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Original Research Article

Variations in origin and relation of the posterior cutaneous nerve of the thigh with piriformis muscle

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ABSTRACT

Background: The gluteal region includes a disproportionate number of nerves of all sizes, both motor and sensory. The piriformis is the uppermost of the small muscles of the gluteal region and the key to the arrangement of nerves and vessels in the buttock. The posterior cutaneous nerve of the thigh usually supplies the posterior aspect of the thigh and, according to literature the nerve terminates at the popliteal region or proximal leg. The study was undertaken to record the variations in emergence of the posterior cutaneous nerve of the thigh and its relation to piriformis muscle.
Methods: Comprised of 60-lower extremities with gluteal region from 30 embalmed adult human cadavers (52 male and 8 female specimens). Any variation in the emergence of the posterior cutaneous nerve of the thigh in relation to piriformis was noted.
Results: In the present study piriformis consisted of one belly in 55 specimens (91.67%) and two bellies of piriformis were observed in 5 specimens. In present study the posterior cutaneous nerve of thigh was emerging below the piriformis in 56 specimens (93.33%) and in 4 specimens (6.67%), the relation of posterior cutaneous nerve of thigh with piriformis was found variable which were grouped as type A, type B and type C.
Conclusions: Knowledge of variant relation of posterior cutaneous nerve of thigh with the piriformis is important as entrapment of this nerve may lead to pain in the area innervated by posterior cutaneous nerve of thigh.

Keywords: Variations, Origin, Relation, Posterior cutaneous nerve of the thigh, Piriformis

INTRODUCTION

The gluteal region is a common site for intramuscular injection of drugs and includes a disproportionate number of nerves of all sizes, both motor and sensory.[1] The piriformis is the uppermost of the small muscles of the gluteal region and the key to the arrangement of nerves and vessels in the buttock. The superior gluteal nerve appears at its upper border while the pudendal nerve, the inferior gluteal nerve, the sciatic nerve and the posterior cutaneous nerve of thigh (posterior femoral cutaneous nerve) appear at its lower border.[2]

The piriformis muscle is a short lateral rotator of the hip. The most frequent variation is the division of the muscle into two parts.[3] The piriformis, one of the intrapelvic muscles may compress the sciatic nerve and cause the piriformis syndrome. Piriformis syndrome not only occurs due to piriformis hypertrophy, inflammation or irritation, but also may be caused by congenital variations of the piriformis and sciatic nerve.[4] Piriformis syndrome and coccygodynia are associated with some sciatic nerve variations due to compression of the nerve by hypertrophy or contraction of piriformis. The resulting pain and paresis in the gluteal region may affect the

biomechanical function of the pelvis lead to postural abnormalities and locomotor instability.[5]

The posterior cutaneous nerve of the thigh usually supplies the posterior aspect of the thigh and, according to literature, the nerve terminates at the popliteal region or proximal leg.[6-11] A further course to the lower leg has been considered, but has not been clearly confirmed to date.[12,13] Sensory supply of the posterior cutaneous nerve of thigh in the lower leg would have a significant impact on regional anaesthesia procedures. If it were the case, a PFCN block would have to be included to provide complete anaesthesia for surgical procedures of the leg, hindfoot and ankle.

The study was undertaken to record the variations in emergence of the posterior cutaneous nerve of the thigh and its relation to piriformis muscle, compare the variations (if present) on both the sides and to compile the result and find out the commonest variation in this region. The study would be useful in analysing the clinical aspect related to variations so recorded.

METHODS

Material for the cross sectional study comprised of 60-lower extremities with gluteal region from 30 embalmed adult human cadavers in the Department of Anatomy, Govt. Medical College, Patiala. Study period extended from August, 2016 to November, 2017. Of these 60 specimens, 52 were of male and 8 were of female cadavers. Cadavers having any other congenital abnormalities, lower limb fractures and any hip replacements were excluded from the study. Cadavers having normal lower limb were included the study. Gluteal region was dissected to expose the structures under cover of gluteus maximus. The skin and superficial fascia were reflected laterally. Special care was taken to cut superficial fascia along the lower border of gluteus maximus in order to avoid injury to the posterior cutaneous nerve (PCN) of the thigh. Then deep fascia was reflected carefully in order to follow the trunk of PCN of thigh. The gluteus maximus was reflected by passing two fingers deep to the lower border of the muscle 2-3 cm medial to its femoral insertion, cutting upwards between the fingers to the upper border superior to the greater trochanter in order to avoid injury to the inferior gluteal nerve which enters its deep surface. While reflecting the medial part of the muscle, special care was taken to the deep surface of the muscle to avoid injury to the PCN of thigh. As the ischial tuberosity was uncovered, muscle was carefully detached from the surface of rigid sacrotuberous ligament. PCN of the thigh and inferior gluteal nerve were cleaned and followed upwards to the lower border of the piriformis. Thick firm sciatic nerve, nerve to obturator internus, internal pudendal vessels, and pudendal nerve in relation to ischial spine were cleaned.

Gluteus medius was cleaned and its attachments were defined. Posterior border of the muscle was lifted away from piriformis and it was separated from behind forwards by pushing the fingers between them. Cut was made across the gluteus medius 5 cms above the greater trochanter and reflected the two parts towards their attachments. Branches of superior gluteal nerve were exposed after raising the upper part of the muscle. This nerve was cleaned and traced between gluteus medius and minimus to the deep surface of tensor fascia lata.

Any variation in the emergence of PCN of thigh in relation to piriformis was noted along with presence. All data including variations were recorded as photographs and schematic illustrations. The data was compiled and compared to the standard texts as well as with the accessible literature. Data analysis was done using percentage.

RESULTS

Out of 60 gluteal regions dissected, the piriformis consisted of a single belly in 55 specimens (91.67 %) where as in rest of 5 specimens (8.33%) the piriformis was seen being consisted of two bellies.

Out of 60 gluteal regions dissected, in 56 specimens (93.33%), the posterior cutaneous nerve of thigh was seen emerging below the inferior border of the piriformis as a single trunk, medial to the sciatic nerve which is a normal pattern as described in standard textbooks. In rest of 4 specimens (6.67%) the relation between posterior cutaneous nerve of thigh and piriformis was found variable. Bilateral variation of posterior cutaneous nerve of thigh was seen in 2 specimens belonging to one male cadaver whereas in rest of two specimens unilateral right sided variation was seen in two female cadavers. For the purpose of observations and description, variations of posterior cutaneous nerve of thigh were grouped as type A, type B and type C.

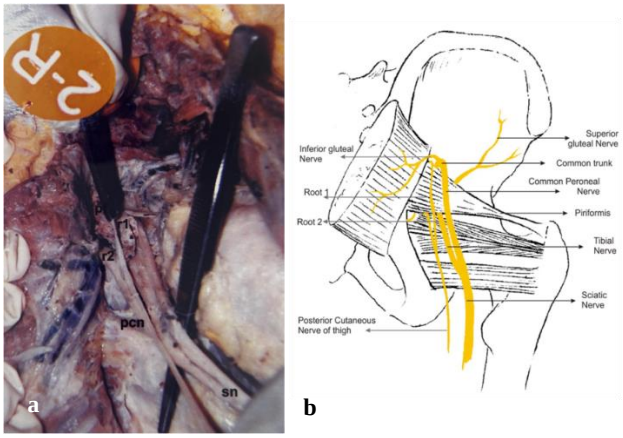

Figure 1 (a and b): Posterior cutaneous nerve of the thigh was seen to be formed by two roots.

R1: first root, R2: second root, PCN: posterior cutaneous nerve of the thigh, SN: sciatic nerve.

In type A variation (female specimen) the posterior cutaneous nerve of the thigh was seen to be formed by two roots. One root was coming from the superior border of the piriformis whereas the second root was emerging below the piriformis. Both roots joined at the level of gemellus inferior to form the single trunk of the posterior cutaneous nerve of the thigh (Figure 1).

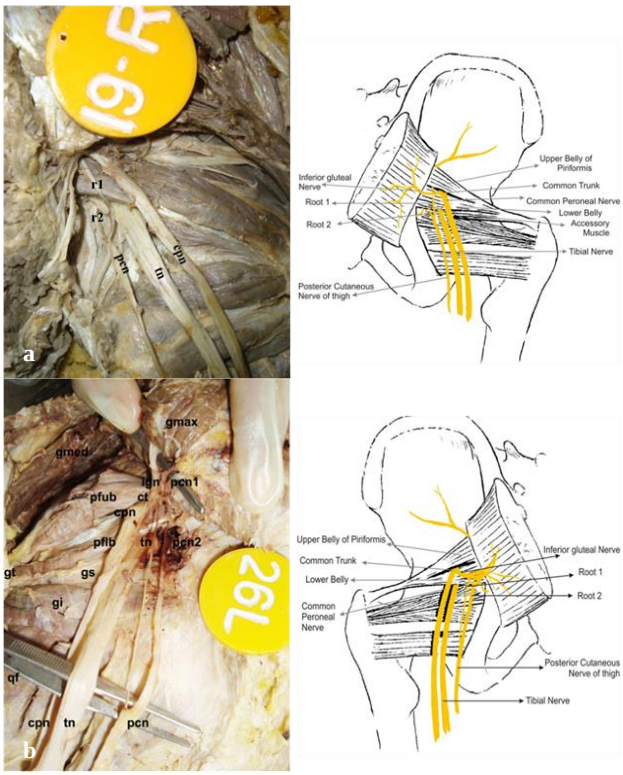

Figure 2: (a) One root of the posterior cutaneous nerve of the thigh entering the gluteal region by piercing the two bellies of piriformis, second root emerging below the lower belly of piriformis; (b) first root arising from the inferior gluteal nerve entering the gluteal region by piercing the two bellies of piriformis and second root emerging below the lower belly of the piriformis, both roots joining at the level of the quadratus femoris to form the posterior cutaneous nerve of the thigh.

R1: first root, R2: second root, PCN: posterior cutaneous nerve of the thigh, TN: tibial nerve, CPN: common peroneal nerve, IGN: inferior gluteal nerve, GMAX: gluteaus maximus, GMED: gluteus medius, GI & GS: gemellus inferior & gemellus superior.

In type B variation (female & male specimen) one root of the posterior cutaneous nerve of the thigh was seen entering the gluteal region by piercing the two bellies of piriformis whereas second root was seen emerging below the lower belly of the piriformis. In one the specimens both the roots were joining at the level of the gemellus superior to form a single trunk of posterior cutaneous nerve of thigh (Figure 2a). In the other specimen, first root of the posterior cutaneous nerve of the thigh was seen arising from the inferior gluteal nerve which was entering the gluteal region by piercing the two bellies of piriformis and second root was seen emerging below the lower belly of the piriformis. Then both the roots were joining at the level of the quadratus femoris to form the posterior cutaneous nerve of the thigh (Figure 2b).

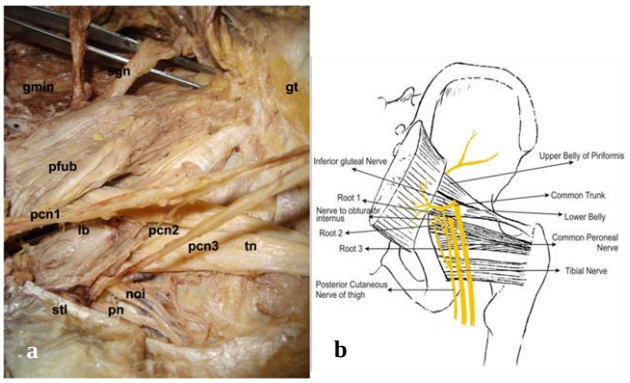

Figure 3 (a and b): Posterior cutaneous nerve of the thigh was seen having three roots of origin.

PCN1: first root, PCN2: second root, PCN3: third root, PCN: posterior cutaneous nerve of the thigh, TN: tibial nerve, NOI: nerve to obturatur internus, IGN: inferior gluteal nerve.

The posterior cutaneous nerve of the thigh was seen having three roots of origin in the type C variation. The first root was seen arising from the inferior gluteal nerve which was entering the gluteal region by piercing the two bellies of piriformis. Second root was emerging below the lower belly of the piriformis whereas third root was arising from the nerve to obturator internus, emerging below the lower belly of piriformis. 3rd root was joining the first two roots to form the posterior cutaneous nerve of thigh of at the level of quadratus femoris (Figure 3).

DISCUSSION

In present study piriformis consisted of one belly in 55 specimens (91.67%) and two bellies of piriformis were observed in 5 specimens (8.33%). Similar findings had been also been reported in the literature in the past (Table 1).

Table 1: Comparison of the number of bellies of the piriformis present study with earlier published data.

Author	One belly (%)	Two bellies (%)
Anson et al[14]	89.7	10.3
Vicente et al[15]	90	10
Present study	91.67	8.33

In present study the posterior cutaneous nerve of thigh was seen emerging below the piriformis in 56 specimens (93.33%) and in 4 specimens (6.67%), the relation of posterior cutaneous nerve of thigh with piriformis was found variable. These variations were grouped as type A, type B and type C. These variations of the posterior cutaneous nerve of thigh were seen along with variations of inferior gluteal and common peroneal nerves. In 2 variant specimens, the inferior gluteal nerve was giving

contribution to a root of posterior cutaneous nerve of thigh.

Tillmann found in 17 specimens (7.5%) out of 224 specimens that inferior gluteal nerve and common peroneal nerve were entering the gluteal region by passing through the piriformis.[16] In addition to this, the entire posterior cutaneous nerve of thigh, or only its dorsal ramus, often ran alongside the inferior gluteal and common peroneal nerves through 'Foramen intrapiriforme'. In a case report, the posterior femoral cutaneous nerve was found to pierce the piriformis muscle.[17]

Kurtoglu et al reported in a new born cadaver that the piriformis consisted of a larger upper part and a smaller lower part.[18] The common peroneal nerve and a very small part of the posterior cutaneous nerve of thigh and inferior gluteal nerve passed through these two parts of muscle. Thick bundle of posterior cutaneous nerve of thigh was emerging below the lower belly of piriformis similar to type B variation of present study. So, the composition of the posterior femoral cutaneous nerve is considered necessary when considering the dorsoventral relationships of the sacral plexus and boundaries of the dorsal and ventral rami and also in cases of isolated PFCN block.[19,20]

Limitations

Limitations of cadaveric study included the availability of fresh specimens or the changes in vascular properties in the case of embalmed cadavers.

CONCLUSION

Knowledge of variant relation of posterior cutaneous nerve of thigh with the piriformis is important as entrapment of this nerve may lead to pain in the area innervated by posterior cutaneous nerve of thigh. For clinicians, it is very important to consider these variations in practice as, such variations may go undiagnosed. It is further commented that these variations are not a rare phenomenon but are quite common. If such variation are kept in mind, advanced imaging techniques are able to diagnose such cases in life and can be treated.

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