

CASE REPORT

A rare case of communicating branch between the posterior femoral cutaneous and the sciatic nerves

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Abstract

During routine dissection of a 75-year-old male cadaver, we observed a communicating branch between the posterior femoral cutaneous nerve and the sciatic nerve. The connection was 11 cm below the infrapiriform foramen and was 3 cm long. Excluding this communicating branch, the origin, course and distribution of the posterior femoral cutaneous nerve showed no variation. The other branches of the sacral plexus were as usual.

Keywords: posterior femoral cutaneous nerve, sciatic nerve, communicating branch.

Introduction

The posterior femoral cutaneous nerve (PFCN) arises from the ventral rami of first three or four sacral spinal nerves (S1–S3/S4), consists exclusively of cutaneous nerve fibers and may exist from one to three nerves. Additional neural contributions have been documented as high as the fourth lumbar level to as low as the fourth sacral level. It issues from the pelvis through the greater sciatic foramen below the piriformis. It then descends beneath the gluteus maximus with the inferior gluteal artery. After reaching the subgluteal area, the PFCN gives rise to the inferior cluneal (S1–S2) and perineal (S2–S3) branches. The inferior cluneal branch provides cutaneous innervation to the inferior buttock whereas the perineal branch innervates the lateral perineum, the proximal medial thigh, the posterolateral aspect of the scrotum/labium majus, and a portion of the penis/clitoris. Then the PFCN runs down the back of the thigh beneath the fascia lata, and over the long head of the biceps femoris to the back of the knee; here it pierces the deep fascia and accompanies the small saphenous vein to about the middle of the back of the leg, its terminal twigs communicating with the sural nerve. Terminal branches continue inferiorly, with sensibility to the posterior thigh, popliteal area, and proximal part of the leg, occasionally extending sensibility as far distal as the calcaneal region. In mammals, contributions to the PFCN have been described from the roots of the inferior gluteal nerve, the common peroneal nerve, and the sciatic/tibial nerves [1–3].

There are many studies on the origin and distribution of the PFCN [4, 5], several case reports on the PFCN

neuropathy [6–8], a nerve conduction study [9], and a free inferior gluteal flap study with sparing of the PFCN [3]. However, to the best of our knowledge, no cases, to date, have reported a communication between PFCN and sciatic nerve.

Materials, Methods and Results

This case was noted in the Department of Anatomy, Faculty of Medicine, Suleyman Demirel University in 2010 spring semester.

During routine dissections for second year medical students within the neuroscience subject committee, we encountered a variation in the left lower limb of a 75-year-old male cadaver of Turkish origin. The cause of death was documented as cardiac arrest. No known muscular disease or neurological disorder was noted in his medical history. On inspection, no signs of previous surgical scars, signs of muscular disorders or atrophy were present in both lower limbs.

Dissection started with distal approach at the left popliteal fossa; then we found the PFCN, and removed superficial structures. We continued the dissection toward the left gluteal region, where we noticed a connection between sciatic nerve and PFCN. The connective and fatty tissues were removed for better exposing and making measurements at the area. Using a digital caliper, we measured the communicating branch and its relations to the nearby structures. The length of the communicating branch was 3 cm, and the distance between the uppermost point of the connection and lowermost point of the infrapiriform foramen was 11 cm. Distally to the connection, the caliber of PFCN minimally decreased (Figure 1).

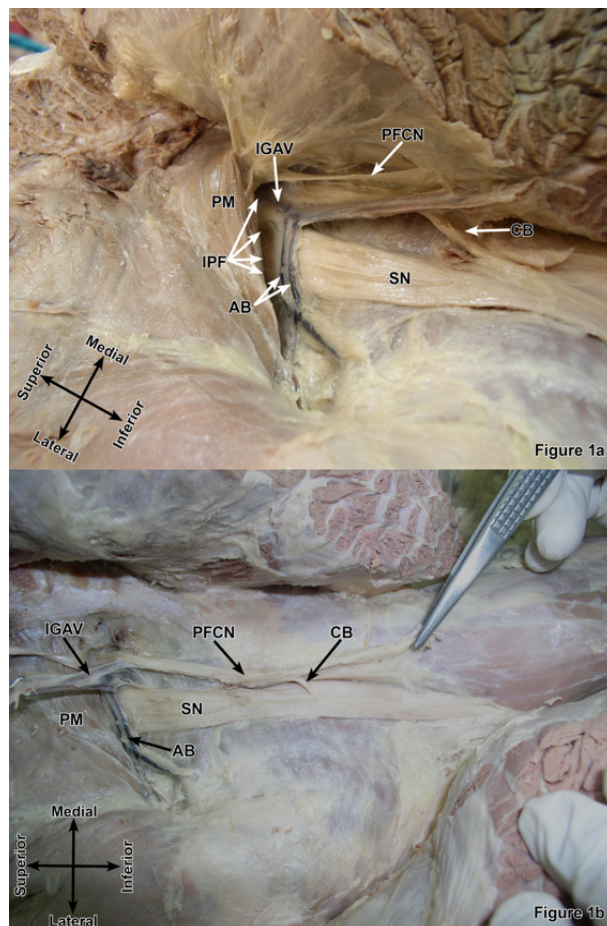


Figure 1 – (a) PFCN emerges from the greater sciatic foramen below the piriformis with IGA and SN; more distally communicates with SN; (b) general view of the area. PM: piriformis muscle; IPF: infra-piriform foramen; IGAV: inferior gluteal artery and vein; AB: articular branches of inferior gluteal artery and vein; SN: sciatic nerve; PFCN: posterior femoral cutaneous nerve; CB: communicating branch between sciatic and posterior femoral cutaneous nerves.

The nerve became superficial without giving any muscular branches, continued as a pure sensory nerve as usual. The rest of the terminal branches of the sacral plexus showed no variations. No muscular variation was noted in both lower limbs. The relationship of the PFCN with the other neurovascular structures at the infra-piriform foramen, namely inferior gluteal nerve and vessels, sciatic nerve, internal pudendal vessels and pudendal nerve, was as usual. After noting this variant connection between the PFCN and sciatic nerve in the left lower limb, we meticulously dissected the right side, paying special attention to possible neuromuscular variations. However, the arrangement, structure and relationship of the nerves and the muscles of the right lower limb showed no variations. After having careful examination and measurements at the left side, we photographed the variant communication for documentation.

Discussion

The PFCN leaves the pelvis with the inferior gluteal nerve and inferior gluteal vessels as well as the sciatic

nerve, emerging from the greater sciatic foramen beneath the piriformis muscle in a majority of cases. The PFCN travels medial to the sciatic nerve to lie directly on the deep surface of the gluteus maximus muscle, having an intimate relationship with the inferior gluteal artery [3]. Previous studies relating to the PFCN have focused mainly on its origin from the sacral plexus or its relationship to the piriformis muscle [3, 4, 10]. In our case, the origin and course of PFCN was as usual.

Other studies of PFCN include its contribution to the formation of sural nerve [5], mononeuropathy related to a gluteal intramuscular injection [6, 7], posterior thigh pain immediately after uterosacral ligament fixation (USLF) [8], landmarks of its perineal branch [2], a nerve conduction study [9], and a free inferior gluteal flap study with sparing of the PFCN [3].

Uluotku H *et al.* studied the location and formation of the sural nerve in 40 lower limbs of newborn cadavers. In two cases (5%), the sural nerve was formed by the peroneal communicating branch from the common peroneal nerve and fibers from the posterior femoral cutaneous nerve joining the medial sural cutaneous nerve [5]. When we apply their findings to our case, it may be postulated that the fibers from the PFCN may pass to the sciatic nerve via the communicating branch, and then join the medial sural cutaneous nerve. However, it is not possible to have an evident explanation without histological and immunochemical studies.

A connection between the perineal branch of the PFCN and the inferior rectal branch of the pudendal nerve has been described. This communication between the PFCN and the pudendal nerve is believed to be one of the reasons that sensory impairment is usually not seen with entrapment of the pudendal nerve [2]. In our case, the communication was between the PFCN and the sciatic nerve.

PFCN is vulnerable to damage during USLF. Flynn MK *et al.* postulated that the nerve likely responsible for the constellation of symptoms seen in these patients is the PFCN. This could occur, according to the authors, if the uterosacral ligament or nerve were atypically located or if the sutures were paced too far laterally [8]. However, in a cadaveric study investigating nerve injury during USLF, Collins SA *et al.* concluded that it is unlikely that the PFCN is directly responsible for the symptoms described by Flynn MK *et al.*, and proposed an alternative explanation. The portion of the PFCN that courses through the pelvis was far away from the surgical site in their example. They concluded that, it is more likely that autonomic and visceral S2 and S3 fibers of the inferior hypogastric plexus become entrapped during USLF and relay painful stimuli via spinal nerves to somatic efferents innervating the S2 and S3 dermatomes [11].

The sciatic nerve is the nerve most commonly injured following intragluteal injection. Two previous studies reviewed 137 patients who developed neuropathy after intragluteal injection, and it was reported that sciatic neuropathy comprised more than 95% of all cases. There have been very few reports of PFCN neuropathy; they comprise only about 1% of all cases [6].

The PFCN lies close to the sciatic nerve, and it is clear that injury to the PFCN by direct trauma hardly ever occurs without accompanying damage to the larger sciatic nerve nearby. As a result, there have been very few reports of isolated PFCN neuropathy. Since 1968, only nine cases studies have been reported. Isolated PFCN neuropathy is known to occur in situations that promote compression of this nerve, such as 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 [6]. If this occurs, the loss of sensation in the posterior thigh is seen, and sensory loss in the inferior medial buttock region that is consistent with an inferior medial clunial nerve lesion may be added. This is explained by the fact that as the PFCN leaves the sciatic foramen, it gives rise to inferior medial clunial branches that provide sensory innervation to the inferior posterior buttock [7].

The free inferior gluteal flap is a major secondary choice of autologous tissue for breast reconstruction if the transverse rectus abdominis musculocutaneous flap is not an option. However, loss of inferior buttock, posterior thigh, and popliteal sensibility is a frequent sequela of harvesting the free inferior gluteal musculocutaneous flap. Zenn MR and Millard JA have demonstrated that in 94.5% of cadaveric pelvic halves dissection, it was possible to preserve the PFCN or some of its branches while harvesting the free inferior gluteal myocutaneous flap. This was best accomplished by approaching the harvest of the flap from lateral to medial, then cephalad to caudal in dissection. The inferior border of the piriformis muscle and its approach using surface landmarks has proved to be a reliable maneuver in identifying the inferior border of the piriformis muscle and subsequently the PFCN and inferior gluteal artery early in their course. This approach has been used with clinical success [3].

Conclusions

The PFCN has been widely investigated regarding its origin, distribution and mononeuropathies. However, a communication between PFCN and sciatic nerve seems to be a very rare variation. In such cases, histology and immunohistochemistry may be used to characterize specific nerve fibers within the communicating branch to evidently describe its functional anatomy.

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