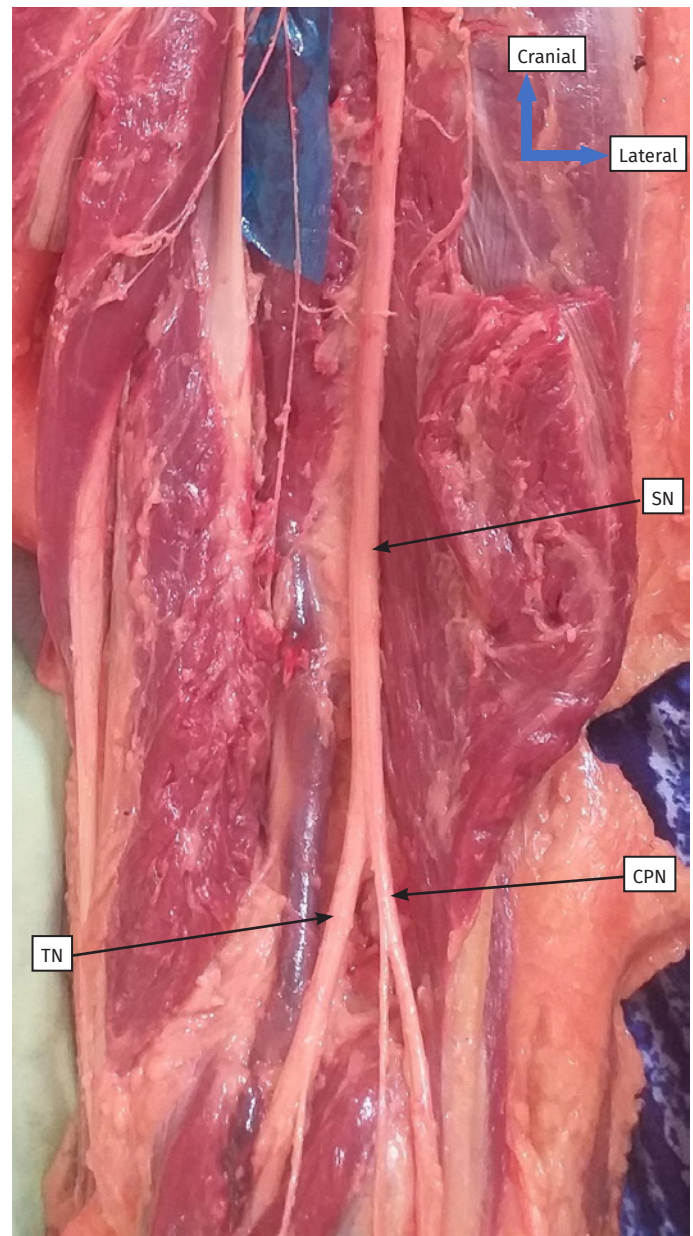
No significant difference was noted either by sex (Table 1) or by side (Table 2) or by laterality.

**Table 1.** Mode of termination of the sciatic nerve by sex.

Mode of Termination	Women		Man		Total	
	N	%	N	%	N	%
Bifurcation	14	18.92	47	63.51	61	82.43
Trifurcation	2	2.7	10	13.51	12	16.22
Hexafurcation	0	0	1	1.35	1	1.35
Total	16	21.62	58	78.38	74	100

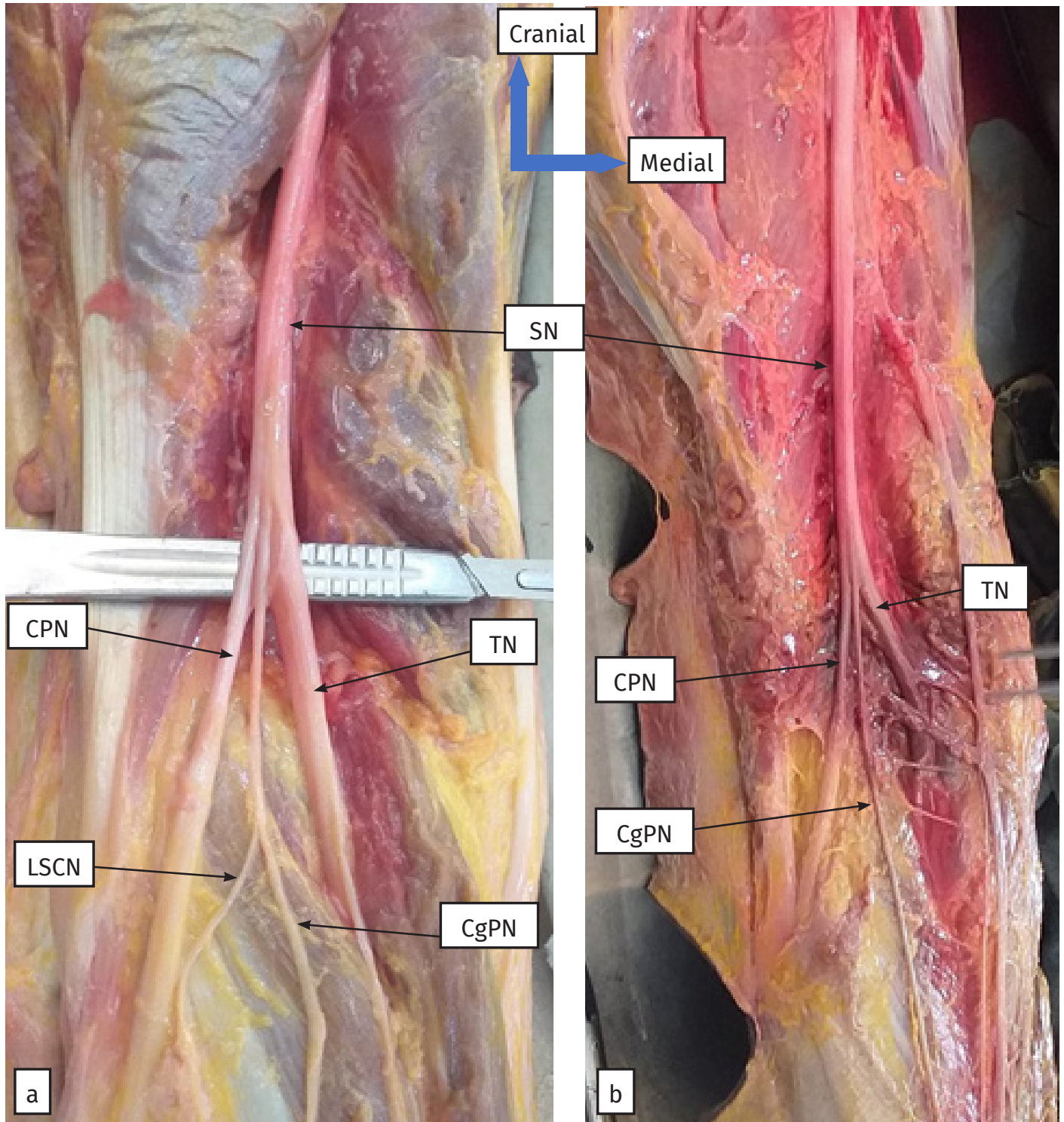
**Table 2.** Mode of termination depending on the side.

Mode of Termination	Right Side		Left Side		Total	
	N	%	N	%	N	%
Bifurcation	31	1.89	30	40.54	61	82.43
Trifurcation	5	6.76	7	9.46	12	16.22
Hexafurcation	1	1.35	0	0	1	1.35
Total	37	50	37	50	74	100



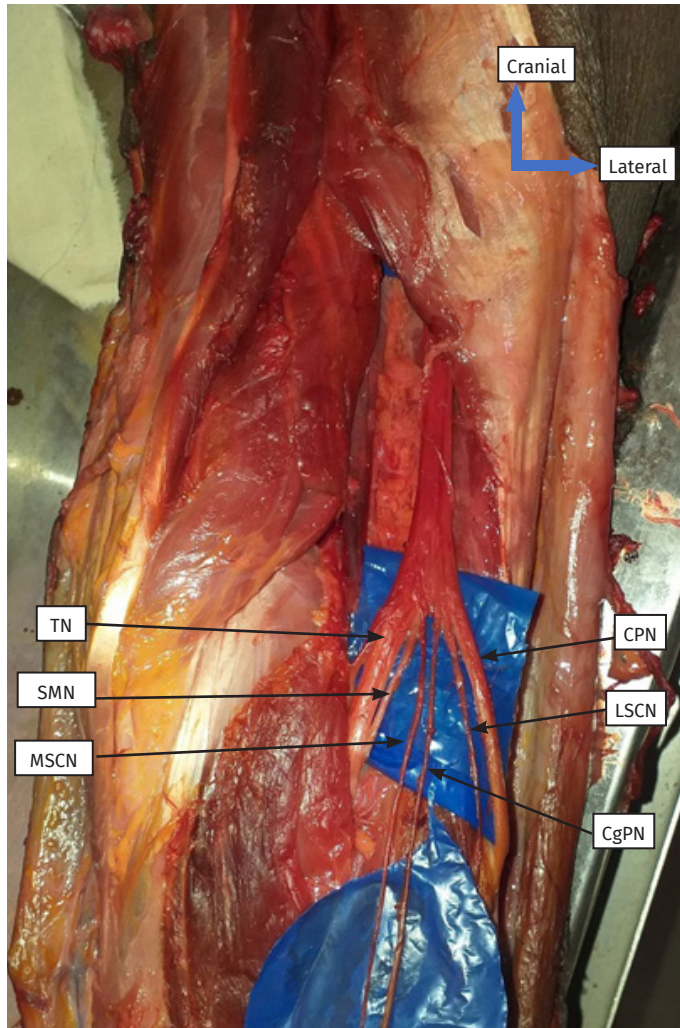
**Figure 1.** Bifurcation of the sciatic nerve into tibial and common peroneal nerves.

CPN= Common peroneal nerve, SN= Sciatic nerve, TN= Tibial nerve.



**Figure 2.** a= Trifurcation of the sciatic nerve into tibial nerve, common peroneal nerve and a trunk common to the lateral sural cutaneous and communicating peroneal nerves; b= Trifurcation of sciatic nerve into tibial nerve, common peroneal nerve and communicating peroneal nerve

CgPN= Communicating peroneal nerve, CPN= Common peroneal nerve, LSCN= Lateral sural cutaneous nerve, SN= Sciatic nerve, TN= Tibial nerve.



**Figure 3.** Hexafurcation (six-branches termination) of the sciatic nerve into tibial, peroneal common, medial sural cutaneous, lateral sural cutaneous, communicating peroneal nerves and soleus muscle nerve.

CgPN= Communicating peroneal nerve, CPN= Common peroneal nerve, LSCN= Lateral sural cutaneous nerve, MSCN= Medial sural cutaneous nerve, SN= Sciatic nerve, SMN= Soleus muscle nerve, TN= Tibial nerve.

## Discussion

In the present study, the classical mode of termination (bifurcation of the sciatic nerve into tibial nerve and common peroneal nerve) was most frequently encountered with a prevalence of 82.43%. This is lower than the results of Amasiatu *et al*<sup>4</sup> who found, in their study in a Nigerian population, the bifurcation of the sciatic nerve in 86.52% of cases. Their results confirm with ours that bifurcation is the most frequent termination of the sciatic nerve.

In the present study, the trifurcation of sciatic nerve (sciatic nerve terminates in three branches) was the anatomical variation most frequently observed of the mode of termination of sciatic nerve. It was observed in 14.71% of cases. This prevalence observed in the present study is the highest in the literature. Amasiatu *et al*<sup>4</sup>, in their study of 282 cases in a Nigerian population, noted trifurcation of the sciatic nerve in 37 cases (13.12%). It was observed in 3 out of 56 cases (5%) in the study by Berihu and Debeb<sup>3</sup> in an Ethiopian population, in 2 out of 50 cases (4%) in the study by Mallikarjun and Sangeetha<sup>5</sup>, in 1 out of 50 cases (2%) in the study by Anbumani *et al*<sup>6</sup>. Sawant<sup>7</sup> reported a case of bilateral sciatic nerve trifurcation, It was reported in 1 case by Nayak<sup>8</sup> and Sharvari *et al*<sup>9</sup>.

The terminal branches of the sciatic nerve in trifurcations according to the authors are summarized in Table 3.

In the present study, hexafurcation (six-branch termination) of the sciatic nerve was observed in 1 case in a male on the right. The sciatic nerve ended by giving the tibial, common peroneal, lateral sural cutaneous, medial sural cutaneous, communicating peroneal nerve and the soleus muscle nerve. This variation has not been noted in the literature. However, other variations have been reported in the literature, but were not observed in the present study. Amasiatu

**Table 3.** Terminal branches of the sciatic nerve in trifurcations according to the authors.

Authors	Number of Member	Number of Trifurcation	Terminal Branches of SN
Nayak <sup>8</sup>	-----	1	TN, CPN, lateral sural cutaneous nerve
Sawant <sup>7</sup>	2	2	TN, superficial and deep peroneal nerves
Mallikarjun and Sangeetha <sup>5</sup>	50	2	TN, CPN, soleus nerve
Berihu and Debeb <sup>3</sup>	56	3	TN, CPN, trunk to the lateral sural cutaneous nerve and CgPN (2 cases) TN, superficial and deep peroneal nerves (1 case)
Sharvari <i>et al</i> <sup>9</sup>	2	1	TN, PN, sural nerve
Anbumani <i>et al</i> <sup>6</sup>	50	1	TN, CPN, sural nerve
Amasiatu <i>et al</i> <sup>4</sup>	282	37	TN, CPN, sural nerve
Present study	74	12	TN, CPN, trunk to the lateral sural cutaneous nerve and CgPN(5cases) TN, CPN, CgPN (5 cases) TN, CPN, sural nerve (2 cases)

CgPN= Communicating peroneal nerve, CPN= Common peroneal nerve, SN= Sciatic nerve, TN= Tibial nerve.

*et al*<sup>4</sup>, in their study of 282 dissections, observed quadrifurcation (termination in four branches) of the sciatic nerve in 2 cases (0.71%) and quintufurcation (termination in five branches) of the sciatic nerve in 1 case (0.35%). Russa and Fabian<sup>10</sup> reported a case of sciatic nerve quadrifurcation.

Sciatic nerve trifurcation may be a boon to surgeons performing popliteal block for leg surgery, as the high endings of the sciatic nerve may be responsible for failure of popliteal block anesthesia<sup>8</sup>.

Knowledge of the classic anatomy of the bifurcation as well as the possible variations of the sciatic nerve and its branches helps the radiologist and surgeons

correctly interpret what they see and encounter when assessing and treating patients with sciatica and other nervous problems<sup>3</sup>.

## Conclusion

Anatomical variations in the mode of termination of the sciatic nerve are not uncommon. The most common of these variations is the trifurcation in which the sciatic nerve ends up giving the tibial nerve, the common peroneal nerve and a third branch which is variable. Knowledge of these variations is important for surgeons when treating popliteal artery aneurysm, popliteal vessel fistulization, and popliteal fossa cysts.

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## Mini Curriculum and Author's Contribution

1. Tata Touré – MD. Contribution: Design of the study, participation in data collection, drafting of the document. ORCID:0000-0002-1316-3613.
2. Babou Ba – MD. Contribution: Participation in data collection.
3. Aboul Kadri Moussa – MD. Contribution: Participation in data collection.
4. Abdoulaye Kante – MD; Ph.D. Contribution: Participation in data collection, performance of statistical tests.
5. Desired Laurent Ndzié Essomba – MD. Contribution: Participation in data collection.
6. Tieman Coulibaly – MD. Contribution: Revision of the document.
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