

## Case report:

# Unilateral high division of the Sciatic Nerve with divided Piriformis

**<sup>1</sup>DR. CHIRANJIB BAPULI, <sup>2</sup>DR. SUSUMNA BISWAS, <sup>3</sup>DR. MANOTOSH BANERJEE,  
<sup>4</sup>DR. SEIKH ALI AMAM, <sup>5</sup>DR. SUDESHNA MAJUMDAR, <sup>6</sup>DR. ARPAN KUMAR GOSWAMI, <sup>7</sup>DR.  
MANISHA BISWAS, <sup>8</sup>DR. BISWAPRIYA SINHA**

<sup>1</sup>Junior Resident, Department of Anatomy, Nilratan Sircar Medical College, Kolkata – 700014, West Bengal, India.

<sup>2</sup>Demonstrator, Department of Anatomy, Nilratan Sircar Medical College, Kolkata – 700014, West Bengal, India.

<sup>3</sup>Junior Resident, Department of Anatomy, Nilratan Sircar Medical College, Kolkata – 700014, West Bengal, India.

<sup>4</sup>Associate Professor, Department of Anatomy, Nilratan Sircar Medical College, Kolkata – 700014, West Bengal, India.

<sup>5</sup>Professor, Department of Anatomy, Nilratan Sircar Medical College, Kolkata – 700014, West Bengal, India.

<sup>6</sup>Junior Resident, Department of Anatomy, Nilratan Sircar Medical College, Kolkata – 700014, West Bengal, India.

<sup>7</sup>Junior Resident, Department of Anatomy, Nilratan Sircar Medical College, Kolkata – 700014, West Bengal, India.

<sup>8</sup> Junior Resident, Department of Anatomy, Nilratan Sircar Medical College, Kolkata – 700014, West Bengal, India.

**Corresponding author: Dr. Sudeshna Majumdar; E-mail I.D.: sudeshnamajumdar.2007 @ rediffmail.com**

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## Abstract

While doing the routine dissection for the undergraduate students in the department of Anatomy, Nil Ratan Sircar Medical College, Kolkata, few variations were found in the gluteal region of a 70 years old male cadaver, in the year 2013. On the right side the sciatic nerve (SN) pierced the piriformis muscle dividing it into superior and inferior slips and then, after a short distance, divided into tibial and common peroneal nerves in the gluteal region. On the left side, sciatic nerve divided into two terminal branches (common peroneal and tibial nerves) in the lower part of the back of the thigh near the apex of the popliteal fossa as usual. This high division of the sciatic nerve may result in nerve injury during deep intramuscular injections in gluteal region, piriformis syndrome due to compression of the nerve, failed SN block in anesthesia and surgical complications.

**Key words:** Piriformis muscle, Sciatic nerve, Piriformis syndrome

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## INTRODUCTION

Sciatic nerve (SN) is the thickest nerve in the human body. Normally it reaches the gluteal region from the pelvic fossa by passing below the piriformis muscle and divides into tibial and the common fibular (peroneal) nerves at the lower part of the posterior compartment of the thigh. The point of division of the sciatic nerve into tibial and common fibular components is very much variable. The common site is at the junction of the middle third and lower third of the back of the thigh, near the apex of the popliteal fossa. Dorsal divisions of ventral rami of L<sub>4-5</sub>, S<sub>1-2</sub>

form the common peroneal component and the ventral divisions of ventral rami of L<sub>4-5</sub>, S<sub>1-3</sub> form the tibial component of the sciatic nerve<sup>1</sup>.

The piriformis is a flat muscle, pyramidal in shape, lying almost parallel to the posterior margin of the gluteus medius. It arises from the front of the sacrum by three fleshy digitations. A few fibers also arise from the margin of the greater sciatic foramen and from the anterior surface of the sacrotuberous ligament. The muscle comes out of the pelvis through the greater sciatic foramen and is inserted by a

rounded tendon to the upper border of the greater trochanter<sup>1</sup>.

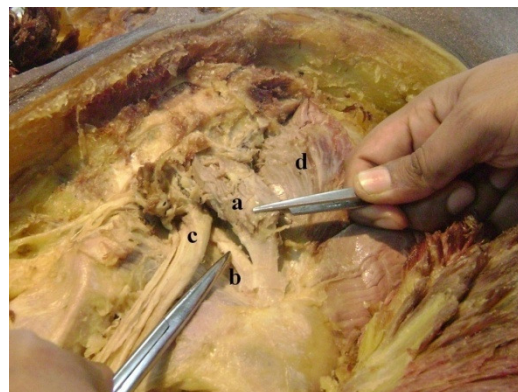
Piriformis syndrome is caused by an entrapment of the sciatic nerve as it exits the greater sciatic notch in the gluteal region<sup>2,3,4</sup>. The high division of SN may lead to compression of nerve and piriformis syndrome along with complications during intramuscular injection, anaesthesia or surgery in the gluteal region<sup>2,3,5</sup>. The present work was planned to describe two anatomical variations in the gluteal region with clinical significance.

During routine dissection of the gluteal region, two variations were found in a 70 years old male cadaver in 2013, in the department of Anatomy, Nil Ratan Sircar Medical College, Kolkata, India. Minute dissection was carried out bilaterally in the gluteal region. The exposed gluteus maximus was obliquely cut at the junction of its medial one-third and lateral two-third on both sides, without damaging any structure. The underlying structures were dissected, observed carefully and photographs were taken.

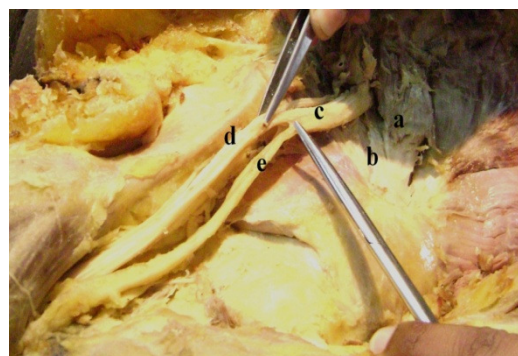
### OBSERVATIONS

In the right sided gluteal region the sciatic nerve pierced the piriformis muscle dividing it into superior and inferior slips. Then after a short distance the sciatic nerve bifurcated into tibial and common peroneal nerves (in the gluteal region). These two nerves descended to the back of the thigh then and to the back of the leg (Figure 1 & 2).

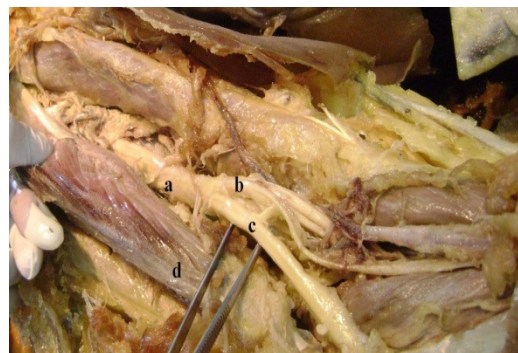
But on the left side the sciatic nerve divided into tibial and common peroneal nerves at the junction of the middle third and lower third of the back of the thigh (near the apex of the popliteal fossa) as usual (Figure3).



**Figure – 1.** The sciatic nerve emerged between the two slips of the piriformis muscle in the right gluteal region. **Index :** a) Upper slip of piriformis muscle, b) Lower slip of piriformis muscle, c) Sciatic Nerve, d) Gluteus medius muscle.



**Figure 2:** In the gluteal region the right sciatic nerve has been divided into the tibial and common peroneal nerves. **Index:** a) Upper slip of piriformis muscle, b) Lower slip of piriformis muscle, c) Sciatic Nerve, d) Tibial nerve, e) Common peroneal nerve.



**Figure 3:** Division of the left sciatic nerve in the lower part of the back of the thigh into tibial and

common peroneal nerves. **Index:** a) Sciatic Nerve, b) Tibial nerve, c) Common peroneal nerve, d) Biceps femoris muscle.

## DISCUSSION

Unilateral double gluteus maximus and double piriformis with high division of sciatic nerve were reported by Kirici et al (1999)<sup>6</sup>. In that case the common peroneal nerve passed between the two parts of piriformis and the tibial nerve emerged under the lower border of inferior piriformis<sup>6</sup>. In a case presented by Paval et al in 2008, high division of the sciatic nerve was found bilaterally in a 70 year old male cadaver. Common peroneal nerve pierced the piriformis dividing the muscle into upper and lower slips whereas the tibial nerve emerged below the lower slip of the piriformis<sup>3</sup>. Khan et al (2011) found a case where on the left side common peroneal nerve passed between the two divisions of piriformis and tibial nerve passed below the inferior piriformis<sup>5</sup>.

In 2013, Bhattacharya et al presented a case with double piriformis and division of the sciatic nerve in the pelvis; the common peroneal nerve emerged between the two piriformis muscles, whereas the tibial nerve emerged below the lower piriformis on the left side. On the right side sciatic nerve divided in the gluteal region after emerging from the lower border of piriformis like the present case<sup>7</sup>. Smoll found that the prevalence of high division of sciatic nerve in cadavers was 16.9% and in surgical case series was 16.2%<sup>8</sup>. This high division of the sciatic nerve may result in nerve injury during deep intramuscular injections in the gluteal region, sciatica, piriformis syndrome, failed SN block in anesthesia or incomplete block of SN during popliteal block anesthesia, injury during posterior

hip operations and other surgery in the gluteal region<sup>3,5,6,9</sup>.

In piriformis syndrome, the sciatic nerve can be entrapped between the gemellus superior and piriformis muscles<sup>3,10</sup>. Another common site of entrapment is when the sciatic nerve or one of its branches pierces the piriformis muscle, and this can occur in about 1% to 5% of all humans<sup>3,11,12</sup>. In that case myospasm and or contraction of the piriformis muscle itself can lead to pain along the back of the thigh to the knee, loss of sensation or numbness and tingling into the leg and sole of the foot<sup>3,11</sup>. This particular syndrome can often mimic its more notorious counterpart known as sciatica. Piriformis syndrome is often misdiagnosed as sciatica due to similar symptoms<sup>3,11,13,14</sup>. The main difference between sciatica and piriformis syndrome is in the cause. Sciatica is directly due to a lumbar disc pressing on the sciatic nerve as it exits the intervertebral foramen in the lumbar spine<sup>3,11,14</sup>.

Some workers consider piriformis syndrome to be a form of myofascial pain syndrome<sup>2,3,4</sup>. A history of trauma may be present in approximately 50% of cases of the syndrome. The trauma is not usually sudden in onset and may occur several months before the initial symptoms. It may also follow total hip replacement surgery<sup>2,3</sup>. Complete medical history and physical examination are necessary for differential diagnosis of this syndrome<sup>3,15</sup>.

The management of piriformis syndrome includes analgesic, muscle relaxants, injection of local anesthetic agents, steroid (like methylprednisolone) or botulinum toxin into the piriformis muscle; steroid and liquid anaesthetic agents can be injected to the area of sciatic nerve even<sup>2,3,4,7,10,15</sup>. To avoid blind injection in the gluteal region, the use of

electromyography or computed tomography (CT) will be helpful to identify the piriformis muscle and a nerve stimulator can be used for sciatic nerve identification<sup>3,4,7,10,11</sup>. Anatomical landmarks and fluoroscopic guidance may also be useful in this regard<sup>9</sup>. Surgery may be considered when the piriformis is involved in the sciatic nerve entrapment. The muscle may be thinned, divided or excised to be compensated with the obturator internus, gemelli, or quadratus femoris muscle, as these muscles share common insertions with the piriformis muscle<sup>3,4,7,10</sup>.

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## CONCLUSION

This case report has a contribution in Orthopaedics, in Sports Medicine as the piriformis syndrome is a cause of soft tissue problem of the hip, especially among the athletes<sup>7,15,16</sup>. This case will also enhance our knowledge in Gross Anatomy and Clinical Anatomy.

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