

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

Tata Touré (✉ [ttbabatoure@gmail.com](mailto:ttbabatoure@gmail.com))

Anatomy laboratory of the Faculty of Medecine and Odontostomatology of Bamako

**Babou Ba**

Anatomy laboratory of the Faculty of Medecine and Odontostomatology of Bamako

**Adoul Kader Moussa**

Anatomy laboratory of the Faculty of Medecine and Odontostomatology of Bamako

**Abdoulaye Kanté**

Anatomy laboratory of the Faculty of Medecine and Odontostomatology of Bamako

**Falé Traoré**

Anatomy laboratory of the Faculty of Medecine and Odontostomatology of Bamako

**Demba Yatera**

Anatomy laboratory of the Faculty of Medecine and Odontostomatology of Bamako

**Moustapha Dicko**

Anatomy laboratory of the Faculty of Medecine and Odontostomatology of Bamako

**Laurent Désiré Ndzie Essomba**

Anatomy laboratory of the Faculty of Medecine and Odontostomatology of Bamako

**Tieman Coulibaly**

Anatomy laboratory of the Faculty of Medecine and Odontostomatology of Bamako

**Nouhoum Ongoïba**

Anatomy laboratory of the Faculty of Medecine and Odontostomatology of Bamako

---

## Research Article

**Keywords:** Sciatic nerve, tibial nerve, common peroneal nerve, bifurcation, trifurcation, hexafurcation

**Posted Date:** September 14th, 2021

**DOI:** <https://doi.org/10.21203/rs.3.rs-753714/v1>

**License:**   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

# Abstract

**Background:** The sciatic nerve is the largest nerve in body. It is the only terminal branch of the sacral plexus. It emerges under the piriformis muscle, descends into the gluteal region, then into the posterior compartment of the thigh. It ends in the popliteal fossa by dividing into the tibial and common peroneal nerve. It is the most frequently injured nerve. The aim of this work was to study the mode of termination of the sciatic nerve by cadaveric dissection in a Malian population.

**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%. The termination mode showed a significant difference being more frequently bilateral than unilateral ( $P \leq 0.05$ )

**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.

## Background

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 [1].

The sciatic nerve is the most frequently injured nerve [2].

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 [3], the other in a Nigerian population. by Amasiatu et al [4]. 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 throughs 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.

The mode of termination showed a significant difference, frequently being bilateral rather than unilateral ( $P < 0.05$ ). However, the difference was not significant either by sex (Table 1) or by side (Table 2).

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

Mode of terminaison	Women		Man		Total	
	N	%	N	%	N	%
Bifurcation	14	18.92	47	63.51	61	82.43
Trifurcation	2	2.7	10	13.51	12	6.22
Hexafurcation	0	0	1	1.35	1	1.35
<b>Total</b>	<b>16</b>	<b>21.62</b>	<b>58</b>	<b>78.38</b>	<b>74</b>	<b>100</b>

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

Mode of terminaison	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
<b>Total</b>	<b>37</b>	<b>50</b>	<b>37</b>	<b>50</b>	<b>74</b>	<b>100</b>

## 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 [4] 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 [4], 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 [3] in an Ethiopian population, in 2 out of 50 cases (4%) in the study by Mallikarjun and Sangeetha [5], in 1 out of 50 cases (2%) in the study by Anbumani et al [6]. Sawant [7] reported a case of bilateral sciatic nerve trifurcation, It was reported in 1 case by Nayak [8] and Sharvari et al [9].

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

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

Authors	Number of member	Number of trifurcations	Terminal branches of SN
Nayak [8]	—	1	TN, CPN, lateral sural cutaneous nerve
Sawant [7]	2	2	TN, superficial and deep peroneal nerves
Mallikarjun and Sangeetha [5]	50	2	TN, CPN, soleus nerve
Berchus et Debeb [3]	56	3	TN, CPN, trunk to the lateral sural cutaneous nerve and CgPN (2 cases) TN, superficial and deep peroneal nerves (1 case)
Sharvari et al [9]	2	1	TN, PN, sural nerve
Anbumani et al [6]	50	1	TN, CPN, sural nerve
Amasiatu et al [4]	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*

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 et al [4], 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 [10] reported a case of sciatic nerve quadrifurcation.

In the present study, laterality was taken into account. The mode of termination of sciatic nerve showed a significant difference being more frequently bilateral than unilateral. In case of surgery on the two popliteal fossae of the same person, when the surgeon encounters a variation on one side, he must bear in mind that there is more chance of encountering the same variation of the other side.

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 [8].

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 [3].

## 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.

## Declarations

### Ethical approval and consent to participate

The need for ethical approval has been unnecessary according to Mali's national regulations. In accordance with article 5 of decree N°63 PG-RM implementing the ordinance relating to autopsies and dissections, and the authorization issued by ordinance N°29 CMLN of March 22, 1975 of the official journal of Mali of the May 1, 1975; the cadaveric subjects used in this study were not claimed after their death and were assigned to the Faculty of Medicine and Odontostomatology of Bamako (former National School of Medicine) at the request of dean of this Establishment in view of the didactic dissection exercise.

### Contributions from authors

TT designed the work, participated in the data collection and analysis, and wrote the document. BB, AKM, AK, FT, DY, MD and LDNE participated in the data collection. TC and NO have extensively revised the final document.

### Availability of data and materials

The datasets used in this study are available from the corresponding author on reasonable request.

### Authors information

<sup>1</sup>Anatomy laboratory of the Faculty of Medicine and Odontostomatology of Bamako (FMOS), Mali

<sup>2</sup>Traumatology Department of the Gabriel Touré University Hospital Center, Bamako, Mali

<sup>3</sup>Surgery Department B of the University Hospital Center of Point-G, Bamako, Mali

### Competing interests

The authors declare that they have no competing interests

## References

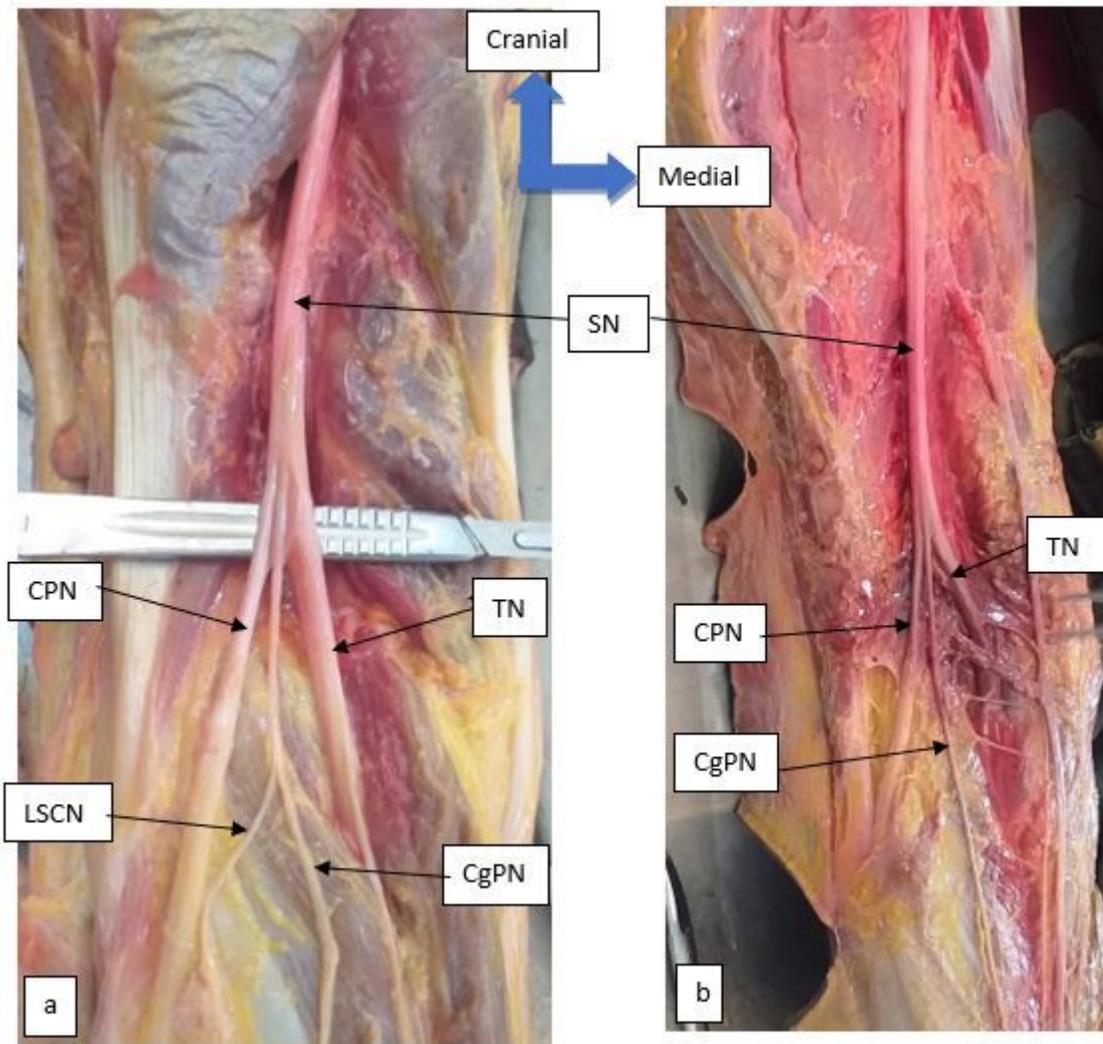
1. Moore KL et Dalley AF. Anatomie médicale : aspects fondamentaux et applications cliniques (Dhem A & Milaire J, Trad. 5<sup>ème</sup> éd). Paris: De Boeck; 2007.
2. Kumar TM, Srimathi, Rani A, Latha S. A cadaveric study of sciatic nerve and its level of bifurcation. *J Clin Diagn Res.* 2011;5:1502-4.
3. Berihu BA and Debeb YG. Anatomical variation in bifurcation and trifurcations of sciatic nerve and its clinical implications: in selected university in Ethiopia. *BMC Res Notes* 2015;8:633.
4. Amasiatu VC, Oyakhire MO and Oladipo GS. Termination pattern of sciatic nerve in Nigeria: A cadaver dissection study. *JIRMEPS.* 2017; 12(1): 1-6.
5. Mallikarjun A and Sangeetha V. Study on variant anatomy of sciatic nerve. *J Clin Diagn Res* 2014;8(8):AC07–AC09.
6. Anbumani TL, Thamarai Selvi A, Anthony Ammal S. Sciatic nerve and its variations: An anatomical study. *Int J Anat Res.* 2015;3(2):1121-27.
7. Sawant SP. A case report on the bilateral trifurcation of the sciatic nerve and its clinical significance. *IJAPBS.* 2013;2(1):24–30.
8. Nayak S. An unusual case of trifurcation of the sciatic nerve. *Neuroanatomy.* 2006;5: 6–7.
9. Sharvari AM, Sharadkumar PS, Rakhi MM, Shaguphta TS, Shaheen R, Uma R. A case report on Sciatic nerve terminated in to the Tibial, Common peroneal and Sural nerves. *Int. J. Adv. Case Reports.* 2015;2(5):329–332.
10. Russa AD and Fabian FM. A unique quadrifurcation of the sciatic nerve in the lower leg. *AJA.* 2017;6(2): 919 -923.

## Figures



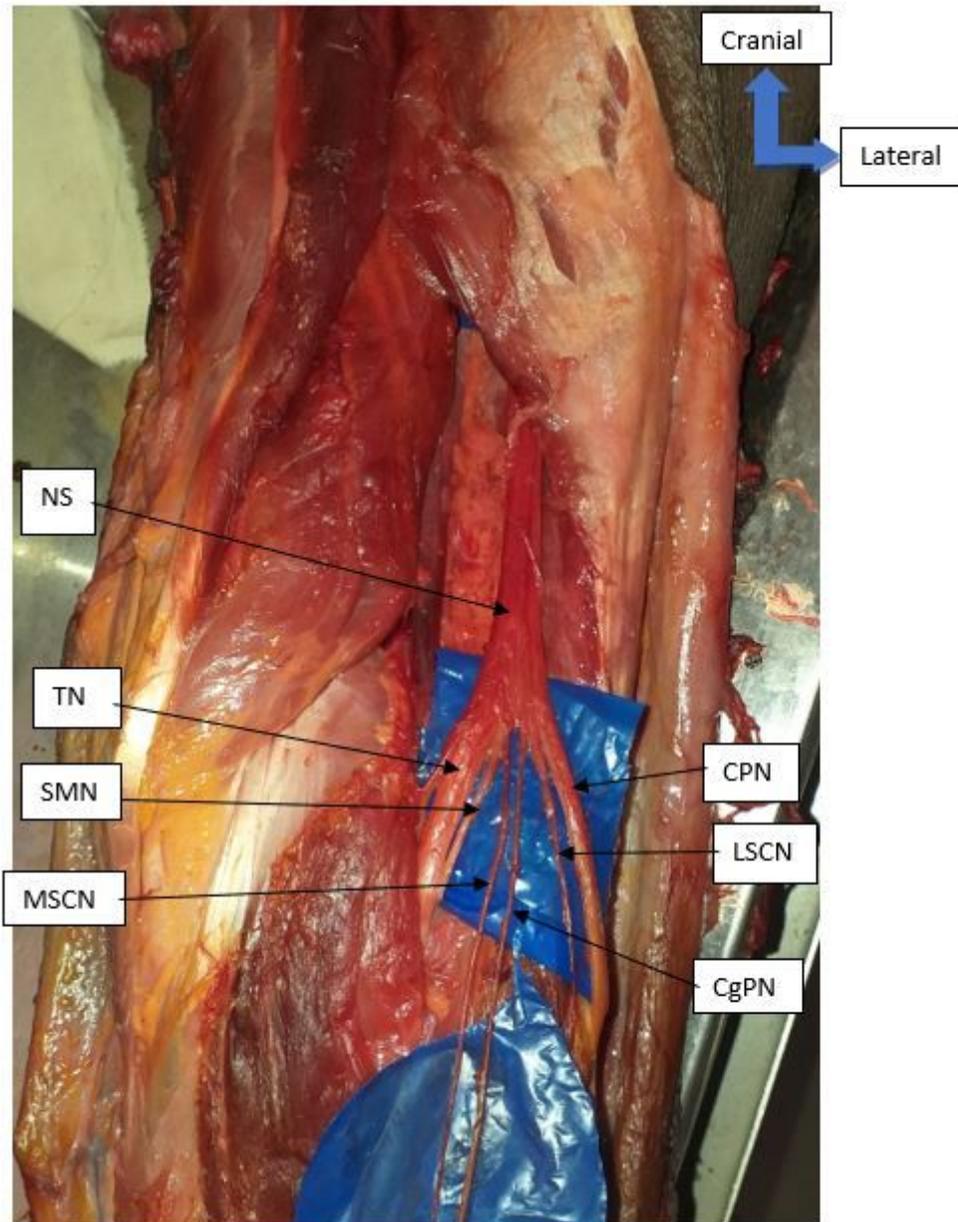
**Figure 1**

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