

Original Article**A Cadaveric Study on the Variation in the Level of Division of Sciatic Nerve in Nepalese Population****Diwakar Kumar Shah and Sanzida Khatun**

Department of Anatomy, Nobel Medical College Teaching Hospital, Biratnagar, Nepal.

Article Received: 18th January, 2020; Accepted: 28th April, 2020; Published: 30th June, 2020**DOI: <http://dx.doi.org/10.3126/jonmc.v9i1.29414>****Abstract****Background**

Sciatic nerve, the thickest nerve of our body (around 2cm wide at its origin), leaves the pelvic cavity from the greater sciatic foramina below the piriformis muscle and between the greater trochanter of femur and ischial tuberosity. As variations have been reported in the level of division of sciatic nerve into its terminal branches, the current study aims to determine the most common site of division of sciatic nerve in Nepalese population.

Materials and Methods

The current study is a cross-sectional and descriptive study which was carried out in the Department of Anatomy, Nobel Medical College, where twenty-three cadavers were used and both the lower limbs were examined. Depending upon the level of division of the sciatic nerve into its terminal branches, it was categorized into six different groups (A-F).


Results

It was seen that the sciatic nerve had already divided into its terminal branches before its exit into the gluteal region in 23.91% extremities. The second commonest site for the termination of sciatic nerve into its terminal branch was found to be at the middle region of the back of the thigh in 19.57% followed by its division in the popliteal fossa in 17.39%.

Conclusion

From the current study we conclude that the level of division of sciatic nerve was variable and it is wise to go for other means to find out the level of termination of sciatic nerve before performing any procedure in that area.

Keywords: *Sciatic Nerve, Thigh, Tibial Nerve*

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Citation

Shah DK, Khatun S, A Cadaveric Study on the Variation in the Level of Division of Sciatic Nerve in Nepalese Population, JoNMC. 9:1 (2020) 12-16.



Introduction

Sciatic nerve (SN) is the thickest and largest nerve of human body. It originates from the sacral plexus and supplies the muscles of the lower limb, leaves the pelvic cavity from the greater sciatic foramina below the piriformis muscle and between the greater trochanter of femur and ischial tuberosity. It passes along the back of the thigh before dividing into its terminal branches; the tibial and the common peroneal nerve (TN and CPN respectively).

The most common site of division of sciatic nerve is in the distal thigh or halfway down the back of the thigh [1, 2]. The level of division of SN may vary from its entry into the gluteal region through the greater sciatic foramen, till the level of popliteal fossa [3]. Tibial and the common peroneal nerve usually get separated at the level of popliteal fossa but their division may also be seen at the higher levels such that the tibial nerve emerges below the piriformis muscle and the common peroneal nerve emerges passing through the substance of them uscle [1, 2, 4]. Variations have been reported in the division of sciatic nerve from low level to high level division [5].

As the nerve leaves the pelvic cavity below the piriformis muscle or sometimes through the piriformis muscle, piriformis syndrome often can be thought to cause pain in the buttock's region and also along the course of the sciatic nerve [3]. Because of its association with various clinical symptoms, a thorough knowledge about the morphology of sciatic nerve becomes utmost important and shall add further guideline for the clinicians working in this region. The present study was carried out in order to find out the level of division of sciatic nerve and also to see its relation with the piriformis muscle while emerging through the greater sciatic foramen.

Materials and Methods

The present study was cross-sectional and descriptive which was carried out from January 2019 to December 2019 in the department of Anatomy, Nobel Medical College after taking the ethical approval from the Institutional Research Committee (IRC). Properly embalmed and formalin fixed cadavers were included for the study. Cadavers with any signs of deformity of lower extremities or cadavers that have undergone any surgical procedure in the lower extremity were excluded from the study. In the study done by Ugrenovix et. al., it was seen that the incidence of division of sciatic nerve before entering into the gluteal region was 4%. Using the formula $n = z^2 pq/d^2$ with 6% of error, the sample size was calculated to be 41 [6]. In the present study 23 cadavers (n=46) from the Department of Anatomy, Nobel Medical

College were included.

Twenty-three properly embalmed and formalin fixed cadavers were used in the present study out of which, 15 were males and eight females. Both right and left inferior extremities were properly dissected to expose the sciatic nerve till its division into the tibial and common peroneal nerves. Depending upon the level of division of the sciatic nerve into its terminal branches, it was categorized into six different groups (A-F) where, Group A represents the cadavers in which the sciatic nerve divided proximal to its exit in the gluteal region, Group B when it was divided in the gluteal region, Group C, D and E when the sciatic nerve divided in the upper, middle and the lower region of the back of the thigh. When the nerve was divided into the popliteal fossa, it was categorized as Group F [7]. Relation of the sciatic nerve with the piriformis muscle was also noted for each case. After examination all the data were entered in the MS Excel sheet and were finally analyzed using SPSS 20.0 software.

Results

Out of the total cadavers examined, it was seen that in 11 (23.91%) extremities, the sciatic nerve had already divided into its terminal branches before its exit into the gluteal region (Group A). The second common site for the termination of sciatic nerve into its terminal branch was found to be at the middle region of the back of the thigh (9, 19.57%) (Group D) followed by its division in the popliteal fossa (8, 17.39%) (Group F). It was seen that in seven (15.22%) extremities the division was at the upper region of the back of the thigh followed by six (13.04%) of extremities where the nerve divided at the lower region of the back of the thigh. It was seen that in five extremities, the division of sciatic nerve was in the gluteal region (10.87%) which was the least common site of termination of SN. It was interesting to see that out of the 23 cadavers examined, 10 cadavers (43.48%) had same level of division of sciatic nerve bilaterally. Out of these 10 cadavers, 4 had its termination before its exit into the gluteal region followed by 3 in the popliteal fossa, 2 in the middle of the back of the thigh and one in the upper region of the back of the thigh. In none of the cadavers, sciatic nerve was dividing into gluteal region or the lower region of the back of the thigh bilaterally. The most common site for the termination of sciatic nerve in male was either its exit into the gluteal region or in the lower region of the back of the thigh (six each) followed by either in the gluteal region or in the, middle region of the back of the thigh whereas in females it was seen that the most common site for the termination of



sciatic nerve was before its exit into the gluteal region (five) followed by either in the middle region of the back of the thigh or in the popliteal fossa (four each). It was also seen that the most common site of termination of sciatic nerve on the right extremity was before its exit into the gluteal region (seven) followed by into the popliteal fossa whereas in the left side it was seen that the sciatic nerve divides most often either in the middle or the lower region of the back of the thigh. In the right side of a male cadaver it was found that the common peroneal nerve emerges above the piriformis and the tibial nerve below the piriformis muscle.

Out of all the specimens examined, we found that in one specimen the tibial nerve was emerging below the piriformis muscle whereas the common peroneal nerve between the two heads of piriformis muscle as shown in the Figure 2.

Table 1: Showing different level of division of sciatic nerve and the number of limbs falling under each category.

Level of division of sciatic nerve	Number of limbs	Percentage
Group A	11	23.91
Group B	5	10.87
Group C	7	15.22
Group D	9	19.57
Group E	6	13.04
Group F	8	17.39
Total	46	100.00

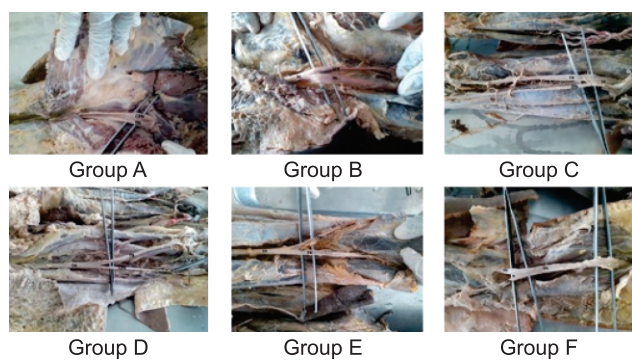


Figure 1: Showing the different level of division of sciatic nerve



Figure 2: Tibial nerve passing below the piriformis and Common Peroneal Nerve between the two heads of piriformis muscle.

Discussion

Sciatic nerve is formed when the ventral (TN) and the dorsal (CPN) component of sacral plexus moves downward and close together. Based on this developmental fact, the tibial and common peroneal nerve may separate from each other at different level from their formation in the pelvic cavity to their termination in the back of the thigh. Hence, the level of division of sciatic nerve into its terminal branches is highly variable [8, 9]. In the present study it was seen that the incidence of division of SN before entering into the gluteal region was 23.91%. This finding was quite comparable with the results obtained by Javia et al and Pokorny et al. Javia et. al. from their study reported that the division of SN before entering into the gluteal region occurred in 23.53% of cases [10]. In another similar study carried out by Pokorny et al they found that 20.9% of SN divides into its terminal branches before entering into the gluteal region [11]. Other researchers like Ikiz and Amrutha from their studies also reported about the higher division of SN before entering into the gluteal region [6, 7]. Patel Z and Ikiz et. al. from their respective studies reported the high-level division of SN in 15% and 15.38% of cases [5, 6]. Similar findings were reported by many other researchers but when these findings were compared with the findings of present study it was seen that the incidence of higher division of SN before entering into the gluteal region was higher in the present study [12, 13, 14]

From the present study, it was observed that in 19.57% of cases SN divides into its terminal branches in the middle of the back of the thigh. When comparing this finding with the findings of the other researchers, it was noted that researchers like Sawant et al, Javia et al, Prakash et al and Anbumani et al found that 12%, 2.95%, 2.3% and 2% of cases where the SN was dividing in the middle of the back of the thigh [8, 10, 14, 15]. In the present study it was interesting to note that out of the 17.39% of the total cases, SN was dividing into its terminal branches in the popliteal fossa. This finding was quite comparable with the findings of Javia et al, who reported 20.59% of cases falling under this category [10]. The findings were higher when compared with the findings of Sawant et al (8%), Ikiz et al (3.85%) and Bangarayya et al (4%) [6, 12, 15]. When this finding was compared to the results of studies carried out by other researchers like Prakash et al (34.9%), Ugrenovic et al (66%) and Patel et al (85%); it was seen that the incidence of division of



SN at this level was comparatively lower than that of the findings of these researchers [5, 8, 16]

In the present study it was noted that in 15.22% of subjects examined, SN was dividing in the upper back of the thigh. This finding was much higher when compared to that reported by Prakash et al (3.5%) and Sawant et al (3%) Javia et al (1.96%) [8, 10, 15]. Few researchers from their studies reported that SN was dividing into its terminal branch in the lower third of the back of the thigh in 40.7%, 47.06% and 53% of cases respectively which was very high when compared with the results of the present study [8, 14, 15]. We found that Gluteal region was the least common site for the division of sciatic nerve. This finding was supported by the results of the studies carried out by Prakash et al and Javia et al [8, 10].

We also found that out of all the subjects in which sciatic nerve was dividing before its entry into the gluteal region, only one specimen showed that the tibial nerve was emerging below the piriformis muscle whereas the common peroneal nerve between the two heads of piriformis muscle. Similar variations were reported by various different researchers. Shwetha K et al from their study reported that the tibial nerve emerges below the piriformis whereas common peroneal nerve through the piriformis muscle [17]. Barbosa et al from their study mentioned that in 33.3% of the total specimens examined, common peroneal nerve was emerging through the piriformis muscle whereas tibial nerve below the muscle [18]. This was also supported by other researchers such as Amrutha et al, Anbumani et al [7, 14]. Grewal et al from their study mentioned that out of the specimens in which sciatic nerve was dividing into its terminal branches before entering into the gluteal region, one specimen showed that the common peroneal nerve was emerging above the piriformis muscle whereas the tibial nerve coming from below the piriformis muscle [13]. Anbumani et al and Sawant et al from their study reported that the sciatic nerve terminated into 3 terminal branches in the middle of the popliteal fossa [14, 15]. Javia et al. from their study mentioned that the severity of neuropathies due to entrapment of SN depends on the level of its involvement and in cases with higher division of SN, there is higher possibility of any one branch out of two terminal branches [10].

Since the availability of cadavers was very limited, the sample size taken in the study was quite small which limits the scope of the present study. A similar study can be carried out with a larger sample size in order to see the most common site of division of sciatic nerve in our population.

Conclusion

From the present study, it is seen that the level of division of sciatic nerve is highly variable in the Nepalese population. The commonest site of division of the sciatic nerve was before its entry into the gluteal region followed by middle of the back of thigh. In cases of neuropathies associated with the sciatic nerve, the most important thing that determines the symptoms and the severity, remains the level at which the sciatic nerve is involved. In cases with higher level of division of sciatic nerve, there is very less chances of involvement of both the tibial and common peroneal component of sciatic nerve whereas in cases with low level divisions, symptoms are often associated with both the tibial and the common peroneal nerve. Lack of knowledge about the level of division of sciatic nerve may also result in the failure with the sciatic and popliteal nerve block. Hence it is suggested for all the clinicians to go for a prior radiological opinion to see the level of division of sciatic nerve before performing any procedure in this region.

Conflicts of interests: None

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