

Common peroneal nerve entrapment with the communication between inferior gluteal nerve and common peroneal nerve

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Abstract

Sciatic nerve divides into tibial nerve and common peroneal nerve at the level of superior angle of popliteal fossa and variations in its branching pattern are common. The most common nerve entrapment syndrome in the lower limbs is common peroneal nerve entrapment at fibular head. Invariably it can also be trapped in gluteal region due to split piriformis muscle which compresses sciatic nerve as whole or its division such as common peroneal nerve. In this case report, we describe a case of high division of sciatic nerve along with duplicated piriformis associated with a communicating branch between inferior gluteal nerve and common peroneal nerve. Such an anatomical variation of common peroneal nerve with the communicating nerve is discussed with its embryological basis.

Key words: Common peroneal nerve, inferior gluteal nerve, nerve entrapment, piriformis, sciatic nerve

INTRODUCTION

The sciatic nerve is formed in the pelvis by anterior divisions of fourth lumbar to third sacral (L4-S3) spinal nerve roots. It leaves the pelvis through the greater sciatic foramen below the piriformis, passes along the back of thigh, and divides into tibial and common peroneal nerve usually at the level of superior angle of

popliteal fossa proximal to knee. The tibial component is from the ventral divisions of ventral rami of L4 to S3, and common peroneal component is from the dorsal divisions of ventral rami of L4 to S2. High division of sciatic nerve is sometimes associated with double piriformis, and the piriformis is divided by the sciatic nerve or the components of sciatic nerve into upper and lower piriformis (Guvencer, *et al.*, 2008). Incidence of anatomical variation involving piriformis and sciatic nerve is 15–30% (Pokorny, *et al.*, 2006). Sciatic nerve usually bifurcates at the level of apex of popliteal fossa but in few individuals, it bifurcates at the level of pelvis in which case it is important as this might lead to piriformis syndrome which is caused due to compression of common peroneal

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nerve by piriformis muscle. Common peroneal nerve compression leads to foot drop. Many cadaveric studies have extensively studied the sciatic nerve, its division, and its relation to piriformis (Guvencer, *et al.*, 2008; Pokorny, *et al.*, 2006; Adibatti, 2014; and Le Corroller, *et al.*, 2011) whereas communication between inferior gluteal nerve and common peroneal nerve is rare and hence the present case is reported.

CASE REPORT

During anatomical dissection of a 60-year-old male cadaver, a variation was found in the gluteal region. The gluteus maximus was retracted to explore the muscles and other structures beneath it. An incision was made in the middle of gluteus maximus, and the medial and lateral parts of the muscle were reflected.

On reflecting the lateral part of the muscle to its insertion, greater trochanter was seen. On reflecting the medial part of the muscle, posterior cutaneous nerve of thigh and ischial tuberosity was uncovered and then inferior gluteal nerve was found entering the lower part of gluteus maximus and superior gluteal nerve found entering upper part of this muscle. The gluteus maximus was detached from sacrotuberous ligament. The fascia over piriformis was removed. Following proper exposure of the pelvis, high division of sciatic nerve was evident, common peroneal nerve was found to pass through the substance of piriformis muscle, and it divided the muscle into upper and lower piriformis. Tibial nerve was found passing below the piriformis. On careful identification of every branch originating from sciatic nerve, a communicating nerve was found between common peroneal nerve and the inferior gluteal nerve [Figure 1]. This communicating nerve is found below the upper piriformis and found to lie in the substance of lower piriformis.

The contralateral side of the gluteal region was dissected and there was similar high division of sciatic nerve and double piriformis along with communication between common peroneal nerve and inferior gluteal nerve. Measurements taken are reported in Table 1.

The further course of common peroneal nerve and tibial nerve on both sides was normal.

DISCUSSION

In this case report, exploration of gluteal region shows double piriformis and high division of sciatic nerve. Sciatic nerve divided into tibial and common peroneal components at higher level in the pelvis. In a previous study, variation in the branching pattern of sciatic nerve, it was observed that the incidence of division of sciatic

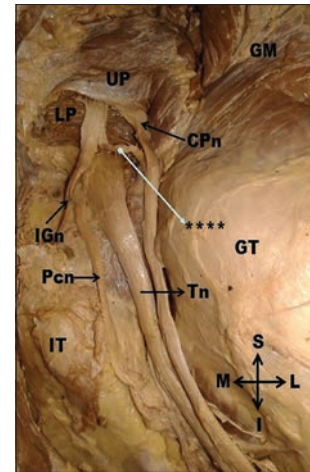


Figure 1: Right gluteal region. Posterior view showing higher division of sciatic nerve into tibial nerve and common peroneal nerve, common peroneal nerve entrapment and communicating branch between inferior gluteal nerve and common peroneal nerve. GM: Gluteus medius muscle; UP: Upper piriformis muscle; LP: Lower piriformis muscle; CPn: Common peroneal nerve; IGn: Inferior gluteal nerve; Pcn: Posterior cutaneous nerve of thigh; Tn: Tibial nerve; GT: Greater trochanter; IT: Ischial tuberosity; ****: Communicating branch between inferior gluteal nerve and common peroneal nerve; S: Superior; L: Lateral; M: Medial; I: Inferior

Table 1: Measurements of piriformis muscle and the communicating nerve in the present case report

Muscle belly	Right side	Left side
Upper piriformis (cm)		
Length	9.3	9.7
Breadth	3.3	3.6
Length of the muscle from musculotendinous junction to insertion	1.1	1.3
Lower piriformis (cm)		
Length	9.2	9.3
Breadth	2.5	1.7
Length of the muscle from musculotendinous junction to insertion	3.2	3.3
Diameter of the tendon at insertion (cm)	3.5	3.0
Communicating nerve (mm)		
Length	7.5	7.5

nerve at the apex of popliteal fossa is higher compared to high division at pelvis (Adibatti, 2014).

In the present case, the common peroneal component is found to pass through the piriformis muscle and tibial nerve passes below piriformis muscle. The part of muscle which is present above common peroneal nerve is upper piriformis and below the common peroneal nerve is lower piriformis. Many classifications are reported in the branching pattern of sciatic nerve in relation to piriformis. In other studies, each type was observed as a separate entity and reported but not classified. According to Beaton and Anson's classification, type I is unsplit sciatic nerve and passes below single piriformis muscle. Type II is one branch above piriformis and the other passes through piriformis muscle. Type III is unsplit nerve above piriformis muscle. Type IV is one branch passing through piriformis and the other below the muscle.

Type IV accounts to 11–20% which is associated with high degree of compression of common peroneal nerve and piriformis syndrome. Type V is unsplit nerve passes through piriformis muscle. Type VI is one branch above and one branch below the muscle (Pokorny, *et al.*, 2006).

In the present case, there is high division of sciatic nerve and duplication of piriformis that is classified under Type IV according to Beaton and Anson. However, this classification has not taken into account the existence of communication between the nerves in the back of thigh, which could be due to its rarity. Although we classify this variation under Type IV, this could also be classified as a new type (Type VII) because of the existence of communication between inferior gluteal nerve and common peroneal nerve.

Gabrielli *et al.* classified into three types (Babinski, *et al.*, 2003) and the present case can be classified under Type I, without taking into account of the communication between common peroneal nerve and inferior gluteal nerve. As the measurements taken [Table 1] suggests this belong to Type II (Windisch, *et al.*, 2007) as per the morphology of piriformis, lower piriformis muscle showed a greater length from musculotendinous junction to insertion compared to upper piriformis muscle. Many studies are available wherein sciatic nerve was extensively studied for its level of exit and its branching pattern, and the observation of level of bifurcation contributing to clinical implications such as sciatic neuropathy leading to neurological defects. In few other studies, arterial supply to sciatic nerve, new approaches to sciatic nerve block and formation of it below piriformis, was reported (Guvencer *et al.*, 2008; Le corroller *et al.*, 2011). However, there are few studies regarding communication of sciatic nerve and between its components (Jacomo *et al.*, 2014).

In this cadaver, a communicating nerve was found between inferior gluteal nerve and common peroneal nerve and this variation is found along with double piriformis and high division of sciatic nerve bilaterally. Common peroneal nerve is usually compressed at the level of fibro-osseous tunnel formed by fibular head and peroneus longus tendon (Maalla, *et al.*, 2013). However, in this case, common peroneal nerve is compressed between upper and lower piriformis muscle, there is a high chance of piriformis syndrome leading to foot drop. Piriformis syndrome can be divided into two types; primary and secondary. Primary is due to anatomical causes, secondary due to traumatic causes or ischemia (Yadav, *et al.*, 2010). Previous studies are available wherein piriformis syndrome is extensively studied and concluded that sciatica can be due to compression of common peroneal nerve by piriformis muscle; hence, this subserves the clinical importance of observation of level of bifurcation of

sciatic nerve and also the existences of double piriformis in such cases need to be studied.

Compression of sciatic nerve causes numbness, tingling, and radiating pain from gluteal region to foot and toes. Thus, bifurcation of sciatic nerve has its own clinical importance, and application of ultrasound-guided nerve block is must if this nerve is to be blocked. Sciatic nerve injury can be due to improper gluteal injections, excessive compression of nerve, compression during fractures around hip, posterior dislocation of hip, and surgeries with implants (Wolf, *et al.*, 2014).

Lower limb bud is invaded by somatic mesoderm by 5th week and two muscle masses namely dorsal and ventral develops along axial mesenchymal column. Piriformis muscle develops from dorsal muscle mass (Windisch, *et al.*, 2007). Duplicated piriformis muscle can be explained by persistence of undifferentiated mesenchymal cells or by two origin sites of piriformis muscle formed by separate condensations of mesenchyme (Yadav, *et al.*, 2010).

Communications between the nerves of lower limb are less common as compared to the upper limb. In the present case, there is communication between inferior gluteal nerve and common peroneal nerve. We hypothesize that the existence of this communication could be due to compression of common peroneal nerve between the duplicated piriformis muscle fibers during fetal life. Common peroneal nerve is from the dorsal divisions of ventral rami of L4 to S2, and the inferior gluteal nerve arises from the dorsal divisions of ventral rami of L5, S1, and S2. The communicating branch derived from inferior gluteal nerve carrying fibers of L5, S1, and S2 joined the common peroneal nerve below piriformis probably to compensate for the fibers which could have been compressed between the upper piriformis and lower piriformis in the fetal life. Although the common peroneal nerve could have been compressed between the piriformis in the adult life, the person would have been asymptomatic because of the established significant communicating branch compensating for the compressed fibers.

A rare anatomical variation in which a communicating nerve is found between inferior gluteal nerve and common peroneal nerve along with double piriformis and high division of sciatic nerve was found bilaterally. Hence, high division of sciatic nerve, its relation with piriformis and presence of communicating nerve has clinical significance.

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Conflicts of Interest

There are no conflicts of interest.

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