Case Report:
Multiple Anomalous Variations in the Gluteal Region.

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Abstract: We report a case of multiple anatomical variations in the right gluteal region of a 60 years old male cadaver. In the present case lower formation of the sciatic nerve was observed with the peroneal component emerging between the two parts of piriformis along with the inferior gluteal nerve and the tibial component arising inferior to it accompanied by the posterior femoral cutaneous nerve. At the lower border of piriformis, both the tibial and common peroneal components united and descended as a single trunk and further had a normal termination in the popliteal fossa. The posterior femoral cutaneous nerve (PFCN) also presented variations by forming a communicating plexus with the inferior gluteal nerve and terminated in the gluteal region. The variations in the formation of sciatic nerve, the anomalous communication and termination of the PFCN are very important for surgeons and clinicians while planning the treatment regime. Anaesthetists should also be aware of these variations during nerve blocks.

Key Words: Sciatic nerve, Tibial nerve, Common peroneal nerve, Piriformis, Posterior femoral cutaneous nerve, Inferior gluteal nerve.

Introduction:
The sciatic nerve (L4-S3), a branch of the sacral plexus and the largest nerve in the body, is normally formed in the pelvis. It consists of two parts, tibial and fibular, which are initially bound together and then separate at a variable level into two nerves. The nerve traverses below the piriformis; the fibular component, however, may emerge superior to it, in which case it remains separate. The nerve innervates the posterior compartment of the thigh and all compartments of the lower leg and foot.(1)

The posterior femoral cutaneous nerve, consisting exclusively of cutaneous nerve fibers (S1-3) passes inferior to the piriformis, descends deep to the gluteus maximus with the inferior gluteal artery and continues to the middle of the posterior thigh, where it pierces the fascia, and ultimately reaches the calf,(1) The present case reports an unusual lower formation of the sciatic nerve in the gluteal region, an abnormal communication between the posterior femoral cutaneous nerve and the inferior gluteal nerve and their relationship to the piriformis. These findings are rare and are not reported in the available literature.

Case Report
During routine dissection for undergraduate students in the department of Anatomy, Kasturba Medical College, Manipal, multiple variations were observed unilaterally in the right gluteal region of a 60-year-old male cadaver. In the present case, lower formation of the sciatic nerve was observed. The peroneal component was emerging between the two parts of piriformis. This was accompanied by the inferior gluteal nerve. The tibial component of the sciatic nerve along with the posterior femoral cutaneous nerve was arising inferior to piriformis. At the lower border of piriformis, both the components of the sciatic nerve united and descended as a single trunk (Figure 1). The nerve had a normal course and finally terminated in the popliteal fossa by dividing into tibial and common peroneal nerves (Figure 2). The posterior femoral cutaneous nerve (PFCN) also presented variations by forming a communicating plexus with the inferior gluteal nerve and terminated in the gluteal region after providing the gluteal and perineal branches (Figure 1). Further the skin of
the thigh which is normally innervated by the PFCN was found to be supplied by numerous cutaneous branches arising from the sciatic nerve. No other variations were observed.

**Figure 1:** Showing lower formation of the sciatic nerve and anomalous communication between the posterior femoral cutaneous and inferior gluteal nerves in the gluteal region. The peroneal component (CP) emerging between the two parts of piriformis (PM) accompanied by the inferior gluteal nerve (IGN). The tibial component (T) along with the posterior femoral cutaneous nerve (PFCN) arising inferior to piriformes. At the lower border of piriformes, both the components of the sciatic nerve (SN) united and descended as a single trunk and had a normal termination in the popliteal fossa. Arrow denotes the PFCN forming a communicating plexus with the inferior gluteal nerve and terminating in the gluteal region. G.Max- Gluteus maximus, G.Med- Gluteus medius, SGA-Superior gluteal artery, IGA-Inferior gluteal artery, GT- Greater trochanter.

**Discussion**

Sciatic nerve is normally formed in the pelvis when the large dorsal divisions (common peroneal component: L4, L5, S1, S2) combines with the ventral divisions (tibial component: L4, L5, S1, S2, S3). (1) Contrary to the above, Gurnal et al had reported the lower formation of the sciatic nerve in the gluteal region instead of the pelvic region. All the components of the sciatic nerve i.e., Lumbosacral trunk (L4, L5, S1, S2 and S3) were observed to remain separate up to the lower part of the gluteal region.(2) The present case also showed a lower formation of the sciatic nerve.

**Figure 2:** Showing the normal course and termination of the sciatic nerve in the popliteal fossa. SN- Sciatic nerve, TN- Tibial nerve, CPN- Common peroneal nerve, ST & SM- Semitendinosus & semimembranosus, BF- Biceps femoris. G. Max- Gluteus maximus, G. Med- Gluteus medius. White arrows denote tibial and common peroneal components of the SN uniting inferior to piriformis.
The two parts of the sciatic nerve (tibial and common peroneal) develop separately in early embryonic stage and maintain their individual identity throughout their extent, even though joined together to form a single nerve trunk by a common connective tissue sheath.(3) The variations at the level where common connective tissue wrapping ceases and branching begins, has been highlighted by a number of studies. (4-7) The present case reveals that the level where the common connective tissue wrapping for sciatic nerve commences is also variable, as indicated by the presence of separate components of the sciatic nerve up to the lower gluteal region.

During the sciatic nerve block, the local anaesthetic medication is infiltrated into the connective sheath around the nerve. But if the sciatic nerve is present as separately sheathed bundles until the lower gluteal level, then a complete nerve blockage may not be possible. This condition, if present, may lead to the failure of sciatic nerve block even after multiple punctures and attempts.(2) The usual description of passage of the entire nerve trunk, inferior to the piriformis, is observed in 80 to 90% of cases.(2) The incidence of sciatic nerve trunk division before its entry into the gluteal region and its variable relation with piriformis was observed by Pokorny et al in 20.9%, (4) Ugrenovic et al in 4% (5) and Gabrielli et al in 13.7% of cases.(6) When the nerve division was present in the pelvis, the common peroneal component of the nerve pierced the piriformis muscle in 2.5% cases and passed above the piriformis in 1.5% of cases.(4,5,7) In the present case too, the common peroneal component descended into the gluteal region by passing between the two heads of piriformes, thus emphasizing the existence of intimate but variable relationship the sciatic nerve and its components has with the piriformis muscle.

Interestingly, the nerve was also accompanied by the inferior gluteal nerve. The tibial division passing inferior to piriformis was escorted by the posterior femoral cutaneous nerve. The nerves and vessels passing between the two heads of piriformes may get compressed if the muscle hypertrophies, and may show different symptoms, similar to sciatica i.e., “piriformis syndrome”.(7) In the past, authors have reported the communication between the posterior femoral cutaneous nerve and sciatic nerve.(8) However in the present case, PFCN was seen to form a communicating plexus with some of the twigs of the inferior gluteal nerve. These findings have not been reported so far. Therefore it could be postulated that, in course of development some of the sensory or proprioceptive fibers of PFCN arising from dorsal division of the ventral rami of S1and S2 carried via the inferior gluteal nerve (which is otherwise a motor nerve) might have later joined with the remaining fibers from the ventral division S2 and S3 arising separately, thereby forming a communicating plexus. The PFCN after providing the gluteal and perineal branches terminated in the gluteal region without providing any cutaneous fibers to the back of the thigh. The sensory innervation of the back of the thigh was furnished by the sciatic nerve. This has to be further investigated by immunohistochemistry in order to characterize the specific nerve fibers in order to describe its functional anatomy. Injury to the PFCN by direct trauma is unusual without accompanying damage to the sciatic nerve as it lies close to the latter. As a result, there have been very few reports of isolated PFCN neuropathy. Isolated PFCN neuropathy may occur due to nerve compression during hematoma or tumor formation in the presacral regions, prolonged bicycling and falls on the buttock. PFCN neuropathy can also result from direct injury secondary to intragluteal injection.(9)

Variations of the PFCN should be borne in mind by the surgeons while utilizing the inferior gluteal perforator flaps for breast reconstruction. This is because; the loss of sensations in the inferior buttock, posterior thigh, and popliteal sensibility is a frequent sequel of harvesting the free inferior gluteal musculocutaneous flap.(8) The variations in the formation of sciatic nerve, the anomalous communication of the PFCN with the inferior gluteal nerve and their relationship to the piriformis are very important for surgeons, as this is an area of frequent surgical manipulation like hip arthroplasty, gluteoplasty, piriformis tendon release, sciatic neurolysis etc. Additionally the failed sciatic nerve block in anesthesia, nerve injury during posterior hip operations and deep intramuscular injection hazards could also be avoided.

References