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Case Report Unusual accessory piriformis muscle: A case report

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ABSTRACT

In human anatomy, piriformis muscle and peripheral nerve variants may represent an unrecognized etiology. These variations in the gluteal region may cause entrapment of the sciatic nerve and induce to the piriformis syndrome. We present a case of accessory piriformis muscle accompanying to high divisions of sciatic nerve, unusual course of nerves and fusion of the piriformis muscle with gluteus medius in the left gluteal region of a 64-year-old male cadaver. The nerves which are originating from dorsal part of the sacral plexus, inferior gluteal nerve, common fibular part of the sciatic nerve and posterior femoral cutaneous nerve are located between the piriformis and accessory piriformis muscles make this case the most interesting of its kind. Awareness of these variations may prove to be useful for surgeons during the surgery of the gluteal region and the clinician when treating patients with buttock pain. Additionally, the possible role of aberrant anatomical variations of the related region in causing piriformis syndrome must be taken into consideration as one of the contributing factors.

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1. Introduction

In human anatomy, certain muscular and peripheral nerve variants may represent an unrecognized etiology. The muscular anatomical variations become apparent during the embryonic development. Despite resembling an improper or altered state of anatomical development, vast majority of these variations occur in a benign phenotype.¹

The piriformis muscle (PM) has a central location at the gluteal region. The sciatic nerve (SN) is the thickest nerve in the body and lies at the deep side of the PM. Considering this close anatomical proximity, the appearance of anatomical variations including PM and SN is not rare.^{2–5} Nevertheless, abnormalities of the SN and the PM can contribute to the occurrence of the piriformis syndrome (PS).^{3–5} The PS is known to cause to the non-discogenic sciatica and it usually occurs as secondary to the compression of the SN by abnormal PM.⁶ However, the possible role of aberrant anatomical variations of the related region in causing PS must be taken into consideration as one of the contributing factors, which is partly discussed in the current paper by referring to our case.

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2. Case report

A case displaying unilateral variant muscle distal to the PM accompanied with high divisions of SN were encountered during a routine lower extremity dissection (10% formalin-fixed, 64-year-old male cadaver) in the Human Anatomy Department of the Near East University. In order to clarify the relationship between the origin and insertion parts of the PM and variant muscle, the further dissection was performed. The relationship between the nerves and the muscles were also noted. Each phase of the dissection was visualized by digital camera.

The PM fibers were running laterally through the greater sciatic foramen and inserted to the apex of the greater trochanter (GT) of the femur. We also encountered the fibers which have belonged to the gluteus medius and minimus muscles reaching to the PM. The variant muscle was lying parallel and distal to the main PM. The fleshy part of the variant muscle was observed to be originating from the pelvic surface around fifth sacral segment and a small part of origin of the sacrotuberal ligament as separately from the PM. It was inserted into the medial side of the GT of the femur with its own tendon (Fig. 1). Based on the anatomical definitions of the variant muscle mentioned above, we suggest that this formation of the muscle can be described as an accessory piriformis muscle (APM), rather than a slip or a bundle of the PM.

Furthermore, by using a digital caliper, the length and width of the fleshy and tendinous part of the PM and the APM were

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Fig. 1. The photograph shows the APM and the SN divisions with the IGNs. PM: piriformis muscle, APM: accessory piriformis muscle, TN: tibial nerve, CFN: common fibular nerve, IGN: inferior gluteal nerve, GM: gluteus medius muscle, Gmin: gluteus minimus muscle, GMax: gluteus maximus muscle, black arrow: APM tendon, PFCN: posterior femoral cutaneus nerve, IGAV: inferior gluteal artery and vein.

measured. Accordingly, the lengths and widths of fleshy parts were recorded as follows; 4.0 and 2.8 cm for PM and 3.8 and 1.6 cm for APM. Additionally, the upper fibers of the PM were merged with the gluteus medius and minimus muscles throughout the 1.2 cm towards the insertion point. Gemelli and obturator internus muscles were found to be normal.

In close relation with the APM and PM, we observed a high division of the SN and other nerve variations. The SN diverged into the common fibular (CFN) and tibial (TN) divisions deep to the PM. We also observed two inferior gluteal nerves (IGN). The TN, one of the IGN and pudendal nerve were found to be emerging from the lower border of the APM, while the CFN, posterior femoral cutaneous nerve (PFCN) and the other IGN were located between the PM and the APM (Fig. 1). The CFN and TN were coursing separately throughout the posterior thigh.

Concerning the positioning to the vascular structures, superior gluteal vessels and nerve passed above the PM as normal. The inferior gluteal and internal pudendal vessels were passed below the APM (Fig. 1).

On the right side, any variant muscle has not been found. PM, course of SN and the other nerves were observed as usual.

3. Discussion

Extending from 2nd to 4th sacral segments to medial side of the lower border of the greater trochanter (GT) of the femur, the PM is settled closely on the course of almost all the neurovascular structures of the gluteal region. Since, the location of the PM is of utmost importance to the neurovascular structures of gluteal region; its' anatomical variations may present as a finding of clinical importance.

The existence of the aberrant slip of muscle fibers rising from the pelvic surface of sacrum is called the accessory bundle (slip) of the PM.^{3–5,7} As observed by Natsis et al.³ the two heads of double PM was described as superficial and deep heads. Accessory slip of PM has been described in recent literature and researchers indicated that the PM might have superior and inferior parts.^{3,5,7} In our case, in addition to the PM with its usual location and a normal size, the other muscle having its own apparent belly, independent origin and insertion was defined as an accessory muscle, rather than as a slip or a bundle of the PM.

Later reports have further emphasized on the incidence. descriptive anatomy and clinical significance of those SN and PM variations.⁵ In the case of Battaglia et al.⁴ PM was divided into two discrete bellies by the CFN, while the TN passed inferior and deep to the caudal border of the PM. Chapman and Bakkum⁶ presented MRI finding of patient with PS due to the accessory superior bundles of the right PM. Additionally, in another study including 30 cadavers, 20% of the PMs were found to have double heads and CFN were located between these two heads.⁸ On the other hand our case was differing from the previous reports by the following anatomical features: In addition to PM existence, the muscle with its own separate origin and insertion points was defined as APM. Due to the presence of an abberant muscle at the infrapiriform space, positional relation of the nerves which expected to pass together through the infrapiriform foramen has become complicated as the nerves originating from the dorsal part of the sacral plexus were apart from those of ventrals.

The nerve variations of the gluteal region show a diverse distribution based on its course and divisions/branches in the literature. High division of the SN is a well-known phenomenon in the thigh or pelvic regions.^{2,3,5} Either as an intact nerve body or as diverged fibers, SN may emerge above, below or through the PM. High division of the SN and the PM variations can cause compression of the nerve, thus resulting in piriformis syndrome (PS) and coccygodynia.^{5,6}

Uluutku and Kurtoglu² have considered the possible variations of the SN, PFCN, SGN and IGN. They remarked that the unusual located nerves are mostly originating from the dorsal part of the sacral plexus and contribute to positional variations in different combinations. As different from them, in our case, there was no muscle perforation. Besides the CFN, one of the IGN and PFCN, which all are from the dorsal part of the sacral plexus, emerged in a higher position then the nerves of the ventral part, as similar to Uluutku and Kurtoglu.²

Release of the PM fibers is considered for PS patients who do not respond to conservative methods. Frequently encountered intraoperative finding is that one or both components of the SN passed above or through the belly of the PM.⁹ It should be kept in mind that abnormal course of SN components would not be the only surprise in the region. The other nerves from the dorsal part of the sacral plexus can mostly accompany to SN abnormality.

In the present case, the fibers contributing from gluteus medius and minimus muscles to the lateral half part of PM have made the region more complicated. The PM fused with the gluteus medius is reported as 3.57% by Windisch et al.¹⁰ Conjoint PM and gluteus medius has been considered as an issue that needs to be taken into consideration regarding the posterior surgical approach for total hip replacement.¹¹

4. Conclusion

Most of the previous authors have reported the entrapment of the sciatic nerve or its divisions caused by the duplicated PMs. Similarly, the entrapment by the PM and APM could be considered as a potential cause of PS. In the light of all these findings, the possible existence of combined variations of the PM and related nerves, especially the nerves from the dorsal part of the sacral plexus, might be crucial to the certain surgical approaches for the gluteal region and must be acknowledged by the surgeons.

Conflict of interest

All authors declare that they have no conflict of interest and the case was not supported or funded by any drug company.

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References

- 1. Standring S. Gray's anatomy: the anatomical basis of clinical practice. *Pelvic girdle, gluteal region and thigh.* 40th Ed. Edinburgh (UK): Churchill Livingstone Elsevier; 2008:[17_TD\$DIFF]2481.
- 2. Uluutku MH, Kurtoğlu Z. Variations of nerves located in deep gluteal region. *Okajimas Folia Anat Jpn.* 1999;76(5):273–276.

- **3.** Natsis K, Totlis T, Konstantinidis GA, et al. Anatomical variations between the sciatic nerve and the piriformis muscle: a contribution to surgical anatomy in piriformis syndrome. *Surg Radiol Anat.* 2014;36(3):273–280.
- **4.** Battaglia PJ, Scali F, Enix DE. Co-presentation of unilateral femoral and bilateral sciatic nerve variants in one cadaver: a case report with clinical implications. *Chiropr Man Therap.* 2012;20(1):34.
- 5. Smoll NR. Variations of the piriformis and sciatic nerve with clinical consequence: a review. *Clin Anat.* 2010;23(1):817.
- 6. Chapman C, Bakkum BW. Chiropractic management of a US Army veteran with low back pain and piriformis syndrome comlicated by an anatomical anomaly of the piriformis muscle: a case study. J Chiropr Med. 2012;11(1):24–29.
- Cassidy L, Walters A, Bubb K, et al. Piriformis syndrome: implications of anatomical variations, diagnostic techniques, and treatment options. *Surg Radiol Anat.* 2012;34(6):479–486.
- Haładaj R, Pingot M, Polguj M, et al. Anthropometric study of the piriformis muscle and sciatic nerve: a morphological analysis in a Polish population. *Med Sci Monit.* 2015;21:3760–3768.
- Boyajian-O'Neill LA, McClain RL, Coleman MK, et al. Diagnosis and management of piriformis syndrome: an osteopathic approach. J Am Osteopath Assoc. 2008;108(11):657–664.
- Windisch G, Braun EM, Anderhuber F. Piriformis muscle: clinical anatomy and consideration of the piriformis syndrome. Surg Radiol Anat. 2007;29(1):37–45.
- 11. Solomon LB, Lee YC, Callary SA, et al. Anatomy of piriformis, obturator internus and obturator externus. J Bone Jt Surg Br. 2010;92(9):1317–1324.