

# ANOMALOUS COMMON PERONEAL NERVE SUPPLYING THE GLUTEUS MAXIMUS MUSCLE WITH HIGH DIVISION OF SCIATIC NERVE

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## ABSTRACT

On dissection of a 60-year-old adult male cadaver, a high division of the sciatic nerve was observed on the right side along with an accessory slip of the piriformis. In this case, the common peroneal nerve pierced through and the tibial nerve passed below the accessory slip of the piriformis. Additionally, there was an unusual finding in which the common peroneal nerve was found to innervate the gluteus maximus. This finding is of academic interest and clinical significance as this variation may contribute to clinical conditions such as piriformis syndrome and foot drop with injury to the gluteal region.

**Keywords:** Sciatica, Common peroneal nerve, Gluteus maximus, Inferior gluteal nerve, variations.

## INTRODUCTION

Sciatic nerve, the largest nerve of the body, is derived from the anterior divisions of L4-S3 spinal nerve roots and is nearly 2 cm wide at its origin (Hollinshed, 1958). It divides into two terminal branches, namely the tibial (ventral divisions of ventral rami L4 to S3) and common peroneal nerve (dorsal divisions of ventral rami L4 to S2). The common site of division is at the junction of the middle and lower third of the thigh, near the apex of the popliteal fossa (Stranding, 2005). Numerous variations in the point of division of the Sciatic nerve have been reported in literature with high level divisions within the pelvis in approximately 12% of individuals (Moore and Dalley, 1999). Many of these variations are classified into different types depending on their relationship to the piriformis.

The common peroneal nerve divides into the superficial and deep peroneal nerve at the neck of the fibula. However, anomalous variations in the division pattern of the common peroneal nerve have been described with divisions occurring in the popliteal fossa before reaching the fibular head (Moore and Dalley, 1999). Standard anatomy textbooks have described that the common peroneal nerve innervates the short head of biceps and anterolateral compartment of the leg after dividing into the superficial and deep peroneal nerve (Stranding et al., 2005; Moore and Dalley, 1999). This study describes an unusual case of unilateral high division of the sciatic nerve together with the common peroneal nerve supplying the gluteus maximus muscle.

## CASE REPORT

During routine cadaveric dissection of the lower limb in the department of anatomy, a high division of the sciatic nerve was found in the pelvis. The cadaveric dissection was carried out bilaterally in the lower limb of a 60-year-old male. A unilateral high bifurcation of the sciatic nerve was noticed in the right leg where the sciatic nerve terminated in the gluteal region by the accessory slip of the piriformis

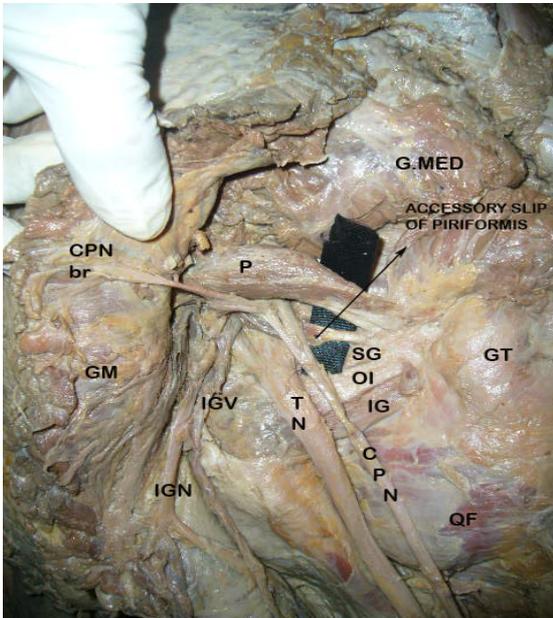
muscle. It bifurcated into a larger anteromedial or tibial component which passed below and a smaller posterolateral or peroneal component passing through the accessory slip of piriformis muscle.

Further, in the same cadaver, an anomalous finding was observed in the innervation of the right common peroneal nerve. A thick muscular branch emerged from the medial aspect of the

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right common peroneal nerve in the gluteal region. This variant branch supplied the gluteus maximus muscle. In addition, the gluteus maximus muscle was also innervated

by the inferior gluteal nerve which traversed the greater sciatic foramen just inferior to the piriformis muscle (Fig 1).



**Figure 1:** Photograph showing the high division of the sciatic nerve by accessory slip of piriformis and a muscular branch from the common peroneal nerve to the gluteus maximus muscle (CPN: Common peroneal nerve; TN: Tibial nerve; IG N: Inferior gluteal nerve; CPN br: muscular branch from common peroneal nerve; IG V: Inferior gluteal vessel; GM: Gluteus maximus; G.Med: Gluteus medius; SG: Superior Gamellus; OI: Obturator Internus; IG: Inferior Gamellus; QF: Quadratus Femoris; GT: Greater Trochanter)

## DISCUSSION

A number of variations in the course and distribution of the sciatic nerve have been reported in literature. The deep gluteal region is often encountered while performing investigations such as imaging techniques or surgeries such as total hip replacement (Smoll, 2010). Beaton and Anson have developed a classification system known as the Beaton and Anson classification for the variations present in the sciatic nerve and piriformis (Beaton and Anson, 1937; Beaton 1938). Their classification is as follows:

Type 1: Undivided nerve below undivided muscle

Type 2: Divisions of nerve between and below undivided muscle

Type 3: Divisions above and below undivided muscle

Type 4: Undivided nerve between heads

Type 5: Divisions between and above heads

Type 6: Undivided nerve above undivided muscle

In this case report, the variation observed was a type 3 classification where the common peroneal nerve passed through the accessory slip of the piriformis muscle and the tibial nerve passed beneath the piriformis. In about 10%

of all cases, the two parts of the sciatic nerve (peroneal and tibial portion) remain separate, and in such cases the peroneal part is usually found to pierce the piriformis (Morris, 1953).

The present case shows the high division of sciatic nerve with the peroneal part piercing the accessory slip of piriformis. This may lead to piriformis syndrome; a clinical entity characterized by sciatica caused by the compression of sciatic nerve by the piriformis and could be one of the main reasons for undiagnosed non discogenic pain in the buttock, forming an implication for clinical practice. Though the accessory slip of the piriformis muscle is a common anatomical variant, it must be noted that the entrapment neuropathy occurring as a result of peroneal nerve is rare (Smoll, 2010).

Knowledge of the high division of sciatic nerve is important for clinicians while treating patients. The most common cause of serious sciatic nerve injury is iatrogenic. The nerve may be damaged by misplaced therapeutic injection into the gluteus maximus (Uluutku and Kurtoglu, 1999). Also, injury to the sciatic nerve injury may be caused by sharp injury, burning from bone cement, traction of the

instruments, manipulation of the hip, inadvertent lengthening of the femur, or haematoma surrounding the nerve (SharadKumar et al., 2013). Another important consequence of the high division of the sciatic nerve is that it can result in failure of sciatic nerve block while performing popliteal block anaesthesia (Prakash et al., 2010). Further, injury to the nerve may occur during surgical operations to the posterior hip. For some reasons, possibly anatomical, instances of foot drop have been reported in literature caused by intragluteal injections (Sobel et al., 1997).

It is a rare variation that gluteus maximus is supplied by a branch from the common peroneal nerve. Uluotku and Kurtoglu (1999) stated that out of 50 cases, only in one case the inferior gluteal nerve and common peroneal nerve was located in the upper margin of the piriformis muscle. In that case, a branch arising from the inferior gluteal nerve contributed to the posterior femoral cutaneous nerve. Moreover, another branch was found to arise from the posterior femoral cutaneous nerve that reached to the deep surface of the gluteus maximus muscle (Uluotku and

Kurtoglu, 1999). In the present study, no connection was found between the inferior gluteal nerve, common peroneal nerve and posterior femoral cutaneous nerve. Since the gluteus maximus is innervated by common peroneal nerve, the muscle may go for atrophy in injury to the sciatic nerve. These anomalies of the gluteal region are not only of academic interest but may be clinically important for carrying out various procedures including investigations (eg. electro-diagnosis involving Electromyography and Nerve Conduction Study), injections like Nerve blocks in anaesthesia) and surgery (e.g. Decompression for entrapments) (Kirici et al., 1999; Sharadkumar et al 2013).

Anatomical knowledge about the high division of the sciatic nerve is important from a diagnostic and therapeutic point of view. Other than the high division of the sciatic nerve, it must be noted that the gluteus maximus had a dual innervation, which increases the chances of entrapment neuropathy. These two findings are unique features found in this case and are of vital importance in orthopaedic management of patients.

## REFERENCES

1. Beaton LE, Anson BJ. 1937. The relation of the sciatic nerve and its subdivisions to the piriformis muscle. *Anat Rec* 70: 1–5.
2. Beaton LE. 1938. The sciatic nerve and piriform muscle: Their interrelation a possible cause of coccygodynia. *J Bone Joint Surgery Am* 20:686–688.
3. Hollinshead HW. 1958. *Anatomy for surgeons. The back & limbs.* Harper, Philadelphia 825-83:614-615,823-831.
4. Kirici Y, Yazar F, Ozan H. 1999. The neurovascular and muscular anomalies of the gluteal region: an atypical pudendal nerve. *Surg Radiol Anat* 21: 393-6
5. Moore KL, Dalley AF. 2014. *Clinically Oriented Anatomy.* Lippincott Williams And Wilkins, Baltimore. p575, 587-93.
6. Morris H. 1953. *Human Anatomy. A Complete Systemic treatise.* Blakiston, Philadelphia and Toronto. p573.1166-71.
7. Prakash, A K Bharadwaj, M N Devi, N S sridevi, P K Rao, G Singh. 2010. Sciatic nerve division; a cadaver study in the indian population and review of literature. *Singapore Med Journal* 51(9) :721
8. Sharadkumar PS, Shaguphta TS, Lele SD, Shaheen R, Menon SR, Uma R. 2013. A case report on the variant low level division of the sciatic nerve at knee level. *IJRRPAS* 3: 118-124
9. Smoll NR. 2010. Variations of the piriformis and sciatic nerve with clinical consequence: a review. *Clin Anat* 23: 8-17
10. Sobel E, Huang EY, Wieting CB. 1997. Drop foot as a complication of acupuncture injury and intragluteal injection. *J Am Podiatr Med Assoc* 87: 52-9
11. Stranding S. 2005. *Gray's Anatomy. The anatomical basis of clinical practice.* Elsevier Churchill Livinstone, Spain. p1384, 1427-8.

12. Uluutku MH, Kurtoglu Z. 1999. Variations of nerves located in the deep gluteal region. *Okajimas Folia Anat Jpn* 76: 273-6.