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"Study of Variations in the Course and Distribution of Sciatic Nerve in the Gluteal Region And Back Of Thigh in Adult Human Cadavers"

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Abstract:
Background*: The sciatic nerve is formed from the sacral pleuxs [L4, L5, S1, S2, S3]. It has two components – tibial and common peroneal. It enters the gluteal region through the greater sciatic foramen, descends on the back of thigh and terminates in the popliteal possa.*
Recent advances in limb surgery need a precise knowledge of frequency of anatomical variations in the sciatic nerve. The anatomy of sciatic nerve is very important for surgeons in order to achieve good result and greater benefits to patients. Hence the present study was undertaken.
Objectives:
1. To study the course and distribution of sciatic nerve in gluteal region and back of thigh.
2. To compare the present findings with earlier studies.
Materials and Methods*:*
1. *34 Embalmed adult lower limbs procured from the Department of Anatomy S.V. Medical College, Tirupati.*
2. *10% formalin solution is used to preserve the specimens.*
3. *One set of dissection instruments and measuring tape.*
The gluteal region and back of the thigh were dissected. The emergence, course, termination, and branches of the sciatic nerve were dissected and traced. Observations were recorded. The specimens were photographed.
Results*: Out of 40 specimens, 26 specimens [65%] showed typical division. 14 specimens [35%] showed atypical division. Out of the 14 specimen with atypical division, 6 specimens had the division within the pelvis, 6 specimens at intermediate level, and 2 specimens showed division and reunion Out of the 40 specimens, 36 (90%) were male and 4 (10%) female; typical right, 92% and typical left, 8% and atypical male, 14% and atypical female, 86%.*
Conclusion: *The predominant type of typical sciatic nerve was of the classic pattern where the sciatic nerve divided into tibial nerve and common peroneal nerve in the popliteal fossa and atypical type was that which divided within the pelvis or anywhere in its course.*
Key Word*: sciatic nerve; tibial nerve; common peroneal nerve; pelvis; typical; atypical; greater sciatic foramen.*

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I. Introduction

Sciatica has been torturing humankind for hundreds, if not thousands of years. Biblical mention of this disease can undoubtedly attest to the horror, frustrations, and real evil of this lawful affection. Sciatica refers to a burning, stinging, and numbing pain felt in the buttock, thigh, leg, and foot, which may or may not be associated with low back pain.

The sciatic nerve is the thickest and longest nerve in the human body. The importance of the nerve in the learning process of human morphology depends on several unique features.

- The sciatic nerve is easy to recognize, prepare, separate, and observe.
- A sciatic nerve consists mostly of lumbo-sacral fibers L4,5 and S1,2,3. They are both sensory and motor.
- The sciatic nerve presents significant variability concerning its topography and division into terminal branches (common peroneal nerve and tibial nerve).

II. Material And Methods

MATERIAL:

34 Embalmed adult lower limbs procured from the Department of Anatomy S.V. Medical College, Tirupati. 10% formalin solution is used to preserve the specimens. One set of dissection instruments and measuring tape.

METHOD:

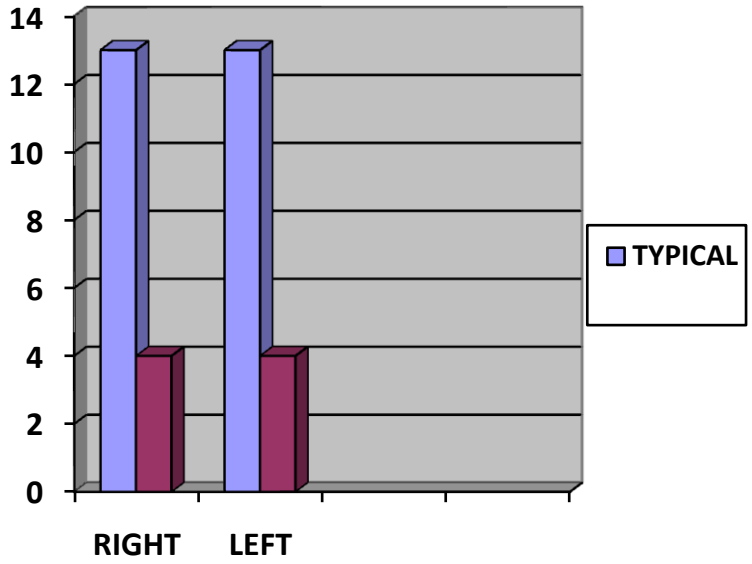
The gluteal region and back of the thigh were dissected. The emergence, course, termination, and branches of the sciatic nerve were dissected and traced. Observations were recorded. The specimens were photographed.

III. Result

TABLE SHOWING TYPICAL AND ATYPICAL DIVISIONS OF SCIATIC NERVE IN PRESENT STUDY

TYPE	RIGHT	LEFT	TOTAL	PERCENTAGE
TYPICAL	13	13	26	76.47%
ATYPICAL	4	4	8	23.53%
TOTAL	17	17	34	100%

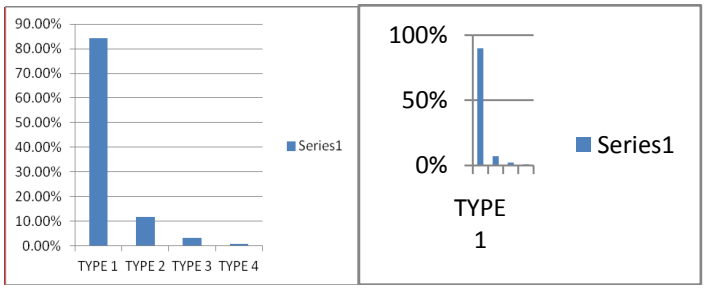
GRAPH SHOWING TYPICAL AND ATYPICAL DIVISIONS OF SCIATIC NERVE IN PRESENT STUDY



RELATIONSHIP BETWEEN SCIATIC NERVE AND PIRIFORMIS

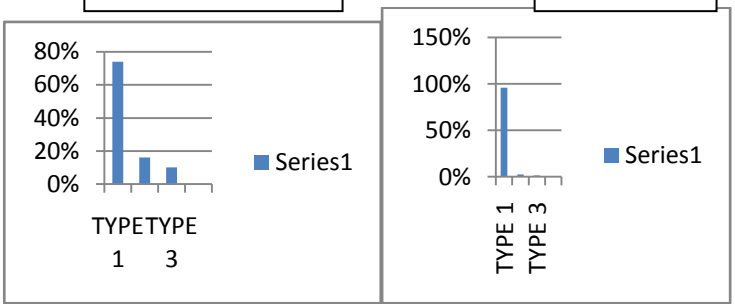
		TYPE 1	TYPE 2	TYPE 3	TYPE 4
1	Beaton and Anson (120 Cadavers)	84.20%	11.70%	3.30%	0.80%
2	Beaton (240 Cadavers)	90%	7.10%	2.10%	0.80%
3	Uluutka & Kurtolglu (25 fetuses)	74%	16%	10%	
4	Ugrenovric et al (100 fetuses)	96%	2.50%	1.50%	
5	Pokorny et al (91 cadavers)	79.10%	14.30%	4.40%	2.20%
6	The present study (34 extremities)	91.18%	5.88%	2.94%	nil

RELATIONSHIP BETWEEN SCIATIC NERVE AND PIRIFORMIS



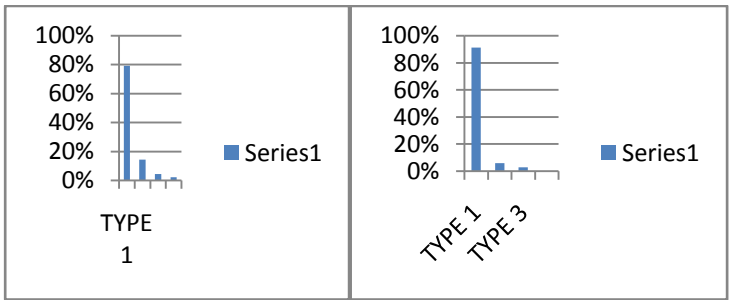
Beaton and Anson

Beaton



Ugrenovric et al

Uluutka & Kurtolglu



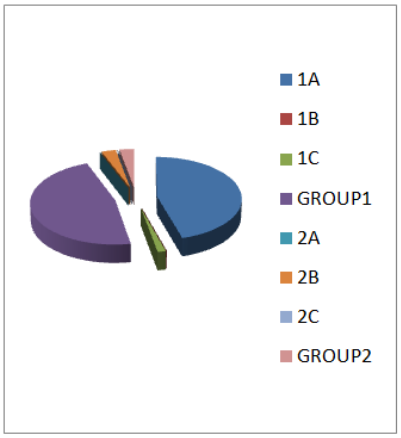
Pokorny et al

PRESENT STUDY

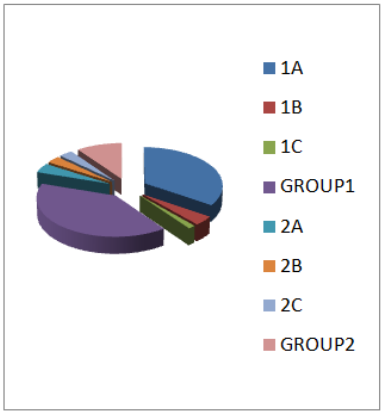
VARIATIONS IN SCIATIC NERVE TOPOGRAPHY

GROUP	PRESENT STUDY n- 34	Ewa Okraszewaka et al n- 36
I A	91.18%	69%
I B	----	8%
I C	2.94%	3%
GROUP I	94.12%	80%
II- A	----	8%
II -B	5.88%	6%
II- C	----	6%
OTHERS	NIL	----
GROUP II	5.88%	20%

VARIATIONS IN SCIATIC NERVE TOPOGRAPHY

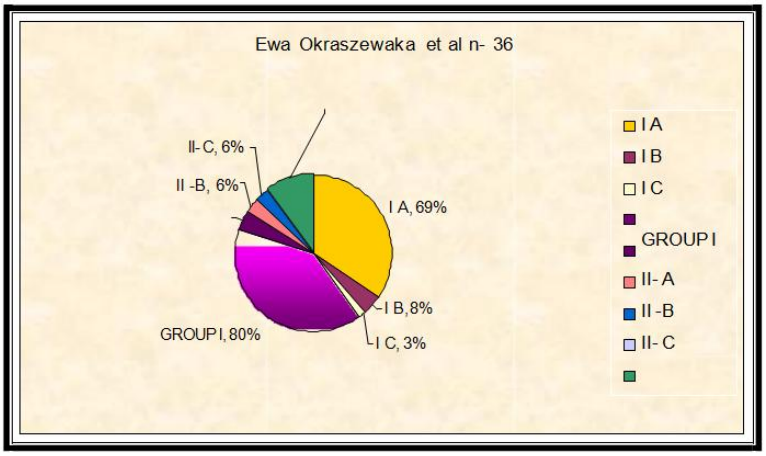


PRESENT STUDY



Ewa Okraszewaka et al

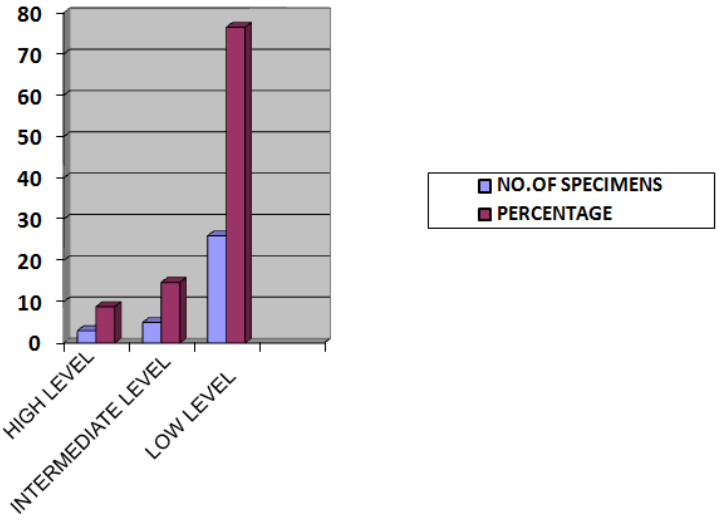
VARIATIONS IN SCIATIC NERVE TOPOGRAPHY



DIVISION OF THE SCIATIC NERVE INTO TERMINAL BRANCHES

LEVELS	NO. OF SPECIMENS	PERCENTAGE
HIGH LEVEL	3	8.82%
INTERMEDIATE LEVEL	5	14.7%
LOW LEVEL	26	76.48%
TOTAL	34	100%

DIVISION OF THE SCIATIC NERVE INTO TERMINAL BRANCHES



IV. Discussion

The branching pattern of the sciatic nerve and the variations present a complex and clinically challenging area of study. It is difficult to dissect its location deep in the gluteal region and back of the thigh within the muscle substance. C T and MRI allow the visualization of the branching pattern. They do not show the small branches of the nerve. Hence the present study was taken up to study the course and branching pattern of the sciatic nerve in the gluteal region and back of the thigh.

In the present study of 34 specimens, the sciatic nerve is a single trunk passing through the lower margin of the piriformis in 76.47% of typical specimens. The remaining 23.53% showed variations (Table No.1, Graph No.1).

These findings agree with the literature, which reports that passage of nerve through the greater sciatic foramen below the piriformis in 80 to 90% of the cases.

Beaton and Anson classified variations of the piriformis and sciatic nerve in 120 specimens in 1937 and 240 specimens in 1938. Their classification is as follows:

Type 1 --- Undivided nerve below the muscle.

Type 2 --- Divisions of the nerve between and below the muscle.

Type 3 --- Divisions below the muscle.

Type 4 --- Undivided nerve between heads.

Type 5 --Divisions between and above heads.

Type 6 ---Undivided nerve above the muscle.

In the present study:

- Type-1 showed 91.18%
- Type-2 showed 5.88%
- Type-3 showed 2.94% (Table No. 2, Graph No. 2).

Type 1 was highest, compared to the earlier findings of Beaton and Anson (84.20%), Beaton (90%), Uluutku & Kurtoglu (74%), and Pokorny et al. (79.10%) except Ugrenovic et al. (96%).

Type 2 is on the lower side compared to the earlier findings of Beaton and Anson (11.70%), Beaton (7.10%), Uluutku & Kurtoglu (16%), and Pokorny et al. (14.3%) except Ugrenovic et al. (2.50%).

Type 3 is on the lower side compared to the earlier findings of Beaton and Anson (3.30%), Uluutku & Kurtoglu (10%), and Pokorny et al. (4.40%) except Beaton (2.10% and Ugrenovic et al. (1.50%).

In the present study, type 4 was not observed, though Beaton and Anson reported 0.80%, Beaton 0.80%, and Pokorny et al. 2.20%.

Ewa Okraszewska et al. grouped sciatic nerve variations as follows:

- GROUP 1A - Sciatic nerve passes under the piriformis as one trunk.
- GROUP1B -Sciatic nerve passes under the m.piriformis as two trunks and then united to form a common sciatic nerve.
- GROUP 1C - Sciatic nerve passes under the m.piriformis as two trunks and continued as terminal branches.
- GROUP II A - Sciatic nerve pierces the m.piriformis and passes through it as one trunk.
- GROUP II B - Common peroneal nerve passes through the m.piriformis, and tibial nerve passes under the muscle.
- GROUP II C - Common peroneal nerve passes over the m.piriformis, and the tibial nerve passes under the muscle.

In the present study:

- 91.18% belongs to group IA
- 5.88% group I.C.
- 2.94% group IIB (Table No.3, Graph No.3).

The results of the present study coincide with the observations made by Ewa Okraszewaka et al.

In the present study, three levels of sciatic nerve division into terminal branches were observed. (Table No. 4, Graph No. 4).

- ✓ High (pelvic) level (8.82%) - sciatic nerve divides within the lesser pelvis.
- ✓ Intermediate level (14.7%) - sciatic nerve divides at lower 2/3 of the femur(between greater sciatic foramen and superior angle of popliteal fossae).
- ✓ Low (popliteal) level (76.47%) - sciatic nerve divides in the popliteal fossa.

Results of the present study correlated with Ewa Okraszewaka et al.'s observations - High level 8.82%, Intermediate level 14.7%, and Low level 76.47%.

V. Conclusion

This present work has brought contributions to the specific topic, both by comparing earlier scientific studies with the available data and by the addition of new observations in the present study to improve the anatomical and clinical knowledge about the gluteal region. Knowing the level of division of the sciatic nerve and the location where it leaves the pelvis is of great importance. The abnormal passage of the sciatic nerve causing compression of the nerve – atypical sciatica. In 23.53% of the cases, an atypical course of the sciatic nerve was observed.

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