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## A CADAVERIC STUDY ON ANATOMICAL VARIATIONS OF SCIATIC NERVE IN RELATION TO PYRIFORMIS MUSCLE IN ANDHRA PRADESH REGION

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### ABSTRACT

**Introduction:** The sciatic nerve is the largest nerve of the body. Not only does it have the largest number of nerve fibers, but it also supplies a vast region. Compression of sciatic nerve anywhere during its course may contribute to clinical conditions like sciatica and piriformis syndrome. Anomalous sciatic nerve and its branches can often be damaged by wrongly placed intra-muscular injections and during pelvic and total hip replacement surgeries. The present study was conducted to highlight different variations in course and branching pattern of the sciatic nerve in Andhra Pradesh population.

**Materials and Methods:** The present study was carried out on gluteal regions of 100 lower extremities of 50 embalmed cadavers during routine dissection practices for undergraduates in the dissection hall of Gandhi medical college and Osmania medical colleges of Andhra Pradesh, India.

**Results and Conclusion:** In the present study 92 out of 100 specimens sciatic nerve passed below piriformis into gluteal region then descended downwards in the back of thigh, which terminated in to common peroneal nerve and tibial nerve in the popliteal fossa as usual. In 3% cases common peroneal nerve pierced piriformis & tibial nerve passed below the muscle. Common peroneal nerve & tibial nerve passed above and below the piriformis respectively in 4% cases. Unsplit sciatic nerve piercing the piriformis is found in 1 case only.

**Keywords:** Sciatic nerve, Tibial nerve, Common peroneal nerve, Piriformis, Piriformis syndrome

### INTRODUCTION

The sciatic nerve is the largest nerve of the body. Not only does it have the largest number of nerve fibers, but it also supplies a vast region. It is the continuation of the upper band of the sacral plexus. It is formed by ventral rami of L<sub>4</sub>, L<sub>5</sub>, S<sub>1</sub>, S<sub>2</sub>, and S<sub>3</sub>. It passes out of the pelvis through the greater sciatic foramen below the piriformis. Then it descends between the greater trochanter of the femur and the tuberosity of ischium and along the back of the thigh. It divides in the lower 1/3<sup>rd</sup> of

the thigh into two large terminal branches named tibial and common peroneal nerves.

Compression of sciatic nerve anywhere during its course may contribute to clinical conditions like sciatica and piriformis syndrome. Anomalous sciatic nerve and its branches can often be damaged by wrongly placed intra-muscular injections and during pelvic and total hip replacement surgeries.

The present study was conducted to highlight different variations in course and branching

pattern of the sciatic nerve in Andhra Pradesh population. A knowledge of the variations of the sciatic nerve could help Anesthetists, Neurosurgeons and Orthopaedicians to avoid surgical errors.

## MATERIALS AND METHODS

The present study was done on gluteal regions of 100 lower extremities of 50 embalmed cadavers during routine dissection practices for undergraduates in the dissection hall of Gandhi medical college and Osmania medical colleges of Andhra Pradesh, India.

Skin incision was given, gluteus maximus muscle was identified, incised and reflected as per the instructions in Cunningham's manual of practical anatomy 15<sup>th</sup> edition. Sciatic nerve was identified and its relation to the piriformis muscle was noted. The sciatic nerve was then traced down till its division into common peroneal and tibial branches. All the observations were meticulously tabulated and compared with previous studies

## OBSERVATIONS

In the present study 92 out of 100 specimens showed normal pattern of sciatic nerve. i.e. sciatic nerve passed below piriformis into gluteal region then descended downwards in the back of thigh, which terminated into common peroneal nerve and tibial nerve in the popliteal fossa. The variations of the nerve in relation to piriformis are shown in the table no 1.

## DISCUSSION

The sciatic nerve is the largest nerve arising from lumbosacral plexus. It innervates 28 muscles of the lower limb. Normally it leaves the pelvis through the greater sciatic foramen and runs below the piriformis to enter the gluteal region. Variations in its relationship with the piriformis have been observed by several workers. Entrapment of the nerve within the piriformis muscle is one of the reasons of its compression,

the condition being called 'piriformis syndrome'. A large number of cases of sciatic nerve injuries have been recorded due to intra-muscular injections given in the gluteal region. The chances of damaging the sciatic nerve in children are higher, more so in neonates and malnourished infants. Therefore the possibility of variations of its course should be considered seriously, which otherwise would lead to unwanted consequences.

Initial studies on the sciatic nerve and its variations started late back in nineteenth century. Several authors reported that the sciatic nerve divides in the pelvic region itself, even before it enters the gluteal region. Beaton L E, *et al*<sup>2</sup> in 2250 lower limbs and Lee C. S. *et al*<sup>6</sup> in 168 lower limbs observed that the common peroneal nerve, as it enters the gluteal region, pierced the piriformis muscle in 11.7% and 19.6% respectively while tibial nerve passed below the muscle. Chiba S<sup>3</sup> dissected 514 lower extremities and observed that in 34% of cases common peroneal nerve pierced through the piriformis muscle. Gabrielli, *et al*<sup>5</sup>, Ewa Okrazeweska, *et al*<sup>4</sup>, Anne M R Agur, *et al*<sup>1</sup>, Ronald A Bergman *et al*<sup>12</sup>, Pokorny D, *et al*<sup>11</sup>, Vincenti EJD, *et al*<sup>14</sup> and Mustafa Guvencer, *et al*<sup>10</sup> observed the same in 11.2%, 2%, 12.2%, 12%, 14.3%, 15% and 16% of cases respectively. Machado, F.A., *et al*<sup>8</sup>, performed the same study on 100 fetuses and showed that in 16% of cases, common peroneal nerve pierced the piriformis muscle.

In the present study of 100 lower limbs, 3% were seen to have this type of variation.

Beaton L E, *et al*<sup>2</sup>, Gabrielli, *et al*<sup>5</sup>, Ewa Okrazeweska, *et al*<sup>4</sup>, Machado, *et al*<sup>8</sup>, Pokorny D, *et al*<sup>11</sup>, Mustafa Guvencer, *et al*<sup>10</sup> in their individual studies, observed that the common peroneal nerve passed above the piriformis and the tibial nerve below the piriformis after dividing in the pelvis, in 3.3% 2.5% 5.5% 2% 4.4% 8% in of cases respectively.

During the present work the common peroneal nerve and tibial nerve were found to pass above

and below the piriformis muscle respectively in 4% of limbs.

There were studies which reported a rare type of variation, that the sciatic nerve enters the gluteal region unsplit and piercing through the piriformis muscle.

Beaton L E, et al<sup>2</sup> observed that in 0.8% of cases entire sciatic nerve pierced the piriformis muscle. Ewa okraszewska, et al<sup>4</sup>, Pokorny D, et al<sup>11</sup>, Ronald A. Bergman, et al<sup>12</sup>, observed the same in 8.3%, 2.2% and 2.25% cases respectively. The present worker found this type of variation in 1 case only.

M. A. Babinski, et al<sup>7</sup> reported a rare variation of the high division of the sciatic nerve surrounding superior gemellus muscle. In the common peroneal nerve passed between piriformis and the superior gemellus muscle and the tibial nerve passed below the superior gemellus muscle. Another case of high division of sciatic nerve was observed by Md Hassan Ali et al<sup>7</sup> in which the right side sciatic nerve divided just 1cm below the piriformis muscle and on the left side division of sciatic nerve was seen 2cm below the piriformis. However on both sides the sciatic nerve divided above the superior gemellus muscle. Sateesha Naik, et al observed trifurcation of sciatic nerve in the middle of popliteal fossa. No such variations were observed in the present study.

## SUMMARY AND CONCLUSION

It has been observed during clinical practice that the commonest causes of sciatic nerve injuries could be either intra muscular injections given in the gluteal region or the posterior dislocation of the hip joint. Such injuries are more common in malnourished infants and neonates due to lack of subcutaneous tissue and less muscle mass. When unsplit nerve or any of its division passes through the piriformis, a painful condition resembling sciatica called piriformis syndrome can occur. Compression of nerve fibers during the maximum contraction of piriformis muscle could be the cause of pain. So the knowledge of the variations

of sciatic nerve will help Anesthetists, Neurosurgeons and Orthopedic surgeons to avoid surgical errors.

Author wishes to continue the study in a larger group of individuals by adopting advanced radiological methods to detect variations in the sciatic nerve.

## Competing Interests

The authors declare that we have no competing interests

## Ethical committee clearance

As the study included only human cadavers, ethical committee clearance was not taken into consideration. Authors will take the responsibility of any further allegations regarding ethical clearance that arise from the study.

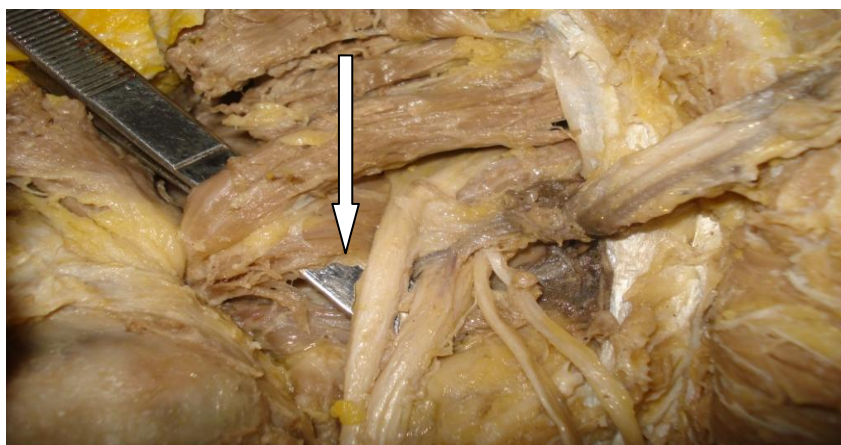
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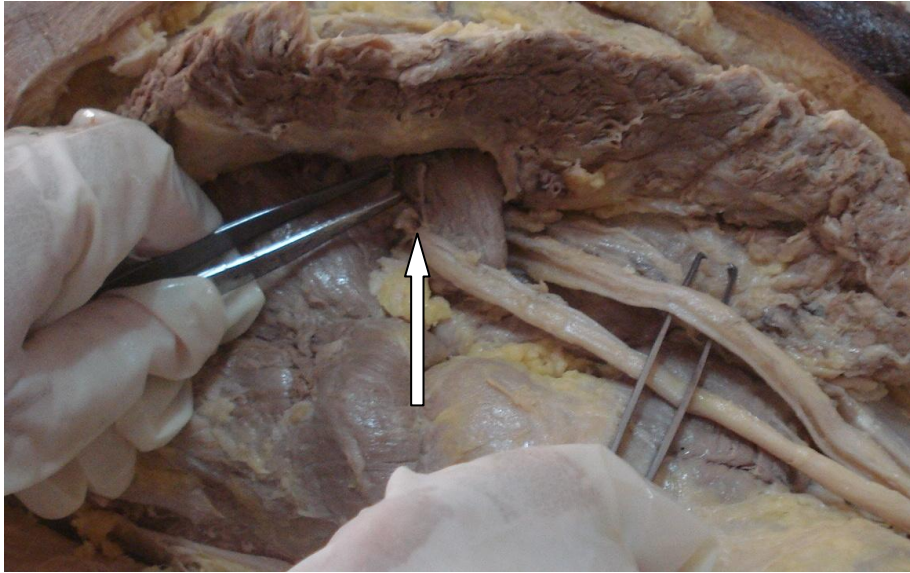
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**Figure 1, showing common peroneal nerve piercing the piriformis muscle and tibial nerve passing below the piriformis**





**Figure 2, showing common peroneal nerve passing above the piriformis muscle and tibial nerve passing below the piriformis**



**Figure 3, showing common peroneal nerve passing above the piriformis muscle and tibial nerve passing below the piriformis**

**Table: showing sciatic nerve variations observed in present study**

Variations	No of specimens	Percentage (n=100)
Common peroneal nerve pierced piriformis & tibial nerve passed below the muscle	3	3%
Common peroneal nerve& tibial nerve passed above and below the piriformis respectively	4	4%
Unsplit sciatic nerve piercing the piriformis	1	1%