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RELATIONSHIP BETWEEN THE SCIATIC NERVE AND PIRIFORMIS MUSCLE

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Abstract- The sciatic nerve begins in pelvis and normally leaves the pelvis by passing through the greater sciatic foramen below the piriformis muscle. Normally it terminates at the superior angle of the popliteal fossa by dividing into the tibial and common peroneal nerve. However, it may rarely be terminated within the pelvis. In such cases, the tibial nerve and the common peroneal nerve may leave the pelvis through different routes. These variations may cause nerve compressions under other anatomic structures, resulting in non-discogenic sciatica. The aim of present study was to define the relationship between the sciatic nerve and the piriformis muscle. 100 gluteal regions were examined in 50 properly embalmed adult male cadavers. In 96% of the cases, the exit of sciatic nerve from the pelvis was observed as a whole nerve without any division, whereas in 4% of the cases, the tibial branch of the sciatic nerve left the pelvis through the infra piriform foramen and common peroneal branch through the piriformis muscle. The differences in the exit routes of these two nerves are important in clarifying the clinical etiology of non discogenic sciatica.

Keywords- Greater sciatic foramen, Piriformis syndrome, Sciatica, Anatomic variation,

INTRODUCTION

The sciatic nerve is thickest nerve in the body. It is almost 2 cm wide at its origin near the sacral plexus. The sciatic nerve is formed in the pelvis by joining anterior divisions of L4, L5, S1, S2, S3 spinal nerve roots. It has two separate nerve trunks, the tibial nerve and the common peroneal nerve enveloped by a common fascial sheath (epineural sheath). These two trunks leave the pelvis through the greater sciatic foramen below the piriformis muscle (infra piriform foramen). The nerve passes along the back of the thigh, and divides into the tibial and common peroneal nerves, at the superior angle of the popliteal fossa. The tibial nerve is formed by the ventral division of the anterior primary rami of L4, L5, S1, S2, S3 and common peroneal nerve is formed by the dorsal division of the anterior primary rami of L4, L5, S1, and S2. Previous studies reported a variety of different anatomic relations between the sciatic nerve and the piriformis¹. The undivided nerve may emerge above, below or through the piriformis muscle. The major

divisions of the nerve may lie either side of the muscle, or (the most common variant) one division either above or below. The evidence of each variation may cause different clinical presentation. It is known that each anatomical variation may reflect a different and a case specific clinical presentation². This requires a detailed description of anatomical variations. The aim of this study was to find out the anatomical variation between the sciatic nerve and the piriformis muscle if any.

MATERIAL AND METHOD

A total number of 50 adult male properly embalmed cadavers with no pathology were used for this study in Government Medical College Haldwani, Nainital, Uttarakhand. 100 gluteal regions of these 50 adult male cadavers were dissected to expose the piriformis muscle and sciatic nerve. Following proper exposure of the gluteal regions, the evidence of variation in relationship of piriformis and the sciatic nerve was recorded.

peroneal nerve (CPN) passes between two heads of piriformis and the tibial nerve (TN) passes under the piriformis muscle is given below [7-11].

RESULTS

It is observed that in 96% specimens of gluteal region, the sciatic nerve leave the pelvis as undivided nerve through the infra piriformis portion of greater sciatic foramen without any variation from normal course, while observations in 4% cadavers demonstrated that common peroneal nerve passed through the piriformis and the tibial nerve through the infra piriformis portion of greater sciatic foramen in gluteal regions (bilaterally on one of the cadavers and unilaterally on 2 cadavers). The photograph of the right gluteal region showing common

DISCUSSION

The finding of anatomical variation in course of sciatic nerve in present study is in agreement with the report of incidence of sciatic nerve division before its exit in gluteal region by Ugrenovic et al [3].

Previous anatomical studies demonstrated 4-48% variation in the relationship between the piriformis and

the sciatic nerve [4-6]. During embryonic stage of development lumbar and sacral plexuses are formed at the base of lower limb bud. As these plexuses grow out into the limb the sciatic nerve is formed when the large dorsal component of sacral plexus (common peroneal nerves) and the ventral component (tibial nerve) of sacral plexus move downward close together. Based on developmental formation, it is possible that common peroneal and tibial nerves separate from each other at different levels from their origins.

The sciatic nerve may be divided into the tibial and common peroneal nerves in the pelvis, and each nerve can leave the pelvis using a separate route. Moore K.L. [1], reported that the common peroneal nerves passed through the piriformis, and the tibial nerves passed through the infra piriformis in 12.2% of the specimens, and that the common peroneal nerves passed through the supra piriformis, and the tibial nerves passed through the infra piriformis in 0.5% of the specimens in a study conducted on 650 extremities (Table I).

Chiba S [4], reported that common peroneal nerves passed through the piriformis in 34% of the cases in another study using 514 extremities. The rate of this variation was higher than other published rates (Table I). Machado et al [5], performed gluteus dissection in 100 fetuses and reported three types of variation, including type -1 where the common peroneal nerves penetrated the piriformis and the tibial nerve passed under the piriformis (16%), type- 2 where the common peroneal nerves passed above the piriformis and the tibial nerve passed under the piriformis and type- 3 where the sciatic nerve penetrated the piriformis (Table I). The passage of the sciatic nerve through the piriformis was also reported by Pecina² in 22% of 130 cadavers. It included penetration of the piriformis by the sciatic nerve in 5%, and presence of the piriformis with two heads in 17%. The same rate was reported to be 7% by Beaton L.E. [6]. Ugrenovic et al [3], found high division of the sciatic nerve in 27.5% of the specimens in a cadaveric study performed in 100 fetuses. The sciatic nerve left the pelvis through the infra piriformis in 96% of 200 gluteal regions. The sciatic nerve passed through the infra piriformis in

2.5% of the specimens, and the common peroneal nerves passed through the supra piriformis and the tibial nerve passed through the infra piriformis in 1.5% of the cadavers. Mustafa Guvencer et al⁷ observed that in 50 adult male cadavers, the sciatic nerve left the pelvis through the infra piriformis in 76% of 50 gluteal regions. The common peroneal nerves passed through the infra piriformis in 16% of the specimens, and the tibial nerve passed through the infra piriformis in 8% of the specimens.

REFERENCES

- [1] Moore K.L., Dalley A.F. (1999) *Clinical Oriented Anatomy, 4th edition, Baltimore Lippincott Williams Wilkins*, 558.
- [2] Pecina M: Contribution to the etiological explanation of the piriformis syndrome. *Acta Anat (Basel)* 105:181-187, 1979
- [3] Ugrenovic S., Jovanovic I., Krstic V., Stojanovic V., Vasovic L., Antic S., Pavlovic S. (2005) *Vojnosanit Pregl.* 62(1):45-49.
- [4] Chiba S. (1992) *Kaibogaku Zasshi* 67(6): 691-724.
- [5] Machado F.A., Babinski M.A., Brasil F.B., Favorito L.A., Abidu-Figureiedo M., Costa M.G. (2003) *Int J Morphol* 21(1): 29-35.
- [6] Beaton L.E. (1938) *J Bone Joint Surgery Am*, 20: 686-688.
- [7] Mustafa Guvencer, Cihan I., Pinar A., Suleman T., Sait N. (2009) *Turkish neurosurgery*, 19.No. 02, 139-144.
- [8] Beaton L.E., Anson B.J. (1937) *Anat Rec* 70: 1-5.
- [9] Uluutku M.H., Kurtoglu Z. (1999) *Okajimas Folia Anat Jpn* 76(5): 273-276.
- [10] Pokorny D., Jahoda D., Veigl D., Pinskerova V., Sonsa A. (2006) *Surg Radiol Anat.*, 28: 88-91.
- [11] Ozaki S., Hamabe T., Muro T. (1999) *Orthopedics* 22(8): 771-772.

Table I-Relationship between the Sciatic Nerve and Piriformis muscle.

| S.N. | | Type 1 | Type 2 | Type 3 | Type 4 | Type 5 | Type 6 |
|------|---------------------------------------|--------|--------|--------|--------|--------|----------|
| 1. | Beaton & Anson 120 cadavers | 84.2% | 11.7% | 3.3% | 0.8% | | |
| 2 | Beaton 240 cadavers | 90% | 7.1% | 2.1% | 0.8% | | |
| 3 | Uluutku & Kurtoglu 25 fetuses | 74% | 16% | 10% | | | |
| 4 | Moore & Dalley 650 extremities | 87.3% | 12.2% | 0.5% | | | |
| 5 | Chiba 514 extremities | 66% | 34% | | | | |
| 6 | Machado et al. 100 fetus extremities | 82% | 16% | 2% | | | |
| 7 | Pecina 130 cadavers | 93.1% | 6.15% | | | | |
| 8 | Ugrenovic et al. 100 fetuses | 96% | 2.5% | 1.5% | | | |
| 9 | Pokorny et al. 91 cadavers | 79.1% | 14.3% | 4.4% | 2.2% | | |
| 10 | Ozaki et al | | | | | | One case |
| 11 | Mustafa Guvencer et al 50 extremities | 76% | 16% | 8% | | | |
| 12 | Current study 100 extremities | 96% | 4% | | | | |

Beaton & Anson classified relationships of the piriformis and sciatic nerve in 120 specimens in 1937, and in 240 specimens in 1938. Their classification, known as the Beaton & Anson classification, is as follows;

Type 1: Undivided sciatic nerve passes below undivided piriformis muscle

Type 2: Divisions of sciatic nerve passes between and below divided piriformis muscle

Type 3: Divisions of sciatic nerve passes above and below undivided piriformis muscle

Type 4: Undivided sciatic nerve passes between heads of divided piriformis muscle

Type 5: Divisions of sciatic nerve passes between and above heads of divided piriformis muscle

Type 6: Undivided sciatic nerve passes above undivided piriformis muscle

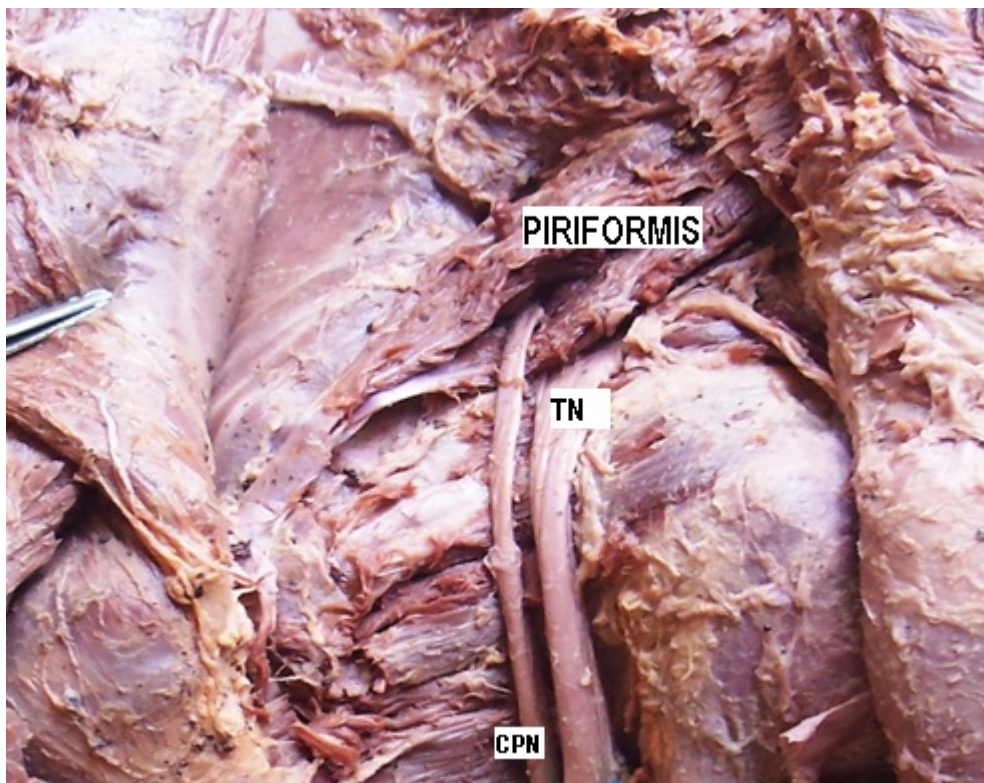


Fig. 1