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Case Report

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A case of bilateral high division of the sciatic nerves, together with a unilateral unusual course of the tibial nerve

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ABSTRACT

In a 62-year-old male cadaver, high division of the sciatic nerve was observed bilaterally. Additionally, on the right side of the same cadaver, the common peroneal nerve passed just inferior to the piriformis muscle and the tibial nerve emerged inferior to the gemellus superior, between the gemellus superior and obturator internus muscles. Then, both of the nerves coursed posterior to the obturator internus, gemellus inferior and quadratus femoris muscles. The gemellus superior muscle, lying just posterior to the tibial nerve may cause to the symptoms of sciatica, because of the compression of the tibial nerve between the gemellus superior and obturator internus muscles. This pathology may lead to a new syndrome; the gemellus superior syndrome, just like the piriformis syndrome. As a conclusion, in the etiology and pathogenesis of sciatica, in addition to the priformis muscle, the abnormalities of the other gluteal external rotator muscles of the hip joint must also be taken into consideration by the clinicians. MR imaging of this region will be very helpful for the accurate diagnosis of this type of pathologies.

Key words: anatomy, variation, gemellus superior muscle, sciatic nerve, tibial nerve.

Introduction

The sciatic nerve, which is the broadest nerve in the body is deep to the gluteus maximus, superiorly. Then it crosses posterior to the obturator internus, gemelli and the quadratus femoris muscles [1]. This nerve divides into its tibial and common peroneal branches approximately halfway or more down the thigh. However, in approximately 12% of the cases, they separate as they leave the pelvis [2]. We here present a case of an unusual course of the tibial nerve together with bilateral high division of the sciatic nerves, which may have a clinical importance in the etiology and pathogenesis of sciatica.

Case Report

During the routine gross anatomy dissection of the gluteal regions of a 62-year-old male cadaver, high division of the sciatic nerve was observed bilaterally. In this case, the tibial nerves on both sides were formed from the ventral rami of L4-L5 and S1-S3 and the common peroneal nerves were derived from the dorsal branches of the L4-L5 and S1-S2 ventral rami. Then, on the left side of the cadaver, the high divided tibial and common peroneal nerves passed from the infrapiriform foramen separately, just inferior to the piriformis muscle and these nerves coursed posterior to the gemelli, obturator internus and quadratus femoris muscles (Fig. 1). However, on the right side, the common peroneal nerve passed just inferior to the piriformis muscle and the tibial nerve emerged inferior to the gemellus superior, between the gemellus superior and obturator internus muscles. On the right side of the cadaver, the piriformis muscle was inserted to the upper part of the greater trochanter and the gemellus superior and obturator internus muscles were inserted to the trochanteric fossa of the femur. Then, both of the nerves coursed posterior to the obturator internus, gemellus inferior and quadratus femoris muscles (Fig. 2). The muscles described above were innervated from the sacral plexus on both sides (Table 1).

Discussion

In approximately 12% of the cases, the tibial and common peroneal nerves separate as they leave the pelvis. In these cases, the tibial nerve passes inferior to the piriformis and the common peroneal nerve pierces this muscle or passes superior to it [2]. Mouret concluded that in case of high level division of the sciatic nerve, the common peroneal nerve passes through the piriformis muscle [3]. Odajima and Kurihara [4] found the common peroneal nerve to pierce the piriformis muscle more commonly in males and on the left side. However, according to Trotter [5], no difference was observed in between the two sexes and the common peroneal nerve pierced the piriformis in whites more commonly than in blacks.

Variations of the gemellus superior muscle is a very rare abnormality. Arifoglu et al. [6] reported a case of double gemellus superior muscles together with double piriformis muscles and high division of the sciatic nerve in the right gluteal region of a 63-year-old male cadaver. Testut and Latarjet [7] found the absence of the gemellus superior muscle in 8% of whites and 6% of blacks, but not observed in the Japanese cadavers. This muscle may have a double origin or it may be formed from two fasciculi [7].

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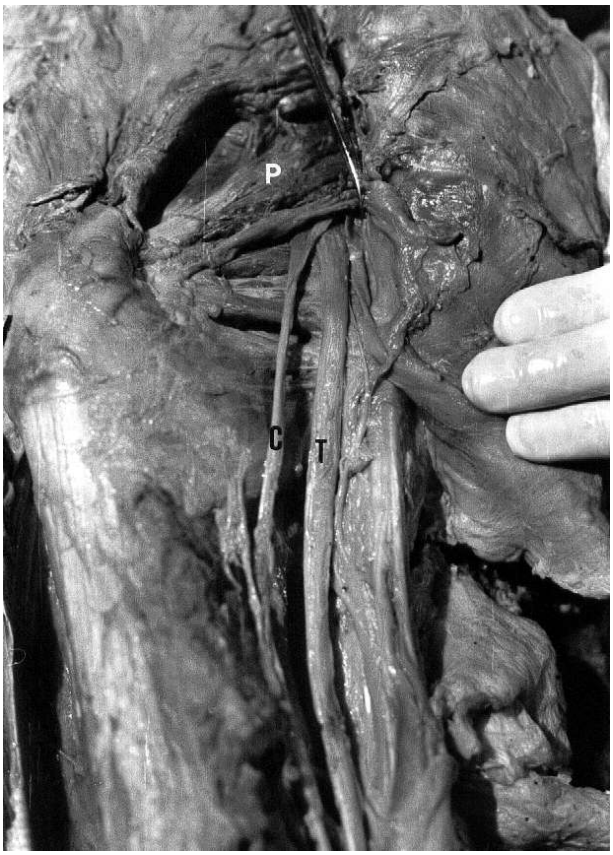

Figure 1 | Photograph showing the high division of the sciatic nerve on the left side of the cadaver. P: Piriformis muscle, T: Tibial nerve, C: Common peroneal nerve.

Table 1 | Innervation of the muscles, on the right and left sides of the cadaver. VR: ventral rami.

MUSCLE	Right (VR)	Left (VR)
Piriformis	L5, S1 and S2	L5 and S1
Obturator internus	L5 and S1	L5 and S1
Gemellus superior	L5 and S1	L5 and S1
Gemellus inferior	L5 and S1	L5 and S1
Quadratus femoris	L5 and S1	L5 and S1

The pattern of innervation of the obturator internus, superior and inferior gemelli, and the quadratus femoris in humans and in rhesus monkeys were investigated by Aung et al. [8]. Their findings revealed that the positional relationships among the branches of the nerves to the obturator internus and gemelli muscles were relatively constant, although the branching patterns and innervation patterns were varied [8].

The relationship of sciatic pain to the piriformis muscle is well known [9]. If the sciatic nerve is compressed by the piriformis muscle, this pathology leads to an entrapment

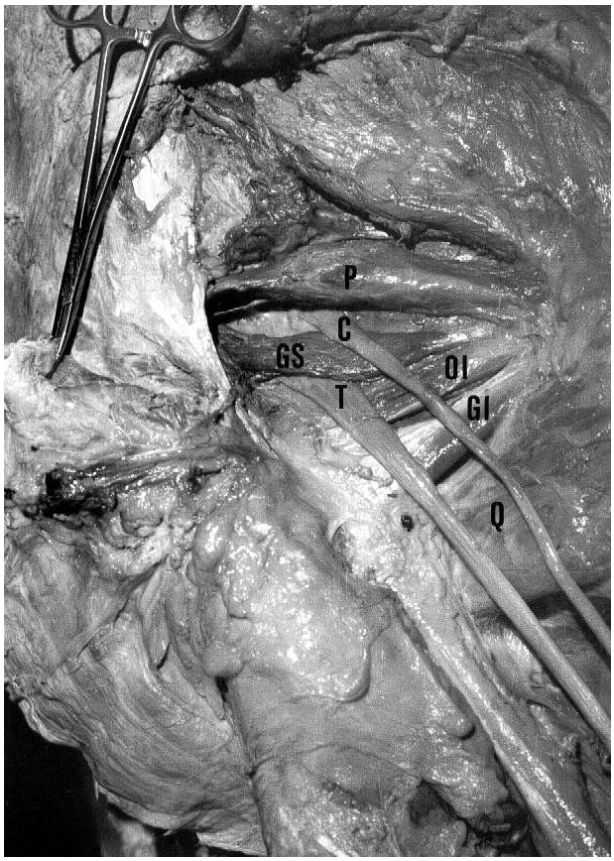

Figure 2 | Photograph showing the high division of the sciatic nerve together with the unusual course of the tibial nerve. P: Piriformis muscle, T: Tibial nerve, C: Common peroneal nerve, GS: Gemellus superior muscle, O: Obturator internus muscle, GI: Gemellus inferior muscle, Q: Quadratus femoris muscle.

neuropathy; called the “piriformis syndrome”. This syndrome occurs generally depending upon to the perforation of the piriformis muscle by the sciatic nerve [9-11], or as a postoperative complication [12].

The gemellus superior muscle, lying just posterior to the tibial nerve, on the right side of our cadaver may also cause to the symptoms of sciatica, because of the compression of the tibial nerve between the gemellus superior and obturator internus muscles. This pathology may lead to a new syndrome; the gemellus superior syndrome, just like the piriformis syndrome. Therefore, this unusual course might produce severe pain by hip abduction and internal rotation [13].

Conclusion

In conclusion, in the etiology and pathogenesis of sciatica, the abnormalities of the other gluteal external rotator muscles of the hip joint must also be taken into consideration, by the clinicians, in addition to the piriformis muscle. MR imaging of this region will be very helpful for the accurate diagnosis of this type of pathologies.

References

[1] Williams PL, Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE, Ferguson MWJ. Gray’s Anatomy. 38th edn. Churchill Livingstone, Edinburgh, 1995; p 1284.

[2] Moore KL, Dalley AF. Clinically Oriented Anatomy. 4th edn. Lippincott Williams and Wilkins, Philadelphia, 1999; p 558

[3] Mouret J. Rapports des muscles pyramidaux avec le nerf sciatique. Montpell. Méd. 1893 (2) 230-233

[4] Odajima G, Kurihara T. Supplementary findings to the morphology of the piriform muscle. Excerpta. Med. 1963 (17) 9.

[5] Trotter M. The relation of the sciatic nerve to the piriformis muscle in american whites and negroes. Anat. Rec. 1932 (52) 321-323.

[6] Arifoglu Y, Surucu HS, Sargon MF, Tanyeli E, Yazar F. Double superior gemellus together with double piriformis and high division of the sciatic nerve. Surg. Radiol. Anat. 1997 (19) 407-408.

[7] Testut L, Latarjet A. Traité d'Anatomie Humaine, 9ème édition. Doin, Paris, 1948; pp 1114-1116.

[8] Aung HH, Sakamoto H, Akita K, Sato T. Anatomical study of the obturator internus, gemelli and quadratus femoris muscles with special reference to their innervation. Anat. Rec. 2001 (263) 41-52.

[9] Hallin RP. Sciatic pain and the piriformis muscle. Postgrad. Med. 1983 (74) 69-72.

[10] Chen WS. Bipartite piriformis muscle: an unusual cause of sciatic nerve entrapment. Pain. 1994 (58) 269-272.

[11] Pfeifer T, Fitz WF. The piriformis syndrome. Z. Orthop. 1989 (127) 691-694.

[12] Brown JA, Braun MA, Namey TC. Piriformis syndrome in a 10-year-old boy as a complication of operation with the patient in the sitting position. Neurosurg. 1988 (23) 117-119.

[13] Cameron HU, Noftal F. The piriformis syndrome. Can. J. Surg. 1988 (31) 210.