Variations of Nerves Located in Deep Gluteal Region

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Summary: The relation of the nerves with the piriformis muscle in the deep gluteal region examined in 50 buttock from 18 male and 7 male newborn cadavers. The nerves were found in usual position in 74% of sides, while one or more nerves perforated the piriformis in 16% and, unusual location of the nerves with intact piriformis was in 10% of sides. Abnormal located nerves are utilised in view of whether originating from dorsal or ventral part of the sacral plexus.

Sacral plexus is constituted by fourth lumbar-third sacral spinal nerve in the pelvis and, gives rise to the peripheral nerves supplying the muscles and skin of the lower extremity. Some of them, sciatic, posterior femoral cutaneous, inferior gluteal and superior gluteal nerves leaves the pelvis via the greater sciatic foramen. A part of the posterior femoral cutaneous nerve, common peroneal component of the sciatic nerve, inferior gluteal and superior gluteal nerve are originating from the dorsal part of the sacral plexus. Superior gluteal nerve is usually passed over the piriformis muscle, while the others located in the lower margin of its. In some cases, one or more nerves or only a part of the nerve(s) may go through the muscle. In this situation, compression of the nerve(s) becomes easier and results in special clinical tables such as piriformis syndrome. Knowing the possible anatomical variations of the nerves and tissues in this area may be helpful for accurate diagnosis and reduce to the complications surgical approaches.

Material and Methods

Bilateral gluteal regions of the 25 newborn cadavers, 18 female and 7 male, were dissected to investigate the positional relationship of the nerves with piriformis muscle. At first, skin was removed, gluteus maximus muscle was insized from the superior-lateral margin to the inferior-medial of its obliquely. Lower and upper parts of the muscle were pulled downward and upward respectively. After that, position of the nerves with the piriformis was studied in main 3 groups following:

1. The first group includes the cases in which superior gluteal nerve is passed over and the others passed under the piriformis, was found in 37 sides (Table 1). (In one of them, sciatic nerve was perforated by inferior gluteal artery at the inferior margin of its).
2. In the second group, cases that the piriformis muscle was perforated by one or more nerves or only a part of the nerve(s) passed through the piriformis muscle (Figure 2).
3. In the third group, the muscle is intact but the nerves are located in unusual position (Figure 3a, 3b).

Observations

In the first group, the cases that the superior gluteal nerve passed over and the others passed under the piriformis, was found in 37 sides (Table 1). (In one of them, sciatic nerve was perforated by inferior gluteal artery at the inferior margin of the muscle).

In the second group, the cases that the piriformis muscle was perforated by one or more nerves or only a part of the nerve(s) was found in 8 sides (Figure 2). In 2 of them, superior gluteal nerve was passed through the muscle. (In one of these 2 cases a branch of superior gluteal artery was also accompany with the nerve). In another case, common peroneal part of the sciatic nerve and inferior gluteal nerve were passed through the muscle. In 2 cases, in addition to the common peroneal and in-
Inferior gluteal nerve, a part of the posterior femoral cutaneous nerve was also passed through the muscle. In only one case, the whole posterior femoral cutaneous nerve passed through the muscle together with common peroneal. In the other one, superior gluteal, inferior gluteal, common peroneal nerves accompany with the only a part of posterior femoral cutaneous nerve interestingly. (In latter case, inferior gluteal artery was passed between the upper and lower parts of the posterior femoral cutaneous nerve before their joining at the lower margin of the piriformis muscle) In the remaining one case, a fibrous band was present in the lower margin of the piriformis muscle. The thicker part of the posterior femoral cutaneous nerve was passed between the band and muscle while the smaller part of its passed under the band together with the other nerves. So we decided to utilise the latter case in the second group (Table 1, 2).

In the third group, the state that the nerves located in unusual position while the piriformis was intact was found in 5 sides (Table 1). In 4 of them, superior gluteal nerve expected to present at the upper margin of the muscle was passed under its (Figure 3a). In the remaining one, inferior gluteal and common peroneal nerves, expected to passed under the piriformis, was located upper margin of its. In that case a branch arising from the inferior gluteal nerve contributed to posterior femoral cutaneous nerve. Moreover a branch arising from the posterior femoral cutaneous nerve reached to the deep surface of the gluteus maximus muscle. Common peroneal nerve joined with the tibial nerve at the lower margin of the piriformis muscle (Figure 3b).

In the all cases that sciatic or/and posterior femoral cutaneous nerves divided into 2 parts by whole or a part of the piriformis muscle, these parts reunited under the piriformis muscle and, then, coursed in the same sheath as normal.

In this series, bilateral abnormally location of the nerve(s) in the gluteal region was found in 12% of cases (3 of 25 cadavers), while unilateral variation was found in 28% (7 of 25). There was also not considerable difference between the right and left sides or between the male and female sexes.
Variations of Nerves Located

Fig. 3a. Showing the superior gluteal nerve passed under the piriformis instead of over its.

SGN Superior gluteal nerve
IGN Inferior gluteal nerve
CPN Common peroneal nerve
NT Tibial nerve
PFCN Posterior femoral cutaneous nerve

Fig. 3b. Showing the common peroneal and inferior gluteal nerve passed over the piriformis muscle instead of under its.

IGN Inferior gluteal nerve
CPN Common peroneal nerve
+ + Communicating branch
++ to gluteus maximus muscle
NT Tibial nerve
PFCN Posterior femoral cutaneous nerve

Table 1. Showing distribution of the sides to the 3 main groups explained in the material methods.

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Discussion

It is not rare that piriformis muscle is penetrated by some structures, which are supposed to pass through the greater sciatic foramen in the normal anatomical position.\(^{3,6,8,11}\) Chiba studied the positional relationship between this muscle and the nerves located in the gluteal region in 13 group. In that study, the cases that the piriformis muscle perforated by whichever nerve has been reported as 38% of sides. In our series, this state is defined in 16% sides, which is rather lower than Chiba's, but is also meaningful for clinically (Table 1).

Clinical table, resulting from the compression of the sciatic nerve or its components is known as piriformis syndrome.\(^{7-10,12,13,16}\) Thus positional relation of the nerve and its components with the piriformis have taken interest of scientists. In our
study, common peroneal nerve passed through the piriformis is found in 10%. Chiba reports the common peroneal nerve passed through the piriformis muscle in 175 of 514 extremities. In fact the ratios found in similar studies which have previously been done were not so high as this. Lee and Tsai determined this ratio as 19.6% in 168 lower extremity dissection, while Beaton and Anson reported 10% in the series of 2250 sampling as well as Hallin.3,6,8,11) On the other hand, the events where the whole of the sciatic nerve passed through the muscle were observed as 0.8-2.2% in the literature.3,14) The events that the whole sciatic nerve passed over the piriformis has also been reported rather rarely.3,6,8,11) The cases like these were not present in our series.

When focused on the posterior femoral cutaneous nerve, which is constituted by both dorsal and ventral part of the sacral plexus, the whole of the nerve perforates the muscle is present in only one case in our series (third event in Table 2). It has also been reported rarely in the literature.1,6) In the other 4 cases, only a part of its passed through the muscle. We suggest that this is not a coincidence, because, the accompanied nerves are also from the dorsal part of sacral plexus.

The nerves perforating the piriformis were not alone in 5 of the 8 sides and, there were different combinations among the only a part of posterior femoral cutaneous nerve, a part of the sciatic nerve (always-common peroneal component), and the whole inferior gluteal nerve (Table 2). It is known that, common peroneal part of the sciatic nerve, inferior gluteal nerve and a part of the posterior femoral cutaneous nerve are formed by the dorsal division of the spinal nerves constituting the sacral9,12,16) We conclude that the unusual located nerves are mostly originating from the dorsal part of the plexus and contribute to positional variations in different combinations.

In Chiba’s series, the cases that the superior gluteal nerve is located in unusual position, is reported in 16% of sides.5) That is in accordance with our ratio (14%). Besides, in only one case, the other variant nerves accompany with this nerve and, in the others it was alone in present series. Thus positional variation of the superior gluteal nerve is thought to be free from the other nerves'.

References

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