



Different neuromuscular variations in the gluteal region

Published online September 11th, 2013 © <http://www.ijav.org>

Bhattacharya SANTANU^[1] +
Chakraborty PITBARAN^[2]
Majumdar SUDESHNA^[1]
Dasgupta HASI^[3]

Department of Anatomy, Calcutta National Medical College, Kolkata [1], Department of Anatomy, Bankura Sammilani Medical College, Bankura [2], Department of Anatomy, NRS Medical College, Kolkata [3], West Bengal, INDIA.



+ Bhattacharya SANTANU, MD
Assistant Professor
Department of Anatomy
Calcutta National Medical College
Kolkata, 700014
West Bengal, INDIA.
☎ +91 943 3562921
✉ dr.santanubhattacharya@gmail.com

Abstract

In a single male cadaver various neuromuscular variations were found during dissection of the gluteal region. On the left side, double piriformis with dual nerve supply of gluteus maximus were found. The additional supply of the gluteus maximus was from the common peroneal nerve. Sciatic nerve divided into common peroneal and tibial nerves within the pelvis to appear in the gluteal region passing above and below the lower piriformis muscle, respectively. They united to form the sciatic nerve again, which subsequently divided into terminal branches (common peroneal and tibial nerves) in the popliteal fossa. On the right side, sciatic nerve divided into terminal branches in the lower part of gluteal region. So, these nerves may be involved in piriformis syndrome, especially on the left side.

© *Int J Anat Var (IJAV)*. 2013; 6: 136–139.

Key words [piriformis] [gluteus maximus] [sciatic nerve] [piriformis syndrome] [sciatica]

Received June 4th, 2012; accepted March 27th, 2013

Introduction

The gluteus maximus is the largest and the most superficial gluteal muscle. It makes up a large portion of the buttocks arising from the posterior gluteal line of ilium, outer sloping surface of the iliac crest, posterior surface of the lower part of the sacrum, the side of the coccyx. The fibers are directed obliquely downward and laterally. The larger upper and superficial portion of the muscle is inserted to the iliotibial tract and fascia lata. The lower deeper portion ends in a thick tendinous lamina and inserted to the gluteal tuberosity [1]. Gluteus maximus is supplied solely by the inferior gluteal nerve which is formed by the dorsal branches of the ventral rami of the fifth lumbar, first and second sacral nerves. It leaves the pelvis through the greater sciatic foramen, below the piriformis and divides into branches which enter the deep surface of gluteus maximus [1].

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 [1].

Sciatic nerve 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 peroneal nerves at the lower part of the posterior compartment of the thigh. Dorsal divisions of ventral rami of L4-5, S1-2 form the common peroneal component and the ventral divisions of ventral rami of L4-5, S1-3 form the tibial component of the sciatic nerve [1]. Pain caused by a compression or irritation of the sciatic nerve in the lower back is called sciatica [2].

The aim of our study is to describe different neuromuscular variations in the gluteal region and their clinical significances.

Case Report

During routine dissection of gluteal region, different variations were found in a 62-year-old male cadaver in 2011. 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, without damaging any structure. The underlying structures were dissected, examined carefully and photographs were taken.

On the left side it was found that the gluteus maximus was supplied by the inferior gluteal nerve from its deep surface as usual. Two separate piriformis muscles were present – one

superior and the other inferior in position (Figure 1). After proper dissection it was found that the sciatic nerve was divided into common peroneal and tibial nerves within the pelvis. The common peroneal nerve came out between the superior and inferior piriformis muscles but the tibial nerve appeared in the gluteal region below the inferior piriformis muscle (Figure 2). Those two nerves joined with each other in the lower part of the gluteal region and formed the main trunk of the sciatic nerve again. In the upper part of the popliteal fossa the sciatic nerve divided into common peroneal and tibial nerves (Figure 3). An unusual branch of the common peroneal nerve emerged between two piriformis muscles and innervated the gluteus maximus from the deep surface, proximal to inferior gluteal nerve (Figure 4).

Both piriformis muscles arose from the pelvic surface of sacrum. In the gluteal region two completed separated tendons of the superior and inferior piriformis muscles were visible. A narrow tendon was formed by the lower muscle and was inserted to the posterior-superior angle of greater trochanter of femur. The tendon of the upper muscle was inserted to the posterior part of the upper border of greater trochanter.

On the right side there was high division of sciatic nerve as it divided into common peroneal and tibial nerves in the gluteal region after emerging from the lower border of piriformis (Figure 5).

Discussion

Unilateral double gluteus maximus and double piriformis with high division of sciatic nerve were reported by Kirici et al. in 1999. 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 [3]. Arifoglu et al. reported about double superior gemellus and double piriformis along with high division of sciatic nerve



Figure 2. Division of sciatic nerve within the pelvis (left side). (A: sciatic nerve; B: common peroneal nerve; C: tibial nerve; D: origin of two piriformis muscles)

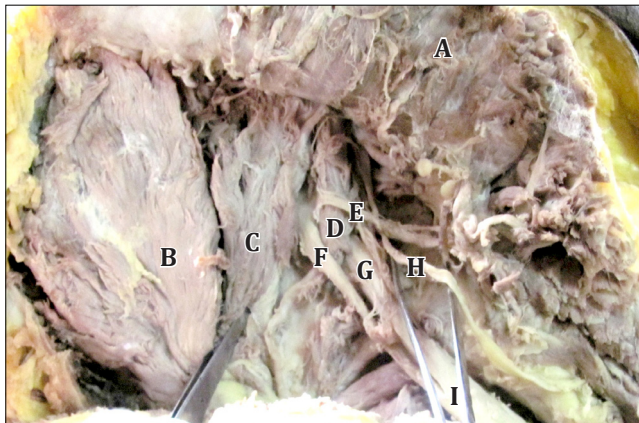


Figure 1. Double piriformis muscles with dual nerve supply of gluteus maximus (left side). (A: gluteus maximus muscle-cut end; B: gluteus medius muscle; C: superior piriformis muscle; D: inferior piriformis muscle; E: extra nerve from common peroneal nerve supplying the gluteus maximus muscle; F: common peroneal nerve; G: tibial nerve; H: inferior gluteal nerve; I: sciatic nerve)

where terminal branches passed between the two piriformis muscles [4]. Khan et al. 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 [5]. Such variations may cause complications during intramuscular injections or surgery in the gluteal region [3, 5].

The current study has similarity with the previously reported cases but to the best of our knowledge dual nerve supply of gluteus maximus and reformation of the sciatic nerve by the union of its terminal branches, is yet to be reported.

Piriformis syndrome is caused by an entrapment of the sciatic nerve in the gluteal region due to myospasm or contracture of either of the piriformis or gemellus superior muscle leading to pain along the back of the thigh, knee and leg with loss of sensation, tingling and numbness in the sole of foot [2, 3, 6]. History of trauma is very important in this syndrome [2, 7]. This syndrome often mimics its notorious



Figure 3. Division of sciatic nerve for the second time within the popliteal fossa (left side). (A: sciatic nerve; B: common peroneal nerve; C: tibial nerve; D: semimembranosus muscle; E: semitendinosus muscle; F: biceps femoris muscle; G: medial head of gastrocnemius; H: lateral head of gastrocnemius)

counterpart sciatica and both of them have almost similar symptoms [7, 8].

Sciatica is directly due to a lumbar disc pressing on the sciatic nerve as it comes out of the intervertebral foramina [7, 8]. Spinal stenosis, trochanteric bursitis, myofascial pain syndrome, pelvic tumor, endometriosis etc. come into the differential diagnoses of the piriformis syndrome [8, 9]. So, medical history and a minute physical examination are helpful in this regard [6, 8].

The management of piriformis syndrome includes analgesic, muscle relaxants, injection of local anesthetic agents, steroid or botulinum toxin into the piriformis muscle [2, 6, 9]. The use of electromyography or computed tomography (CT) can identify the piriformis muscle and a nerve stimulator can be used for sciatic nerve identification [7, 8, 10]. Surgery may be considered when there is involvement of piriformis

in the sciatic nerve entrapment, in which the muscle may be thinned, divided or excised [6–8, 10].

This case report has a contribution in orthopedics, in sports medicine as the piriformis syndrome is a cause of soft tissue problem of the hip, especially among the athletes [9, 11].

Conclusion

In the present study, on the left side both the common peroneal nerve and the additional nerve to gluteus maximus were passing between the two piriformis muscles. So, there was increased chance of entrapment neuropathy. Dual innervations were beneficial for gluteus maximus if there was entrapment of any of the nerves. Moreover, bilateral high divisions of sciatic nerve with unilateral reformation of it by union of common peroneal and tibial nerves, double piriformis (on the left side) were unique findings of this case having paramount importance in orthopedics and sports medicine.

Acknowledgement

We express our gratitude to Prof. Sibani Mazumdar and all other members of the Department of Anatomy, Calcutta National Medical College, Kolkata, for their cordial help. We are also thankful to Dr. Hiranmoy Roy, Assistant Professor, Department of Anatomy, North Bengal Medical College, Darjeeling and Dr. Sarmistha Biswas, Associate Professor, Department of Anatomy, N.R.S. Medical College, Kolkata for their efforts in preparing the manuscript and subsequent publication.

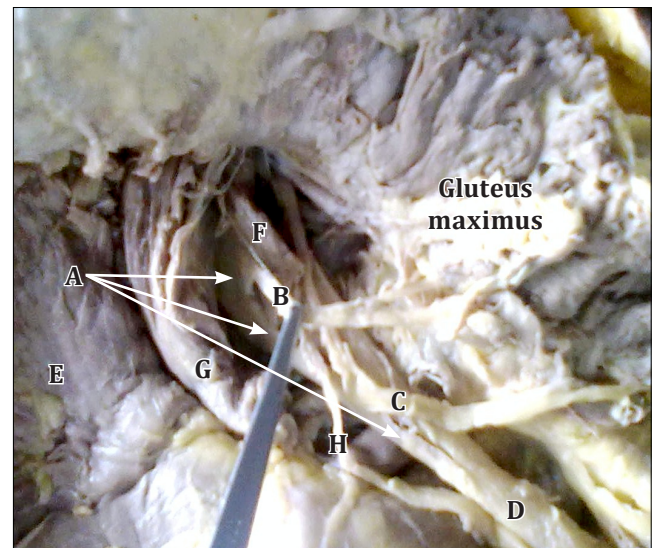


Figure 4. Extra nerve of gluteus maximus arising from the common peroneal nerve (left side). (A: common peroneal nerve; B: extra nerve from common peroneal nerve supplying gluteus maximus muscle; C: inferior gluteal nerve; D: sciatic nerve; E: gluteus medius muscle; F: inferior piriformis muscle; G: superior piriformis muscle; H: posterior femoral cutaneous nerve)

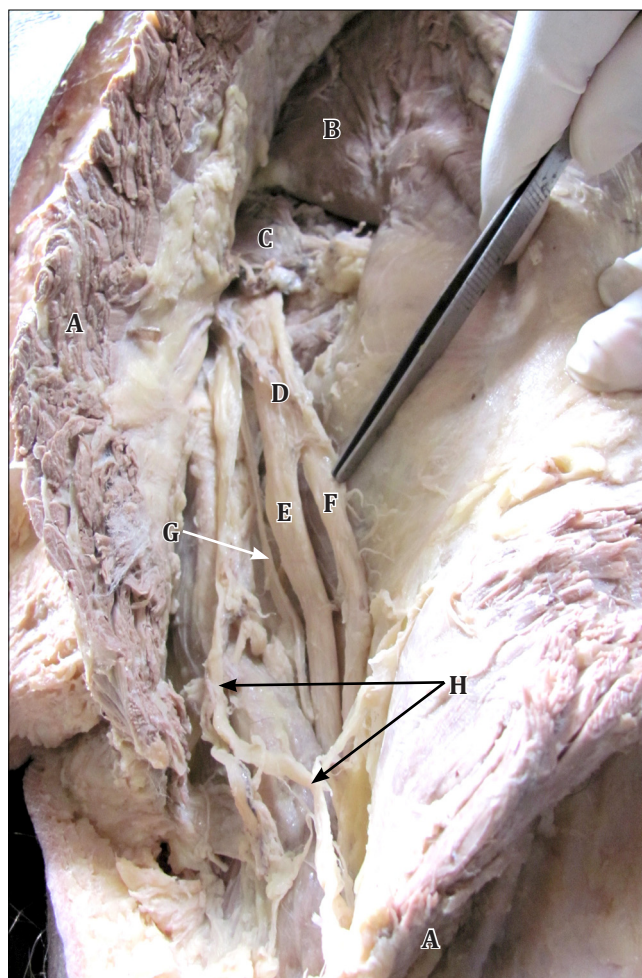


Figure 5. High division of sciatic nerve in the gluteal region (right side). (A: Gluteus maximus muscle –cut end; B: gluteus medius muscle; C: piriformis muscle; D: sciatic nerve; E: tibial nerve; F: common peroneal nerve; G: posterior femoral cutaneous nerve; H: inferior gluteal nerve)

References

- [1] Standring S, Mahadevan V, Collins P, Healy JC, Lee J, Niranjana NS, eds. Gray's Anatomy, The Anatomical Basis of Clinical Practice. 40th Ed., Spain, Philadelphia, Churchill Livingstone Elsevier. 2008; 1336–1338, 1368–1371.
- [2] Porta M. A comparative trial of botulinum toxin type A and methylprednisolone for the treatment of myofascial pain syndrome and pain from chronic muscle spasm. *Pain*. 2000; 85: 101–105.
- [3] Kirici Y, Ozan H. Double gluteus maximus muscle with associated variations in the gluteal region. *Surg Radiol Anat*. 1999; 21: 397–400.
- [4] Arifoglu Y, Surucu HS, Sargon MF, Tanyeli E, Yazar F. Double superior gemellus together with double piriformis and high division of the sciatic nerve. *Surg Radiol Anat*. 1997; 19: 407–408.
- [5] Khan YSK, Khan TK. A rare case of bilateral high division of sciatic nerve (of different types) with unilateral divided piriformis and unusual high origin of genicular branch of common fibular nerve. *Int J of Anat Var (IJAV)*. 2011; 4: 63–66.
- [6] Barton PM. Piriformis syndrome: a rational approach to management. *Pain*. 1991; 47: 345–352.
- [7] Robinson DR. Piriformis syndrome in relation to sciatic pain. *Am J Surg*. 1947; 73: 355–358.
- [8] Pecina M. Contribution to the etiological explanation of the piriformis syndrome. *Acta Anat (Basel)*. 1979; 105: 181–187.
- [9] Hulbert A, Deyle GD. Differential diagnosis and conservative treatment for piriformis syndrome: a review of the literature. *Curr Orthop Pract*. 2009; 20: 313–319.
- [10] Pavai J, Nayak S. A case of bilateral high division of sciatic nerve with a variant inferior gluteal nerve. *Neuroanatomy* 2006; 5: 33–34.
- [11] Melamed H, Hutchison M. Soft tissue problems of the hip in athletes. *Sports Med Arthroscopy Rev*. 2002; 10: 168–175.