An anatomical variation of unilateral higher division of sciatic nerve with bifid piriformis and its clinical implications

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ABSTRACT

Sciatic nerve shows many variations in its division, especially its high division. This variation (high division of sciatic nerve) may result in sciatica, nerve injury during deep intramuscular injections in gluteal region, piriformis syndrome, and failed sciatic nerve block in anesthesia and so on. A case of high divisions of sciatic nerve on left side in a 28-year-old male cadaver was encountered during routine dissection is presented herewith, along with some proposition in available classifications. Knowledge of these variations in course of sciatic nerve may help surgeons and all those who concern to avoid complication and plan their intervention in a better and more effective way.

Key words: sciatic nerve, piriformis muscle, tibial nerve, common peroneal nerve

INTRODUCTION

Sciatic nerve is the thickest nerve of body, arising from sacral plexus. Normally it emerges through the greater sciatic foramen, leaves pelvis and enters into gluteal region by passing below piriformis as a single nerve encompassed by a single epineural sheath. It then crosses posteriorly to the obturator internus, gamelli & quadratus femoris muscle. It divides subsequently into two terminal nerves i.e., tibial nerve and common peroneal nerve usually at the lower part of the posterior compartment of thigh. But sometimes it divides high, while still in pelvis into its terminal branches that leave pelvis in a number of ways. Accordingly, they are classified into different types in relation to piriformis muscle. High division of Sciatic nerve is usually unilateral and rarely bilateral. In this case report, we discuss a unilateral high division of sciatic nerve and its clinical implications like piriformis syndrome, incomplete block of sciatic nerve during popliteal block anesthesia, sciatica, coccygodynia and muscle atrophy.

CASE REPORT

During routine dissection for teaching purpose, a variation in a 28-year-old male cadaver was observed that had unilateral left-sided high division of sciatic nerve. Also, the piriformis was divided into superior and inferior divisions. The common peroneal nerve entered gluteal region by passing between two divisions of the piriformis, while tibial nerve emerged below lower border of inferior piriformis (Figure 1). The level of division of sciatic nerve was situated 44 cm above the joint line of the knee and 8 cm above the ischial tuberosity (hip bone). The thickness of sciatic nerve on left side was 2.3 cm (23 mm) while on the normal (right) side, it was 1.8 cm. Rest of the dissection was normal.
DISCUSSION

During embryological development at the base of the limb bud, the nerves contributing to the lower limb form two plexuses (lumbar and sacral). Later, as the elements from each of these plexuses grow out into the limb, they are subdivided into dorsal and ventral components, for the dorsal and ventral musculatures. The sciatic nerve is formed when the large dorsal component of the sacral plexus (common peroneal nerve) and the ventral component (tibial nerve) move downward close together. Hence, based on their previously mentioned developmental formation, it is possible that the common peroneal and the tibial divisions of the sciatic nerve separate from each other at different levels from their origins: within pelvis, in the gluteal region, the posterior compartment of the thigh or the popliteal fossa, as observed in this case. Various studies have reported on the level of sciatic nerve division into tibial and common peroneal nerves.

The reported incidence of sciatic nerve division before its exit in the gluteal region varies from 4% to 20.9% across different studies. In a study to measure the level of terminal division of the sciatic nerve sheath above the knee in 30 cadaver specimens, the estimated range varied from 50 to 180 mm above the popliteal fossa crease. Güvençer et al., observed high division of sciatic nerve in 48% of the cases with many variations; although in 52 % of the cases, the sciatic nerve exited the pelvis without any division. Smoll found the prevalence of this to be 16.9% in cadavers and 16.2% in surgical case series. This high division results in sciatica, nerve injury during deep intramuscular injections, piriformis syndrome, failed sciatic nerve block in anesthesia and injury during posterior hip operations.

There are different types of high divisions of sciatic nerve within pelvis, usually bilateral. As cited by Güvençer et al., among the many known classifications, the most popular is Beaton and Anson’s classification, who classified all variations under 6 types. However, it needs modification with addition of Type 7, i.e., divisions of sciatic nerve passing between and below the divided piriformis muscle. Classification by Okraszewska was more suitable and we could assign Type IIB for left side as it doesn't mention divided or undivided piriformis. These classifications are necessary, especially, for they help surgeons in assessing cause and site of compression of sciatic nerve and accordingly the treatment differs. This will also alert them to be more careful during surgeries. It is usually seen that when sciatic nerve shows high branching pattern, one of the branch pierces piriformis, but divided piriformis is not usually seen. The latter is said to be a very important cause of piriformis syndrome, as common peroneal nerve passing between two divisions gets compressed and irritated. However studies by Machado et al., (100 cases) and Ugrenovic et al., (200 cases) failed to find even a single divided piriformis. Incidentally, Jawish et al., found only one case of divided piriformis among 26 cases selected from 3550 cases complaining of sciatica. Demiryurek et al., also mentioned a case of bilaterally divided piriformis. Unilateral higher division of sciatic nerve is still rare. Diagnosis of unilateral division of piriformis is very important, as this will solve dilemma of surgeons as to why the symptoms, signs and also the effects of treatment of piriformis syndrome differ on two sides in same person. Mas et al., have also reported a case of bilateral high division of sciatic nerve but with tibial nerve passing under gemelleus superior, unlike the present case wherein common peroneal nerve is passing between two heads of piriformis. Combinations of these variations– high divisions of sciatic nerve on left side and unilateral divided piriformis makes this case very interesting among its types.

CONCLUSION

Knowledge of anatomical variations in gluteal region is imperative for surgeons, as this is the area of frequent surgical manipulation. A thorough knowledge of different variations will help surgeon to be careful and serve to plan various surgical
interventions and management in this region. This also encourage radiologist to repeat MRI on other side, keeping in mind that there can be differences on two sides. This knowledge will also play a vital role in preventing deep intramuscular injection hazards in gluteal region.

REFERENCES