



THE EVALUATION AND VARIATION OF SCIATIC NERVE AND COMPARATIVE STUDY WITH OTHERS

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ABSTRACT

Aim & Objectives:- To study the anatomical variations in the sciatic nerve and comparative study of the sciatic nerve in its emergence in relation to Piriformis muscle and its course & branching pattern in the gluteal region & back of thigh with others studies.

Method:- TYPE OF STUDY: Cross-sectional and observational studies of 50 human cadavers.

Result: The present study, the sciatic nerve was of typical type seen in 36 (72%) Specimens. The atypical type was seen in 14 (28%) and the sciatic nerve shows variations in the level of division. In the present study, in the gluteal region (12%), in the middle of thigh (16%) and at the superior angle of popliteal fossa (72%) were observed. The present study compared with studies of other researchers.

Conclusion The present study shows variation of sciatic nerve in its emergence, course & level of division which may interfere or create complications during the intraoperative procedures or later on its bifurcation level above the popliteal fossa crease is considered important by clinician.

Key words – Sciatic nerve, variations, Bifurcation & Piriformis muscle.

Introduction

Sciatic Nerve injuries are a regular occurrence leading to paralysis, loss of function and deformities of lower limb. These can occur due to Road traffic accidents injuring the nerve directly. Nerves can also get injured during operative procedures and intramuscular injections. The sciatic nerve is the most frequently injured lower extremity nerve.⁽¹⁾ Clear understandings of the course of sciatic nerve and variations in the level of bifurcation have clinical significance to orthopedic surgeons, general surgeons, neurosurgeons, Anaesthesiologists, radiologists and anatomists. Present text books describe the Sciatic nerve as the thickest nerve in the body. It is regarded as the continuation of upper band of sacral plexus having root value of L4, L5, S1, S2, S3.⁽²⁾

Knowledge of these anatomical variations in sciatic nerve is essential in light of the frequency with which injuries occur mainly due to posterior dislocation of hip joint & penetrating wound and also in

case of fracture of hip bone or neck of femur.^(3, 4) The knowledge of variations can also prevent the complications during performing certain surgeries such as total hip replacement surgery, hemiarthroplasty of hip⁽⁵⁾ and positioning of individuals during Gynaecological surgeries like hysterectomy & dilation and curettage which may affect sciatic nerve.⁽⁶⁾ Its bifurcation level above the popliteal fossa crease is considered important by clinician during sciatic nerve block for surgery of the calf, Achilles tendon, ankle joint & the foot. Thus, it is critical to locate its major trunk before its bifurcation and applying local at that level.^(7,8,9) Better knowledge of variations of sciatic nerve will certainly help clinicians to tackle certain neuropathies like piriformis syndrome & sciatica.⁽¹⁰⁾ The studies done by Prakash, Bhardwaj AK et al. (2010) published in Singapore Medical Journal describes variation depending on the level of division of the sciatic nerve (into the tibial and common peroneal nerve) & they made six different groups.⁽¹¹⁾ The Sciatic nerve variations were studied in 36 lower extremities by Ewa Okraszewska.⁽¹²⁾ The topographical variations included Group I - (typical) when the sciatic nerve passed under the piriformis Group II- (atypical) when the sciatic nerve or at least a part, did not pass under the piriformis muscle. In a study conducted by Muthu Kumar T et al.⁽¹⁾ in Chennai, they classified the sciatic nerve on the basis of Emergence into Undivided (single trunk) or Divided (double trunk). Undivided nerve was classified into three groups according to its relation to the piriformis muscle whether above or through or below the piriformis muscle. They also categorized on the basis of level of termination of sciatic nerve in the gluteal region, back of thigh & popliteal fossa. Keeping in mind all these facts that underscore the importance of knowledge of variations of sciatic nerve the present study is undertaken to Study the course of sciatic nerve & variations in the level of bifurcation in the Kolhapur region.

AIM: To study the anatomical variations in the sciatic nerve.

OBJECTIVES:

1. To study the anatomical variations in the sciatic nerve in its emergence in relation to Piriformis muscle.
2. Comparative study the variations of its course & branching pattern in the gluteal region & back of thigh with others studies.

MATERIALS AND METHOD: Materials required:

1. Gloves,
2. Dissecting box containing: a) scissors b) Forceps of different types
3. c) Scalpel
4. Measuring tape
5. Camera



Fig 1: Materials used.

METHODOLOGY: The present work consists of the study of sciatic nerve and its variations in the Gluteal Region and back of the thigh in adult human specimens obtained from cadavers placed for dissection in the department of anatomy, Dr. D.Y. Patil Medical College, Kolhapur. The 50 lower limbs from 25 preserved human cadavers were dissected and observations were noted.

TYPE OF STUDY: Cross-sectional and observational study.

STEPS OF DISSECTION:

1. The cadavers were placed in prone position.
2. The emergence of sciatic nerve in relation with the piriformis muscle was looked for the fascia surrounding the nerve was split.
3. Then the nerve was traced downwards. The back of thigh and popliteal fossa were dissected to observe the course and level of division of the nerve into common peroneal and tibial branch. Observations were made.



Fig.2: Measurement of distance of level of division of sciatic nerve (from the lower border of Piriformis)

RESULT:- A total 50 human adult lower limbs were dissected and the course, branching, termination and variations of sciatic nerve were studied. In the present study, the sciatic nerve was of typical type seen in 36 (72%) specimens. The atypical type was seen in 14 (28%) specimens (Table No.1-and Graph No.1) cut. The sciatic nerve shows variations in the level of division. In the present study, in the gluteal region (12%), in the middle of thigh (16%) and at the superior angle of popliteal fossa (72%) were observed. (Table No.1 and Graph No.1) Out of 50 specimen. In the present study of 50 specimens, regarding emergence in relation with piriformis muscle. sciatic nerve was seen to be a

single trunk passing through the lower margin of the piriformis in 47 (94%) specimens which was considered as typical. The remaining 3(6%) showed variations (Table No.1 and Graph No.1). Comparing our study with Ewa Okraszewska et al.⁽¹²⁾

They grouped sciatic nerve variations as follows:

Group I : when sciatic nerve passed under the piriform muscle (despite the nerve coming as one trunk or already being divided into terminal branches). Consequently in group I three kinds of sciatic nerve topography were revealed

IA - Sciatic nerve passes under piriform muscle as one nervous trunk.

IB - Sciatic nerve passes under piriform muscle as two nervous trunks, which then gather in one common sciatic nerve.

IC - Sciatic nerve passes under piriform muscle as two nervous trunks (as in case IB), however the trunks do not gather and play the role of terminal branches of the nerve.

Group II: when sciatic nerve, or at least a part, did not pass under the piriform muscle. In this group four kinds of sciatic nerve topography were revealed:

IIA — Sciatic nerve perforates piriform muscle and passes through its fibres as one nervous trunk.

IIB— Common fibular nerve perforates the piriform muscle and the tibial nerve passes under the muscle.

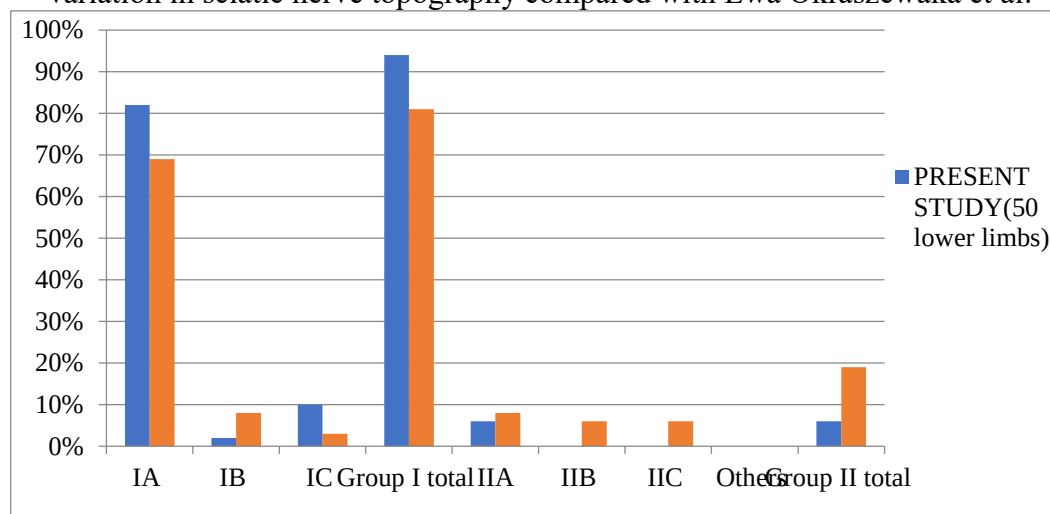
IIC Common fibular nerve passes over the piriform muscle and tibial nerve under the muscle.

Table No. 1 Comparing present study with Ewa Okraszewska et al.

GROUP	PRESENT STUDY (50 lower limbs)	Ewa Okraszewska et al ¹³ (36 lower limb)
IA	82%	69%
IB	2%	8%
IC	10%	3%
Group I total	94%	81%
IIA	6%	8%
IIB	0	6%
IIC	0	6%
Group II total	6%	19%

Graph No.1

Variation in sciatic nerve topography compared with Ewa Okraszewska et al:



The present study in comparative to others such as - A study conducted by Muthu Kumar T et al.(2011) in Chennai, they classified the sciatic nerve on the basis of Emergence into Undivided (single trunk)

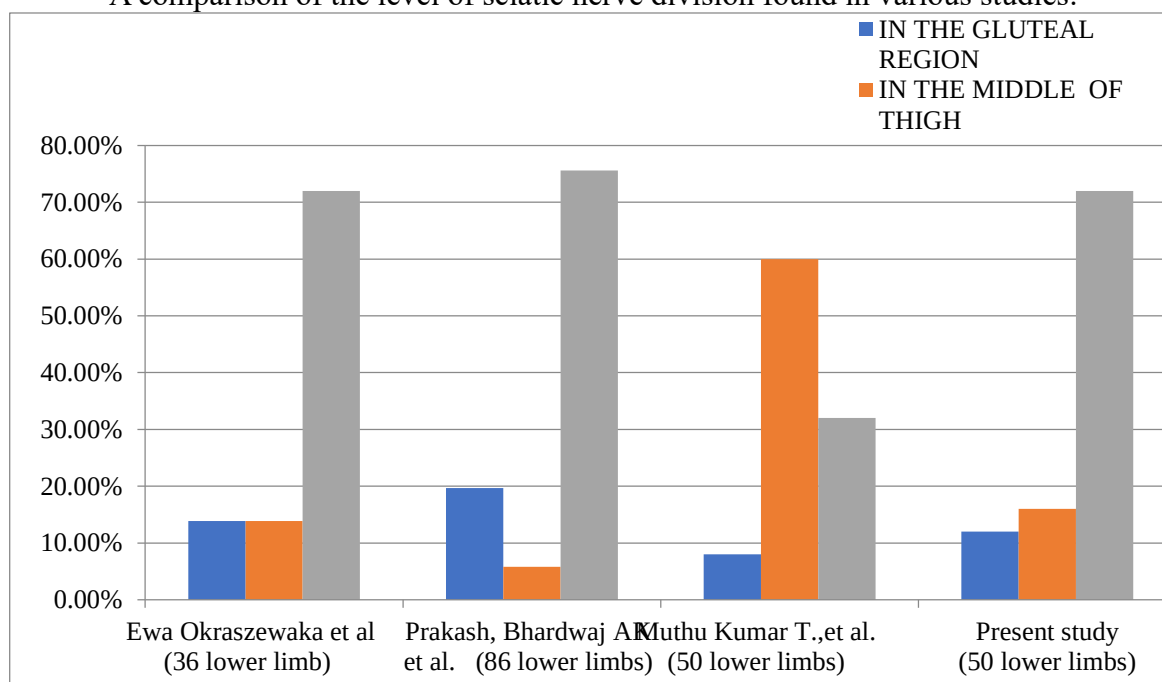
or Divided (double trunk). In one of the studies done by Prakash, Bhardwaj AK et al. (2010) published in Singapore Medical Journal describes variation depending on the level of division of the sciatic nerve (into the tibial and common peroneal nerve) & they made six different groups¹¹. Sciatic nerve variations were studied in 36 lower extremities. By Ewa Okraszewska (2002). The topographical variations included Group I - (typical) when the sciatic nerve passed under the piriformis. Group II- (atypical) when the sciatic nerve or at least a part, did not pass under the piriformis muscle.

Table No. 2 A comparison of the level of sciatic nerve division found in various studies:

LEVEL OF DIVISION AUTHORS	IN THE GLUTEAL REGION	IN THE MIDDLE OF THIGH	AT THE POPLETIAL FOSSA
Ewa Okraszewska et al ¹² (36 lower limbs)	13.89%	13.89%	72%
Prakash, Bhardwaj AK et al. ¹¹ (86 lower limbs)	19.7%	5.8%	75.6%
Muthu Kumar T. et al. ¹ (50 lower limbs)	8%	60%	32%
Present study (50 lower limbs)	12%	16%	72%

Graph No. 2

A comparison of the level of sciatic nerve division found in various studies:



Discussion -

A total 50 human adult lower limbs were dissected and the course, branching, termination and variations of sciatic nerve were studied. The sciatic nerve is just the continuation of the sacral plexus developmentally and anatomically and its complexity leads to different types, and classified into well-defined two categories: typical (normal) and atypical (abnormal). Typical is considered if the nerve divided normally in the popliteal fossa. Atypical may divide within the pelvis or it may divide anywhere in the gluteal region and back of thigh in its course. In the present study, 82% specimen belong to group IA, 2% belong to group IB, 10% to group IC. So group I total was 94%.

Then 6% belong to IIA, Group IIB and IIC was not observed in the present study. So group II total was 6%.

Group IA was higher compared to Ewa Okraszewska et al (69%),
 Group IB was lower compared to Ewa Okraszewska et al (8%),
 Group IC was higher compared to Ewa Okraszewska et al (3%),
 Group IIA was comparable to Ewa Okraszewska et al (8%).

Regarding level of Division of the sciatic nerve into terminal branches.

In one of the studies done by Prakash, Bhardwaj AK et al. (2010)¹¹. published in Singapore Medical Journal describes variation depending on the level of division of the sciatic nerve (into the tibial and common peroneal nerve) & they made six different groups(A-F).

Group A- The sciatic nerve divided proximal to its exit in the gluteal region (17.4%).

Group B- it divided in the gluteal region(2.3%)

Group C- it divided in the upper region of the back of thigh (3.5%).

Group D- it divided in the middle region of the back of thigh (2.3%).

Group E- it divided in the lower region of the back of thigh (40.7%).

Group F- the sciatic nerve divided in the popliteal fossa (34.9%) .

In a study conducted by Muthu Kumar T., et al.(2011)¹ in Chennai, they classified the sciatic nerve on the basis of Emergence into Undivided (single trunk) or Divided (double trunk). Undivided nerve was classified into three groups according to its relation to the piriformis muscle whether above or through or below the piriformis muscle. They also categorized on the basis of level of termination of sciatic nerve in the gluteal region (8%), back of thigh (60%) & popliteal fossa (32%).

CONCLUSION:

Even in this era the cadaver is the best means to study anatomy. The main essence of this study is to get some information on variation of the sciatic nerve anatomy. The present study shows variation of sciatic nerve in its emergence, course & level of division which may interfere or create complications during the intraoperative procedures or later on its bifurcation level above the popliteal fossa crease is considered important by clinician during sciatic nerve block for surgery of the calf, Achilles tendon, ankle joint & the foot. Thus, it is critical to locate its major trunk before its bifurcation and applying local anaesthesia at that level. Better knowledge of variation of sciatic nerve will certainly help clinicians to tackle certain neuropathies like piriformis syndrome & sciatica.

The variation of sciatic nerve should be kept in consideration even in minor procedure like administration of intramuscular injection in the gluteal region (buttock) to avoid injuries. The present study systematically comparative studies and reviews of previous studies of sciatic nerve . It emphasizes proper clinical implications, for the surgeons to practice efficient surgical recombination and avoid errors. Treatment aimed at maximizing the mobility of the lower extremity.

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