

*Case Report*

Variable Division of the Sciatic Nerve- A Series of Rare Cases

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ABSTRACT

Background: Sciatic nerve is thick nerve situated in the gluteal region. The point of division of sciatic nerve into its two major components is very variable. Its division into the tibial and common peroneal nerves can occur at any level from the sacral plexus to the inferior part of the popliteal space.

Aim of study: To brought in light the variations in the level and pattern of division of the sciatic nerve.

Findings: During routine dissection of cadaver 7 cases of different level of division of the sciatic nerve were noted among 100 gluteal region and back of thigh studied in 50 cadavers. In the present study overall incidence of variation in the level of division of sciatic nerve was 7%. Among this undivided nerve passing below the piriformis muscle was seen in 96% cases. Divided nerve below the piriformis muscle in 1% of cases. Divided nerve with common peroneal component through the piriformis muscle and tibial component below the muscle in 2% cases. Divided nerve with common peroneal component between the superior and inferior piriformis muscle and tibial component below the muscle in 1% cases. Division of sciatic nerve at the level of upper thigh i.e. at origin of long head of biceps femoris in 1% of cases. And lower division of the sciatic nerve at the level of knee joint in 2% of cases.

Inference: Knowledge of this variation is important for orthopedic surgeons, physician, and physiotherapist in managing clinical condition like piriformis syndrome, sciatica and while performing hip surgeries and surgeries around back of thigh.

Key words: common peroneal nerve, piriformis, sciatic nerve, tibial nerve

INTRODUCTION

Sciatic nerve is the thickest nerve in the body and is 2cm wide at its origin. The large sciatic nerve arises from L4L5S1S2S3 spinal segment. It leaves the pelvis via the greater sciatic foramen below the piriformis muscle and descends between the greater trochanter and ischial tuberosity. Along the back of the thigh, divide into the tibial (L4L5S1S2S3) and common peroneal or fibular (L4L5S1S2) nerves. The point of

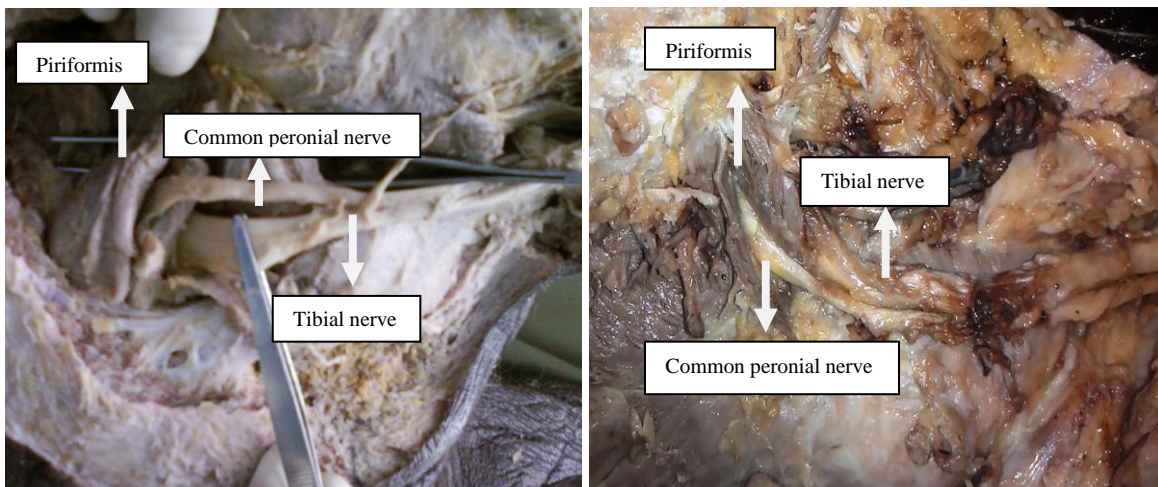
division of sciatic nerve into its two measure components is very variable. The common site is at the junction of the middle and lower third of the thigh near the apex of popliteal fossa. The division may occur at many levels above this, though rarely below it. It is not uncommon for the major components to leave the sacral plexus separately. The sciatic nerve supplies the knee flexors and all the muscles below the knee, so complete palsy of it results in flail

foot and severe difficulty in walking. Sciatic nerve palsy occurs after total hip replacement or similar surgery in 1% of cases. [1] This nerve is also commonly injured in posterior dislocation of hip [2] and in fracture of hip joint. [3] Clinical conditions like piriformis syndrome, sciatica are related to abnormal relation between the piriformis muscle and sciatic nerve. Divided piriformis is said to be very important cause of piriformis syndrome as common peroneal component pass through it and can cause entrapment neuropathy called as piriformis syndrome. [4] Also knowledge of variation in division of the sciatic nerve is important in surgical exploration of sciatic nerve.

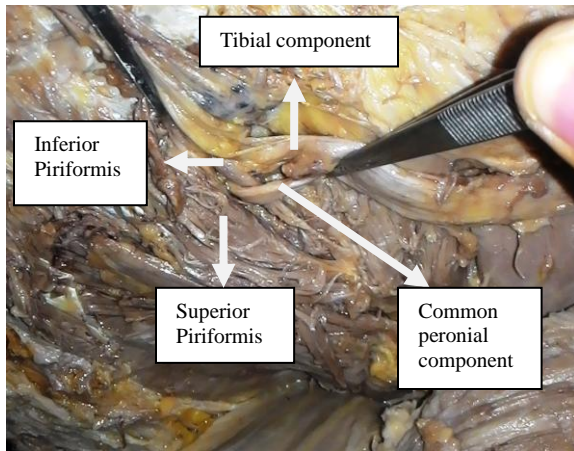
CASE SERIES

During routine dissection of the gluteal region and back of thigh we encountered the case of higher division of the sciatic nerve in one cadaver. So further study was conducted to find the variation in division of the sciatic nerve in other cadavers. In total 50 cadavers (100 gluteal regions) were examined looking for variation in the sciatic nerve. Higher division was seen in 5 cadavers all cases were unilateral, while the lower division was seen in 1 cadaver and it was bilateral. In 2

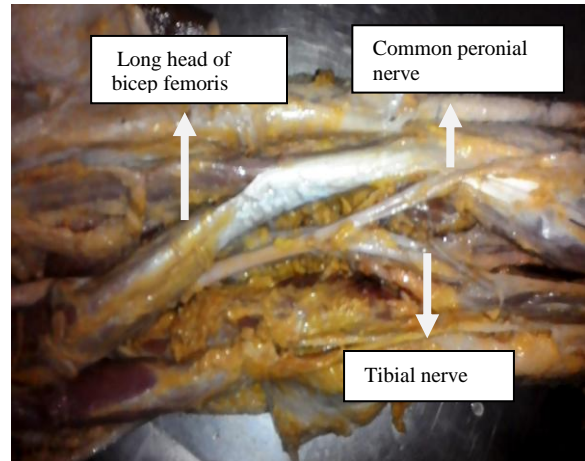
cases, one on right side and one on left side, common peroneal component were passing through the piriformis muscle by piercing it and tibial component was passing below the piriformis (Photograph 1 & 2). In another case seen by us, a muscle with small belly and tendon was seen below the piriformis. This muscle was referred as inferior piriformis [5] and main piriformis muscle as superior piriformis. Common peroneal nerve was passing between this two muscles and tibial component was passing below the inferior piriformis muscle. After traveling a short distance both the components again reunite to form sciatic nerve which again divide in popliteal fossa (Photograph 3). In 1 case, in left gluteal region both the tibial and common peroneal components were separate and passing below the piriformis muscle (Photograph 4). In another case two components of the sciatic nerve separates just below the origin of the long head of bicep femoris from the ischial tuberosity (Photograph 5). In 1 cadaver lower division of the sciatic nerve was seen. The sciatic nerve was dividing into its two components much lower than normal site i.e. at the level of knee joint. This variation was seen bilaterally (Photograph 6).



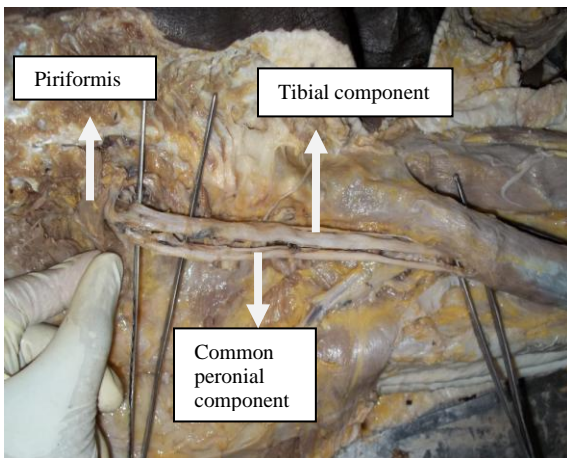
Photograph 1 & 2: Higher division of sciatic nerve with common peroneal component passing through the piriformis and tibial component below the piriformis.



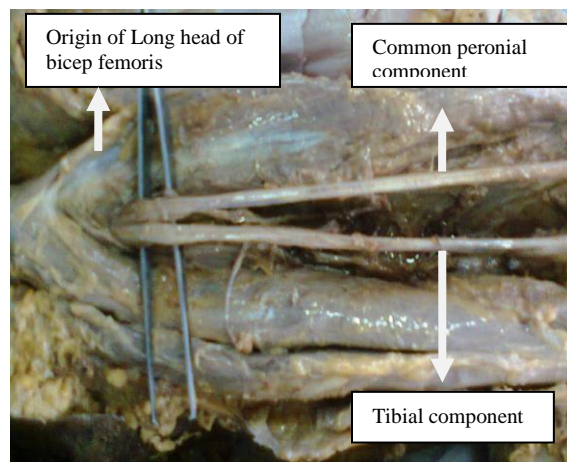
Photograph 3: Higher division of sciatic nerve with common peroneal component passing between the large superior and small inferior piriformis muscle and tibial component below the small inferior piriformis muscle and both the components again rejoin after traveling short distance.



Photograph 6: Lower division of sciatic nerve with both common peroneal and tibial component separating at the level of knee joint was seen bilaterally in cadaver.



Photograph 4: Higher division of sciatic nerve with both common peroneal and tibial component passing piriformis muscle.



Photograph 5: Higher division of sciatic nerve with both common peroneal and tibial component separating just below the origin of long head of biceps femoris.

DISCUSSION

It has been quoted in the literature that sciatic nerve usually shows a lot of variation in its division, especially its higher division. Smoll NR ^[6] (2010) has reported that prevalence of this variation in cadavers was 16.9 % and in surgical case series was 16.2%. The variations from the normal course of the sciatic nerve usually reported are passage of entire nerve through the muscle, passage of one component through the muscle which is usually the common peroneal and one component below the muscle, passing of both the components below the muscle separately. Apparently variations like undivided nerve emerges above the piriformis, undivided nerve emerges through the piriformis, divided nerve emerges above and through the piriformis are quoted in literature but such variations are rarely seen by researchers. ^[7]

Beaton LE and Anson BJ ^[8] (1937) have found the sciatic nerve passing below the muscle with normal relation in 84.2% of cases. The most common variation is the tibial nerve passing below the piriformis and the common peroneal through piriformis has been found in 11.7%. They also reported cases of entire sciatic nerve passing through the piriformis in only 0.8% of cases and

passage of common peroneal nerve above and the tibial below the piriformis muscle in 3.3% of cases. Beaton and Anson classified variations of the piriformis and sciatic nerve and their classification known as Beaton and Anson classification, is as follows:

Type I: Undivided nerve below undivided muscle

Type II: Divisions of nerve between and below undivided muscle

Type III: Divisions above and below undivided muscle

Type IV: Undivided nerve between heads

Type V: Divisions between and above heads

Type VI: Undivided nerve above undivided muscle

Moore KL and Dally AF ^[9] (1999) reported that common peroneal nerve passed through the piriformis and the tibial nerve passed below the piriformis in 12.2% cases and common peroneal nerve passing above and the tibial nerve passing below the muscle in 0.5% cases in a study conducted on 650 extremities. Other previous anatomical studies also show that division of nerve between and below piriformis muscle is quite higher than other variations. The variations from the normal usually reported are passage of entire nerve through the muscle, passage of one component through the muscle and one component below the muscle and passage of both components separately below the muscle.

Guvencer M et al ^[10] (2009) reported in 52% of the cases, the sciatic nerve exited the pelvis as a whole nerve without any division, whereas in 48% a high division was observed. Branches of the sciatic nerve left the pelvis through the infrapiriform foramen (IP) as two separate nerves in 24%. One branch of the sciatic nerve left the pelvis through the infrapiriform foramen and other through a different route in another 24% cases.

In the present study overall incidence of variation in the level of division of sciatic

nerve was 7%. Among this undivided nerve passing below the piriformis muscle was seen in 96% cases. Divided nerve below the piriformis muscle in 1% of cases. Divided nerve with common peroneal component through the piriformis muscle and tibial component below the muscle in 2% cases. Divided nerve with common peroneal component between the superior and inferior piriformis muscle and tibial component below the muscle in 1% cases. Division of sciatic nerve at the level of upper thigh i.e. at origin of long head of bicep femoris in 1% of cases. And lower division of the sciatic nerve at the level of knee joint in 2% of cases.

Incidences of these variations are much higher so knowledge of these variations in division is important.

CONCLUSION

The knowledge of the level of division of the sciatic nerve and the location where it leaves the pelvis is of great importance since many surgeries are done around the hip joint. Such variations can surprise the surgeons during surgery. The abnormal passage through the piriformis may cause compression of these nerves which may be the cause of chronic pain in hip and knee region. So knowledge of this variation is also important among physicians and physiotherapist.

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