Case Report:
Multiple Variations of the Nerves of Gluteal Region and their Clinical Implications

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Abstract: Knowledge of variations of nerves of gluteal region is important for clinicians administering intramuscular injections, for orthopedic surgeons dealing with the hip surgeries and possibly for physiotherapists managing the painful conditions and paralysis of this region. We report multiple variations of the nerves of gluteal region through this article. In the current case, the sciatic nerve was absent. The common peroneal and tibial nerves arose from sacral plexus and reached the gluteal region through greater sciatic foramen above and below piriformis respectively. The common peroneal nerve gave a muscular branch to the gluteus maximus. The inferior gluteal nerve and posterior cutaneous nerve of the thigh arose from a common trunk. The common trunk was formed by three roots. Upper and middle roots arose from sacral plexus and entered gluteal region through greater sciatic foramen respectively above and below piriformis. The lower root arose from the pudendal nerve and joined the common trunk. We discuss the clinical implications of the variations.

Key Words: Sciatic nerve, Gluteal region, Tibial nerve, Piriformis syndrome, Buttock, Peroneal nerve

Introduction:
Variations in the course and distribution of the nerves of gluteal region are not uncommon. Knowledge of their variant course and distribution can minimize their injuries during various surgical procedures in this region. The sciatic nerve is a branch of the sacral plexus. It leaves the pelvis through greater sciatic foramen, below the piriformis muscle. In the gluteal region, it runs under cover of gluteus maximus muscle. It terminates by dividing into tibial and common peroneal nerves at the upper angle of popliteal fossa. Some of its reported variations include its early division either in the pelvis itself, in the gluteal region or in the upper part of the thigh.[1] The inferior gluteal, pudendal and posterior cutaneous nerve of the thigh are also branches of the sacral plexus. All the three nerves enter the gluteal region by passing through the greater sciatic foramen below the piriformis. Variations of these three nerves are rare compared to the incidence of variations of the sciatic nerve. Inferior gluteal nerve may pass through piriformis instead of passing below it.[2] In some cases, the pudendal nerve pierces the sacrotuberous ligament in its course.[3] Variations in the course and distribution of posterior cutaneous nerve of the thigh are very rare. We present some unique variations of nerves of gluteal region and discuss about their clinical importance in this article.

Case Report
During dissection classes for medical undergraduates, we observed multiple variations of the nerves of right gluteal region in an adult male cadaver aged approximately 70 years. The following variations were noted.

1. Sciatic nerve was absent. The common peroneal nerve came to the gluteal region through greater sciatic foramen above the piriformis and the tibial nerve came to the gluteal region through greater sciatic foramen below the piriformis.
2. The common peroneal nerve gave a muscular branch to the gluteus maximus muscle. This branch arose from common peroneal nerve at the greater sciatic foramen and entered the deeper surface of the muscle.
3. The inferior gluteal nerve and the posterior cutaneous nerve of the thigh arose from a common trunk.
4. The common trunk was formed by union of three roots. Upper root of the common trunk arose from the sacral plexus and passed through the greater sciatic foramen above the piriformis to join the common trunk; the middle root arose from the sacral plexus and passed out through the greater sciatic foramen below piriformis to join the common trunk;
the lower root arose from the pudendal nerve and joined the common trunk. The common trunk was about 2 inches long and was situated posterior to the tibial nerve. The distribution of distal parts of tibial, common peroneal, posterior cutaneous nerve and inferior gluteal nerves did not have any variations. All the above said variations are show in in figures 1, 2 and 3.

Fig. 1. Dissection of the right gluteal region. Gluteus maximus muscle (GM) has been reflected to show the variations. GMD, gluteus medius; P, piriformis; STL, sacrotuberous ligament; TN, tibial nerve; CPN, common peroneal nerve; CT, common trunk for inferior gluteal nerve (IGN) and posterior cutaneous nerve of the thigh (PCN); NGM, nerve to gluteus maximus from common peroneal nerve; M, medial; L, lateral; I, inferior; S, superior.

Fig. 2. Closer view of variant nerves of gluteal region. Gluteus maximus muscle (GM) has been reflected to show the variations. GMD, gluteus medius; P, piriformis; TN, tibial nerve; CPN, common peroneal nerve; CT, common trunk for inferior gluteal nerve (IGN) and posterior cutaneous nerve of the thigh (PCN); 3R, three roots of the common trunk; PN, pudendal nerve; NGM, nerve to gluteus maximus from common peroneal nerve; M, medial; L, lateral; I, inferior; S, superior.

Fig. 3. Very close view of variant nerves of gluteal region. Gluteus maximus muscle (GM) has been reflected to show the variations. GMD, gluteus medius; P, piriformis; STL, sacrotuberous ligament; TN, tibial nerve; CPN, common peroneal nerve; CT, common trunk for inferior gluteal nerve (IGN) and posterior cutaneous nerve of the thigh (PCN); UR, upper root of common trunk; MR, middle root of common trunk; LR, lower root of common trunk; PN, pudendal nerve; NGM, nerve to gluteus maximus from common peroneal nerve; M, medial; L, lateral; I, inferior; S, superior.

Discussion:
Sciatic nerve is known to present variations in the level of its termination. It might divide into tibial and common peroneal nerves in the pelvis, in the gluteal region, in the upper part of the thigh or at the upper part of the popliteal fossa. When it divides in the pelvis, the common peroneal nerve passes either above piriformis muscle or pierces it. Rarely the sciatic nerve is formed by the union of three roots in the gluteal region.[4] Sciatic nerve may terminate by giving three branches instead of the normal two branches.[5] In the present case, the sciatic nerve was totally absent. The tibial and common peroneal nerves arose directly from the sacral plexus and emerged out of the greater sciatic foramen. At its exit from the greater sciatic foramen, the common peroneal nerve gave a muscular branch to the gluteus maximus muscle. In our literature survey, we could find only one report where the common peroneal nerve gave a muscular branch to gluteus maximus.[6] In that case, the common peroneal nerve had medial and lateral trunks and they pierced the piriformis muscle. The medial trunk supplied the gluteus maximus; inferior gluteal nerve was absent. In our case the common peroneal nerve did not divide into two trunks and it did not pierce the piriformis. Inferior gluteal nerve was present and it supplied gluteus maximus. Thus gluteus maximus had a duel innervation. Knowledge of the current variation of the sciatic nerve is important in surgical treatment of the piriformis syndrome.[7] Iatrogenic injuries of the muscular branch of common peroneal nerve in our case might lead to weakness of the gluteus maximus muscle. Variations of inferior gluteal nerve and posterior cutaneous nerve are extremely rare. Inferior gluteal nerve may be totally absent in very rare cases. [6] A case of high division of sciatic nerve with the formation of inferior gluteal nerve by two roots has been reported.[7] Posterior cutaneous nerve has a constant course and distribution pattern. There is one case report on its communication with the sciatic nerve.[9] In the current case, the posterior cutaneous nerve of thigh and inferior gluteal nerve arose from a common trunk formed by three roots. This is the first report on such a common trunk. There is ample chance for the compression of the roots of this common trunk when there is a hypertrophy of the piriformis. Knowledge of the common trunk and origin of the two
nerves from the common trunk is useful in posterior approach to the hip joint.[10] While administering intramuscular injections, if the common trunk is involved, there might be altered or loss of sensation over the distribution of posterior cutaneous nerve in addition to weakness of the gluteus maximus muscle.

**Conclusion:**
The current case is unique in having a common trunk for posterior cutaneous nerve of thigh and inferior gluteal nerve, formed by three roots. Muscular branch from common peroneal nerve to the gluteus maximus is also extremely rare. Knowledge of these combined variations of the nerves may be extremely useful for clinicians and orthopedic surgeons in avoiding iatrogenic injuries to these nerves.

**References**