Research Paper Medical Science

Study of Sciatic Nerve At The Level Of Its Bifurcation in Human Cadavers

*** Vandana K. Punase** M.B.B.S. , M.D. (Anatomy) Demonstrator Department of Anatomy. * Corresponding author

ABSTRACT

Aim: To study the level of division of sciatic nerve.

Materials & Methods : Study was carried out in Department of Anatomy, JNMC, Sawangi (Meghe) Wardha. 30 adults (M 24 + F 6)formalin fixed ,normal cadavers were used for this study i.e.; 60 inferior extremities were studied by dissection. The inferior extremities were classified into five groups depending on the level of sciatic nerve division. variations noted recorded & photographs taken.

Results: The highest incidence of sciatic nerve division was observed in popliteal fossa 43.3%. In 26.6% cases sciatic nerve division was observed in gluteal region, 10% Sciatic nerve division in upper 1/3rd of thigh, 6.7% sciatic nerve division in middle 1/3 of thigh and sciatic nerve division in lower 1/3rd of thigh was 13.4% .

Conclusion: There is variation in the site of division of sciatic nerve. The knowledge of this variation is necessary for the surgeons during operation of posterior compartment of thigh.

KEYWORDS : Common Peroneal Nerve, Sciatic Nerve, Tibial Nerve, Piriformis Muscle, cadaver

Introduction:

The sciatic nerve is the thickest nerve in the body. It is almost 2 cm wide and 0.5 cm thick at its origin near the sacral plexus. It is the largest branch of the lumbosacral plexus**.** It is formed by ventral rami of L4, L5, S1, S2, and S3. It is. The nerve leaves the pelvis through the greater sciatic foramen below the piriformis muscle. Then it descends on the posterior surface of the obturator internus, two gemelli and quadratus femoris muscle and divides into its two divisions the tibial and common peroneal nerve. Tibial nerve is derived from the anterior divisions of the sacral plexus(L4, L5, S1–3). The Common peroneal nerve is derived from the posterior divisions of the sacral plexus(L4, L5, S1, S2). The division is generally seen near the superior angle of popliteal fossa. These two nerve trunks are enveloped by a common fascial sheath representing epineurium of the nerve. [1] Several authors have reported variations of its division into tibial and common peroneal nerve from the sacral plexus to the lower part of popliteal fossa. [2,3, 4,] The early division of sciatic nerve can be unilateral or reason for incomplete block of sciatic nerve and have a clinical significance in the etiology and pathogenesis of sciatica. In some cases, when the division is high up in the pelvis, the common fibular branch may pass through the piriformis muscle leading to compression of nerve resulting in piriformis syndrome [5]. During popliteal block anesthesia higher division of sciatic nerve may also be the reason for incomplete block of sciatic nerve and have a clinical significance in the etiology and pathogenesis of sciatica.

Materials & Methods :

The study was conducted over a span of 3 years at JNMC Sawangi (M) wardha, Maharastra, India. Dissection was carried out according to the dissection steps given in Cunningham's manual of practical anatomy. A total of 30 properly embalmed and formalin-fixed cadavers (24 male and 6 female) were studied. Both the inferior extremities (n = 60) were dissected in order to expose the sciatic nerve, including its division into the tibial and common peroneal nerves. They were categorised into five groups (A–E), depending on the level of division of the sciatic nerve into the tibial and common peroneal nerves. In the cadavers in Group A, the sciatic nerve divided in the gluteal region. In Group B, Group C, Group D, it divided in the upper, middle and lower region of the back of the thigh, respectively, and in Group E, the sciatic nerve divided in the popliteal fossa. The variations noted recorded and photographs taken.

Results: 30 cadavers were classified into five groups depending on the level of sciatic nerve division.

Group	Anatomical region	60 lower extremities	%
A	Gluteal region	16	26.6
B	Upper 1/3 of back of the thigh	6	10.0
C	Middle 1/3 of back of thigh	4	6.7
D	Lower 1/3 of back of thigh	8	13.4
E	Popliteal fossa	26	43.3

PIRI

Figure 1: Sciatic nerve division in Rt Gluteal region

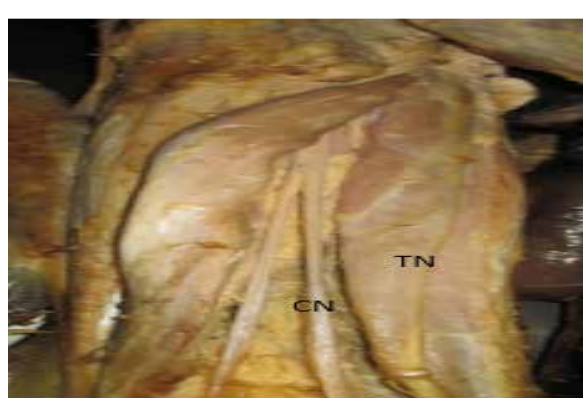

Figure 2: Sciatic nerve division in upper 1/3rd of

Figure 3: Sciatic nerve division in middle 1/3rd of thigh

Figure 4: Sciatic nerve division in lower 1/3rd of thigh

Figure 5: Sciatic nerve division in popliteal fossa

Discussion:

The variations of the bifurcation of sciatic nerve are seen at different level. this bifurcation can be at lower level that is in popliteal fossa or posterior compatment of thigh or at upper level that is in gluteal region. various studies have reported different levels of bifurcation of sciatic nerve. In present study all 60 extremity present with emergence of undivided sciatic nerve below the piriformis muscle. In present study in Group A the division of sciatic nerve into Tibial and Common peroneal nerve observed in gluteal region 26.6% and Prakash et al.observed 2.3%. In Group B division of sciatic nerve in upper 1/3rd of thigh was 10% where as Prakash et al. observed 3.5%. In Group C middle 1/3rd of thigh 6.7% and Prakash et al. observed 2.3%, in Group D lower 1/3rd of thigh 13.4% and Prakash et al.40.7%.[6]

Division of sciatic nerve in popliteal fossa was observed in 43.3% in present study which was highest, Prakash et al. noted35%, Ugrenovic et al. reported in 72.5%, Ewa et al.observed 62%. [2, 7]

Study done by Muthu kumar T et al. found that division of sciatic nerve in gluteal region 8%, in upper 1/3rd of thigh 14%,in middle 1/3rd of thigh 38%, in lower 1/3rd of thigh 8% and in popliteal fossa 32%.[8] R R Karambelkar et al. found that division of sciatic nerve in gluteal region 11.1%, in upper 1/3rd of thigh 6.6%, in middle 1/3rd of thigh 4.4%, in lower 1/3rd of thigh 70.0% and in popliteal fossa 7.78%.[9] In present study the division of sciatic nerve is observed maximum in the popliteal fossa and minimum in the middle 1/3rd of thigh whereas Muthu kumar T et al. found maximum in middle 1/3 rd of thigh, and R R Karambelkar et al. found maximum in lower 1/3rd of thigh.

Conclusions:

There is variation in the site of division of sciatic nerve. The knowledge of this variation is necessary for the surgeons during operation of posterior compartment of thigh. This may be the region of incomplete block during pelvic anesthesia. This high division may result in sciatica nerve injury during deep intramuscular injections in gluteal region & piriformis syndrome. So this these types of variations should be kept in mind not only while dealing with lower limb surgeries but also differential diagnosis of nondiscogenic sciatica.[10]

References:

1. Standring S: Gray's Anatomy, The anatomical basis of clinical practice. 39. edi. Spain: Elsevier Churchill Livingstone, 2005:1403,1404,1446.
2. Ugrenovic S, Jovanovic I, Krstic V, Stojanovic V, Vasovic L, Antic S, Pavlovic S: The level of the sciatic nerve division and its relations to the piriform muscle. Vojnosanit Pregl 2005;62(1): 45–49
3. Silver JK, Leadbetter WB: Piriformis syndrome: Assessment of current practice and literature review. Orthopedics 1998; 21(10): 1133–5.
4. Beaton LE and Anson BJ: The relation of the sciatic nerve and its subdivisions to the piriformis muscle. Anat Rec. 1937;70(1):1-5.
5. Pecina M. Contribution to the etiological explanation of the piriformis syndrome. Acta Anat (Basel).1979;105:181–7.
6. Prakash, Bhardwaj AK, Devi MN, SrideviNA, Rao PK and Singh G: Variation in the high division of the sciatic nerve and relationship between the sciatic nerve and the piriformis. Singapore Med J. 2010;51(9):721.
7. Ewa Okraszewska, Łukasz Migdalski, Kazimierz S. Jedrzejewski, Wojciech Bolanowski. Sciatic nerve variations in some studies on the Polish population and its statistical significance. Folia Morphol Vol. 61, No. 4, pp. 277–82.
8. Muthu kumar T, at al. A cadaveric study of sciatic nerve and its level of bifurcation. J Of Clinical And Diagnostic Research.2011;(8),1502-1504.
10. Karambelkar R R, Shewale A D, Umarji B N. Study of variations in the divisions o, course and termination of the sciatic nerve. Journal Of Krishna Institute Of Medical Sciences University. Jan 2013; vol. 2(1):62-67. ISSN 2231-4261
11. Pooja Rani, Sunita Kalra. A cadaveric study of normal and variant levels of division of sciatic nerve and coupled anomalies with clinical application in surgical interventions. Int J Anat Res 2015, 3(3):1230-36. ISSN 2321-4287 123
12. Ozaki S, Hamabe T, Muro T. Piriformis syndrome resulting from an anomalous relationship between the sciatic nerve and piriformis muscle. Orthopedics 22(8): 771–772, 1999