ORIGINAL RESEARCH PAPER

Volume-8 | Issue-5 | May-2019 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

UNILATERAL HIGH DIVISION OF SCIATIC NERVE: A CASE REPORT

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ABSTRACT

Sacral plexus is the point of formation of many nerves which innervates the lower limb and perineum. They are found in the dorsal pelvic wall, ventral to the Piriformis, gives many branches including sciatic nerve. Among all the branches of sacral plexus, Sciatic Nerve variation is relatively common. During the routine cadaver dissection at PG department of Rachana Sharira, JSAM, Nadiad, a unilateral high division in the sciatic nerve was found in 61 year old female cadaver. The awareness of this anatomical variation is important as the nerve piercing the Piriformis muscle may compressed within the fibres of Piriformis which may cause unusual pain along the course of nerve. The knowledge of anatomical variations in the peripheral nerves is essential in the clinical as well as surgical set up.

AIMS & OBJECTIVES:

(1) To study the course and branches of Sciatic nerve in cadaver.
(2) To analyze the sciatic nerve in relation to the piriformis in cadaver.

KEYWORDS

Piriformis, Sciatic nerve, Sacral Plexus

INTRODUCTION:

The sacral plexus is formed by the lumbosacral trunk ($L_{4,5}$ ventral rami) and ventral rami of upper sacral nerves ($S_{1,2,3,4}$)[1]. This plexus is situated largely anterior to the sacrum. The sacral plexus supplies the buttocks, perineum, and lower limbs[2]. Sciatic nerve is the continuation of the upper band of the sacral plexus[3]. It is widest nerve of the body, about 2 cm broad and consists of Tibial and common peroneal components, both of which form initially a common trunk. The tibial component is derived from the ventral division of the ventral rami of L4, L5, S1, S2 and S3 and common peroneal component from the dorsal division of the ventral rami of L4, L5, S1, and S2[4,5,6].

The sciatic nerve appears through the greater sciatic foramen beneath the Piriformis and curving infero–laterally descends beneath the gluteus maximus midway between the ischial tuberosity and greater trochanter. In the gluteal region it rests successively on the dorsal surface of the body of ischium separated by nerve to quadratus femoris, tricipital tendon of obturator internus with gemelli superior and inferior, quadratus femoris and adductor magnus. In the back of thigh the sciatic nerve emerges from the lower border of gluteus maximus and passes straight downward deep to the long head of biceps femoris, resting on the adductor magnus. Beneath the biceps femoris, at a variable distance above the popliteal fossa, it divides into two terminal branches – tibial and common peroneal nerves.

At the back of thigh the nerve is crossed superficially by the long head of biceps femoris, and close to the upper angle of popliteal fossa it divides into tibial and common peroneal nerves[1].

MATERIALS AND METHOD

During the routine dissection of gluteal region of 61 year old female cadaver fixed with 10% formalin at PG department of Rachana Sharir, JSAM, Nadiad, the origin, course, division and branches of the Sciatic nerve was assessed. Gluteal region, posterior compartment of thigh, popliteal fossa was exposed. By cutting gluteus maximus, piriformis muscle was exposed; the biceps femoris muscle was traced and retracted. The emergence of sciatic nerve in relation to piriformis, its division and course was examined for any possible variation and the observed measures were recorded. Suitable photographs were taken.

OBSERVATION AND RESULT:

In the present study of 61 year female cadaver during the dissection of gluteal region, we found the high division of left sciatic nerve in orientation to piriformis. Left common peroneal nerve was piercing the piriformis muscle fibres while entering the gluteal region, where as left tibial nerve entered gluteal region beneath the piriformis without piercing any of its fibres. Rest of the course and branches of nerve was normal. In the right gluteal region the SN nerve exits normally below the piriformis muscle. Division of the right sciatic nerve was observed at the superior angle of the popliteal fossa. No variation was found in branching pattern.

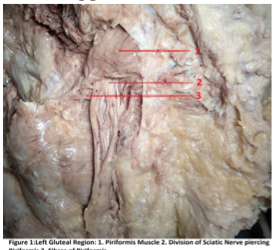

Figure 1:Left Gluteal Region: 1. Piriformis Muscle 2. Division of Sciatic Nerve piercing Piriformis 3. Fibres of Piriformis

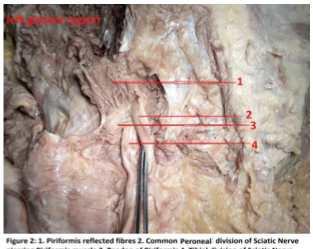

Figure 2: 1. Piriformis reflected fibres 2. Common Peroneal division of Sciatic Nerve piercing Piriformis muscle 3. Tendon of Piriformis 4. Tibial division of Sciatic Nerve

DISCUSSION:

Sciatic nerve gives its terminal branches tibial nerve and common peroneal nerve in the upper angle of popliteal fossa[6]. High division of Sciatic nerve is one of the common variations evidenced by the anatomists. Sciatic neuropathy is the second commonest mono neuropathy of the lower limb[7]. The extent of the neuropathy may also depend on its level of division. In the present case study high division of sciatic nerve in pelvis with common peroneal nerve passing through the piriformis muscle and the tibial nerve passing beneath the muscle was noted. This kind of variations has been termed as Beaton and Anson type2[8].

Table 1: Beatons and Ansons classification of SN division[9]:

Types of division of SN	Level of division of SN
Type 1	Undivided nerve below undivided muscle
Type 2	Division of nerve between and below undivided muscle
Type 3	Division above and below undivided muscle
Type 4	Undivided nerve between heads.
Type 5	Division between and above heads.
Type 6	Undivided nerve above undivided muscle

Sciatica is a painful condition caused by spinal degenerative disc or spinal radiculopathies and 6-8% by piriformis syndrome[9]. The entrapment of sciatic nerve by piriformis muscle while it exits greater sciatic foramen may cause piriformis syndrome[10]. Etiology of piriformis syndrome is not completely understood, but anatomical variation of sciatic nerve in relation to piriformis muscle has been suspected as one of the cause for developing piriformis syndrome[11,12].

Table 2: High level division of SN in earlier studies:

Sl. No	Name of the author	Percentage of high division of SN, (CPN piercing piriformis)	Year
1.	Lewis S et al[13]	8.8% (102 cadavers)	2016

2.	Konstantinos Natis et al[14]	4.1 % (275 cadavers)	2014
3.	Singh A K [15]	4% (100 cadavers)	2011
4.	Ogeng'o JA et al[16]	7.9% (164 cadavers)	2011
5.	Mustafa Guvencer et al[17]	14%(50 cadavers)	2009
6.	Ugrenovic et al[18]	2.5% (100 cadavers)	2005
7.	4 Gabrielli et al[19]	11.2% (80 cadavers)	1997
8.	Chiba S[20]	34% (175 cadavers)	1992
9.	Beaton L E & BJ Anson[21]	7% (240 cadavers)	1938
10.	Beaton L E & BJ Anson[22]	11% (120 cadavers)	1937

It is important to understand the embryological basis behind the high division of sciatic nerve in relation to piriformis muscle. Immediately after being formed, a mixed spinal nerve divides into dorsal and ventral primary rami. The major nerve plexuses (cervical, brachial, and lumbo- sacral) are formed by ventral primary rami. The dorsal division of the trunks of these plexuses supplies the extensor muscles and the extensor surface of the limbs; The ventral division of the trunks supplies the flexor muscles and the flexor surface. Tibial nerve which is a branch of ventral division of sacral plexus and common peroneal nerve which is a branch of dorsal division of sciatic nerve are formed separately during early embryological life. Though they are formed separately both components are enclosed by a connective tissue sheath (epineural sheath) [23]. Hence there is possibility of division of nerve in different levels like pelvis, gluteal region, posterior thigh, just above popliteal fossa.

Identifying the anatomical variation is imperative to plan efficient management for piriformis syndrome. These kinds of variation have considerable clinical significance, in surgeries of gluteal region hip joint[24], intramuscular injection in gluteal region[25], neurology, orthopedics, rehabilitation, anesthesia and radiology. During the surgeries of ankle and foot sciatic nerve is blocked 5 to 7 cm above the transverse popliteal crease. High division of sciatic nerve may lead to failure of sciatic block [26].

CONCLUSION

Though the entrapment neuropathies in peripheral nerve which we have disclosed here is frequent and may not alter the normal functioning of the lower limb muscles, interpretation of such variation is essential concerning treatment of traumatology of the hip joint, reconstructive operations, as well as to the anesthetist performing pain management therapies on the lower limb. The sciatic nerve variation can affect the clinical symptoms, particularly in patients with piriformis syndrome and other non discogenic sciatica.

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