Original Research Paper

Volume-9 | Issue-7 | July - 2019 | PRINT ISSN No. 2249 - 555X

Anatomy

A CADAVERIC STUDY ON VARIATIONS IN THE LEVEL OF BIFURCATION OF SCIATIC NERVE

Dr Sunnapu Umamaheswara Rao	Associate Professor, Department of Anatomy, Andhra medical college, Visakhapatnam, Andhra Pradesh, India,
Dr L Lakshmi sailaja*	Associate Professor, Department of Anatomy, Andhra medical college, Visakhapatnnam, Andhra pradesh, India. *Corresponding Author
Dr A Vasanthi	Associate Professor, Department of Anatomy, Rangaraya medical college, Kakinada, Andhra Pradesh, India.

ABSTRACT sciatic nerve is a main nerve of back of thigh formed in the pelvis by the union of ventral rami of L4 ,L5 ,S1 ,S2 ,S3 Spinal nerves . After formation the nerve leaves the pelvis through the greater sciatic foramen below to the pirifomis muscle which belongs to gluteal region , later it runs in back of thigh at the level of superior angle of popliteal fossa ,the nerve is divided into tibial nerve & common peroneal nerve.sometimes ,the nerve may be divided in the gluteal region above to pirimis /below to pirifomis musle.To know such type of higher level of division of nerve the following study is conducted ,which is very beneficial to general surgeons & orthopaedicians. Total 50 lower limb specimens are used for conducting the following study in a Department of Anatomy , Andhra medical college ,Visakhapatnam & Government medical college ,Ananthapuram.

KEYWORDS : sciatic nerve ,tibial nerve ,common peroneal nerve ,piriformis muscle.

INTRODUCTION :

Sciatic nerve is a longest and thickest nerve in the body.It is formed by by the joining of ventral divisions of anterior primary rami of L4 ,L5 ,S1 ,S2 ,S3 spinal nerves. At the begining the nerve is having a width of 1.5 -2cm. After origin ,from the sacral plexus it enters into pelvis .With in the pelvis the nerve is present infront of piriformis muscle.later the nerve enters into gluteal region through the greater sciatic foramen below to the level of piriformis. Then the nerve running downward with lateral convexity in between greater trochanter and ischial tuberosity into the posterior compartment of thigh.Most commonly at the superior angle of popliteal fossa , sciatic nerve is divided into 2 terminal branches tibial nerve and common peroneal nerve. Branches of nerve supplying to muscles of posterior compartment of thigh ,hip joint and knee joint.

Sciatic nerve is having so many variations regarding its bifurcation.The nerve is dividing at a higher level frequently into 2 terminal branches.The bifurcation is taken pace with in the thigh or in the pelvis. If the bifurcation is with in the pelvis ,branches or nerve is emerging through the piriformis ,above or below to piriformis muscle in gluteal region.Usually higher division of nerve leading to group of compression symptoms .Abnormal bifurcation of nerve leading to injury of nerve during surgical procedures in gluteal region ,back of thigh region.Nerve injury leads to weakness of hamstring group of muscles and few sensory disturbances. So ,we want to do study on variations in the level of bifurcation of sciatic nerve ,which is very useful to surgeons .

MATERIALS AND METHODS:

During routine anatomical dissection for 1st year MBBS students in Anatomy department , Andhra medical college ,Visakhapatnam & Government medical college ,Ananthapuramu ,Andhra pradesh about 50 lower limbs are used as a material for conducting the study.To observe the variations of sciatic nerve ,gluteal region ,posterior compartment of thigh and popliteal fossa regions are exposed clearly during dissection.Gluteus maximus is cut & reflected , biceps femoris is retracted then the nerve is exposed up to popliteal fossa.Mode of leaving of nerve from the pelvis , its relation to piriformis and at what level the nerve is divided is observed & recorded.

RESULTS :

In my present study totally 50 gluteal regions & lower limbs are observed for abnormality in the course & level of division of sciatic nerve.Out of 50 limbs , in 42 limbs (84%) the nerve is having a normal course i.e sciatic nerve after emerging below the piriformis ,runs in the back of thigh and bifurcated at superior angle of popiteal fossa.out of 50 limbs , 8 limbs (16%)showing varation in the bifurcation of nerve.out of 8 limbs ,in a 7 limbs (14%) sciatic nerve is bifurcated in a gluteal region after emerging below the piriformis .Out of 8 limbs , in a 1 limb (2%) bifurcation of nerve is observed in lower one third of back of thigh. In the above same cadaver on right side bifurcation is observed at usual level i.e at superior angle of politeal fossa ,but in left lower limb bifurcation is seen in lower one third part of back of thigh.in these 8 limbs most of the right and left lower limbs are showing bifurcation with in the gluteal region ,later both the tibial nerve & common peroneal nerve are having a usual course in back of thigh , popliteal fossa & back of leg region .In 8 limbs ,1 limb is showing a bifurcation of nerve after having a shorter course in gluteal region later both the nerves are having a usual course. In our study we are not getting the cases of trifurcation of nerve and piercing of piriformis by the branches of sciatic nerve.

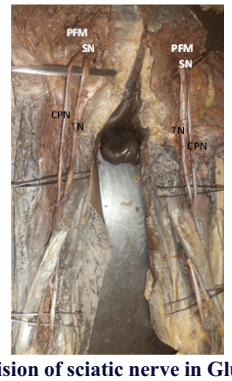

Fig 1 : Showing division of sciatic nerve in Gluteal region on both sides (PFM – Pirifomis muscle ,SN – Sciatic nerve ,TN – Tibial nerve ,CPN – Common peroneal nerve)

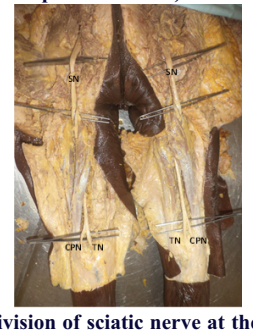

Fig 2 : Showing division of sciatic nerve at the superior angle of popliteal fossa on both sides

Fig 3 : Showing division of sciatic nerve on right side at lower 1/3 of back of thigh ,on left side at the superior angle of Popliteal fossa (RT – Right side ,LT – Left side)

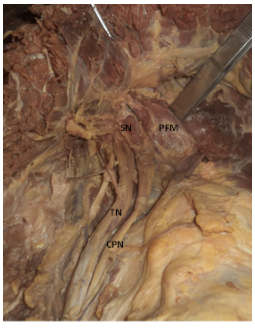

Fig 4: Showing division of nerve below to the level of piriformis muscle (PFM) in Gluteal region

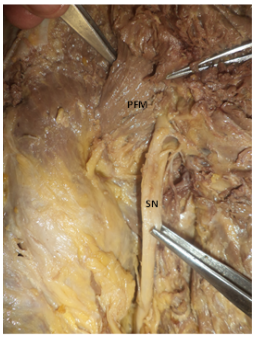

Fig 5 : Showing undivided sciatic nerve in Gluteal region

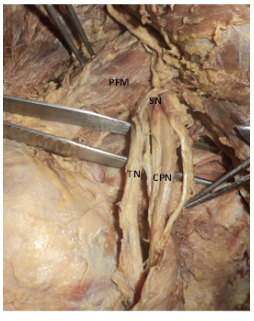

Fig 6 : Showing division of sciatic nerve in Gluteal region below to the level of Piriformis muscle

DISCUSSION :

Table 1 : showing comparison of studies regarding the level of division of sciatic nerve

Author	No of specimens	Percentage of Limbs showing Bifurcation of nerve in pelvis /Gluteal region	Percentage of Limbs showing Bifurcation of nerve at superior angle of popliteal fossa
Gabrielli et al .,1997	40	13.7%	86.3%
Ugrenovic et al .,2005	100	4%	96%
Pokorney et al.,2006	91	20.9%	79.1%
Prakash et al.,2010	43	16.3%	83.7%
Guvencer et al.,2010	25	48%	52%
J.A.Ogeng 'o et al .,2011	164	20.1%	79.9%
Mallikarjun adibatti et al.,2014	50	8%	92%
Anbumani T.L et al.,2015	50	18%	82%
Present study	50	16%	84%

Sciatic nerve is usually divides in popliteal fossa at its upper angle into tibial nerve & common peroneal nerve.In our present stuy 84 % of cases (42 limbs) are following the standard text book description .higher division of sciatic nerve in gluteal region is observed in 14% of cases (7 limbs),where as in only 2% of cases (1 limb) division is observed in back of thigh.According to Gabrielli et al (1997) *(3),*out of 40 specimens in 13.7 % cases sciatic nerve is bifurcated in gluteal region and in 86.3 % of cases the nerve is bifurcated in popliteal fossa.In ugrenovic et al (2005) *(18)* study in 4% of cases the nerve is bifurcated in gluteal region ,in 96% of cases it is bifurcated in popliteal fossa.Where as in a pokorney et al (2006) *(17)* study in 20.9% of cases sciatic nerve is bifurcated in gluteal region ,in 79.1% of cases it is bifurcated in normal location i.e in popliteal fossa.According to prakash et al (2010) *(10)*study ,in 16.3 % of cases the nerve is bifurcated in gluteal region ,but in 83.7% of cases it is bifurcated in popliteal fossa.In a study of guvencer et al (2010) *(9)* , in 48% of cases nerve is bifurcated in gluteal region but 52 % of cases showing bifurcation of nerve in popliteal fossa.According to J.A.Ogeng 'o et al (2011) *(12)* in 20.1 % of cases the nerve is bifurcated in gluteal region ,where as in 79.9% cases sciatic nerve is bifurcated in popliteal fossa.In a study by Mallikarjun adibatti et al (2014) *(15)* , 8 % of cases showing division of nerve in gluteal region, 92% of cases showing nerve division in popliteal fossa.According to study by Anbumani T.L et al.,(2015) *(16)* 18% of cases showing division of nerve in gluteal region,82 % of cases showing division of nerve in popliteal fossa.In the present study ,16% of cases showing division of nerve in gluteal region ,but in 84% of cases nerve is divided in popliteal fossa.According to Beaton and ansons (1937) (1) classification ,we are getting mostly Type1 type of sciatic nerve division i.e undivided nerve below undivided muscle .

Table : 2 showing the percentage of specimens with various levels of division of nerve in present study :

Level of division	Normal division in popliteal fossa	%	High division of nerve in gluteal region	%	High division of nerve in posterior aspect of thigh	%	Total no of specimens	%
No of specimens	42	84%	7	14%	1	2%	50	100

CONCLUSION :

Higher division of the nerve is observed in 16% of cases in this study ,out of these 14% cases are showing division in gluteal region , in 2% cases division is observed in posterior aspect of thigh .We are not getting any specimens with trifurcation of nerve.The information regarding the level of division of nerve is very important for general surgeons ,orthopedicians during various surgical procedures over the gluteal region ,posterior aspect of thigh and in popliteal fossa.Specifically during procedures like sciatic nerve block ,deep intramuscular injections in gluteal region,treatment for piriformis syndrome the information of level of division of sciatic nerve is very important .So in preoperative examination, imaging of sciatic nerve is becoming very crucial and it is usually recommended.

REFERENCES :

1) Beaton L.E ,Anson B.J.The relation of sciatic nerve and its subdivisions to the piriformis muscle .Anat .Rec .1937 ; 70 : 1-5 .
2) Bergman RA, Afifi AK, Miyauchi R. Compendium of human anatomical variations. Baltimore, Urban and Schwarzenberg. 1988; 146.
3) Gabrielli C, Olave E, Mandiola E. Inferior gluteal nerve course associated to the high division of sciatic nerve. Rev Clin Anat. 1997; 15: 79–83.
4) Ewa Okraszewska, Lukasz Migdalski. Sciatic nerve variations in some studies on the Polish population and its statistical significance. Folia Morphol. 2002; Vol 61(4):277–82.
5) Satheesh Nayak. An unusual case of trifurcation of the sciatic nerve. Neuroanatomy.

2006;5: 6–7.
6) Vicente EJD, Viotto MJS, Barbosa CAA and Vicente PC. The Study on Anatomical Relationships and Variations between Sciatic Nerve and Piriformis Muscle. Rev. Bras. Fisioter São Carlos. 2007; 11(3): 197-202.
7) Mustafa Guvencer, Cihas Iyem, Pinar Aleyer, Suleyman Tetik, Sait Naderi, Anatomic considerations and the relationship between the piriformis muscle and the sciatic nerve. Surg Radiol Anat .2008; 30:467–74.
8) Jaijesh Paval, Satheesha Nayak. A case of bilateral high division of sciatic nerve with a variant inferior gluteal nerve. Neuroanatomy. 2006; 5: 33–34.
9) Guvencer M, Iyem C, Akyer P, Tetik S, Naderi S. Variations in the high division of the sciatic nerve and relationship between the sciatic nerve and the piriformis. Turkish Neurosurg. 2009; 19: 139–44 .
10) Prakash BAK, Devi MN, Sridevi NS, Rao PK, Singh G. Sciatic nerve division: a cadaver study in the Indian population and review of literature. Singapore Med J. 2010; 51: 721–23.
11) Shailesh Patel, Mitesh Shah, Rakesh Vora, Ankeer Zalawadia, SP Rathod. A Variation in the high division of the Sciatic nerve and its relations with piriform muscle. National Journal of Medical Research. 2011;1(2): 27-30.
12) JA Ogeng'o, H El Busaidy, PM Mwika, MM Khanbhai, Variant anatomy of Sciatic nerve in a black Kenyan population. Folia Morphol. 2011; Vol. 70, No. 3,175–79.
13) Sawant S.P. A Case report on the bilateral trifurcation of the sciatic nerve and its clinical significance. World research journal of Orthopedics. 2013;1(1):7-10.
14) Prathiba K, Seema Madan, Udaya Kumar P, Dharmendar P, Nisha. A cadaveric study on anatomical variations of sciatic nerve in relation to piriformis muscle in Andhra Pradesh region. Int J Cur Res Rev. 2013; 5 (21); 56-60.
15) Mallikarjun A ,Sangeetha V . Study on variant anatomy of sciatic nerve .Journal of clinical and diagnostic research .2014 Aug ,vol -8 (8) Ac 07 -09.
16) Anbumani T.L ,Thamarai selvi A ,Anthony Ammal .S .Sciatic nerve and its variations - Anatomical study .International journal of anatomy and research 3(2):1121-1127 • June 2015.
17) Pokorney D ,Jahoda .D , Veigl.D ,Pinskerova .V ,Sosna .A . Surg radiol anat 2006 : March 28(1) : 88 -91.
18) Ugrenovic S, Jovanovic I, Krstic V, Stojanovic V, Vasovic L et al. The level of the sciatic nerve division and its relations to the piriform muscle. Vojnosanit Pregl. 2005; 62(1): 45–49. [14]. R. R. Karambelkar et al, Study of Variations in the Divisions, Course and Termination of the Sciatic NerveJKIMSU, Vol. 2, No 1.
19) Susan Standing. Grays Anatomy 40th edn, Churchill Livingstone, New York.1364- 458 .