

## **A very Rare Cases of Bilateral High Division of Sciatic Nerve with Unilateral Divided Piriformis Piriformis with Two Heads and Unusual Origin of Genicular Branch from Tibial Nerve'**

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**Abstract:** We report a very rare case of high division of sciatic nerve ' of different types ' on the either side of 43 years old male Sudanese Cadaver with unilateral right divided piriformis sciatic nerve on the either sides divided in with the pelvis into two terminal branches: common fibular nerve and tibial nerve and entered into the gluteal region .on the Rt side there is divided piriformis ' with superior large and inferior small parts', common fibular nerve pass between these 2 heads of piriformis and tibial nerve pass bellow the superior gemillus muscle on the left side both branches of sciatic nerve : common fibular nerve and tibial nerve pass bellow the piriformis muscle ' normal piriformis on the left; is rare to find different types of bilateral high division of sciatic nerve in the same Cadaver. On the right side also we report a very rare and unusual finding which is origin of descending genicular branch from the tibial nerve at higher level just as it is emerge from the pelvis bellow superior gemillus muscle. To our knowledge there is no literature reporting this type of variation.

**Keywords:** sciatic nerve, Cadaver, Piriformis Piriformis.

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### **INTRODUCTION**

The Sciatic nerve is a branch of lumbosacral plexus L<sub>4</sub>. S<sub>3</sub>, it is a largest and a thickest nerve in the body. After leaving the pelvis through greater sciatic foramine usually bellow piriformis and inter to the gluteal region. In the gluteal region medial to it there are superior gluteal vessels and nerve and inferior pudendal vessels and nerve [1] then inter the posterior aspect of the thigh and subsequently divided into two terminal branches; Common fibular and tibial nerves usually at superior angle of popliteal fossa [2, 3]. But Sciatic nerve may divided at any site from its origin from the plexus to the Lower part of the popliteal fossa [1]. Common fibular and tibial nerves have a both motor and sensory components. Motor supply to the muscles of posterior aspect of the thigh, all muscles below the knee joint "muscles of the leg and foot" and also sensory supply to whole leg and foot except anteriomedial aspect of tibia and medial boarder of foot. Also supply hip, knee and ankle joints [4]. Sciatic nerve has a wide range of variation in its origin, exit from pelvic cavity, relation to piriformis, course and termination, sometimes it divided high in pelvis into two terminal branches and leave the pelvis through different ways. High division of Sciatic nerve usually unilateral or bilateral mostly, leading to compression of nerve

by nearby structures resulting in piriformis syndrome, coccygodynia and incomplete block during popliteal block anesthesia and have a clinical importance in etiology and pathogenesis of non-discogenic sciatica [5].

### **CASE REPORT**

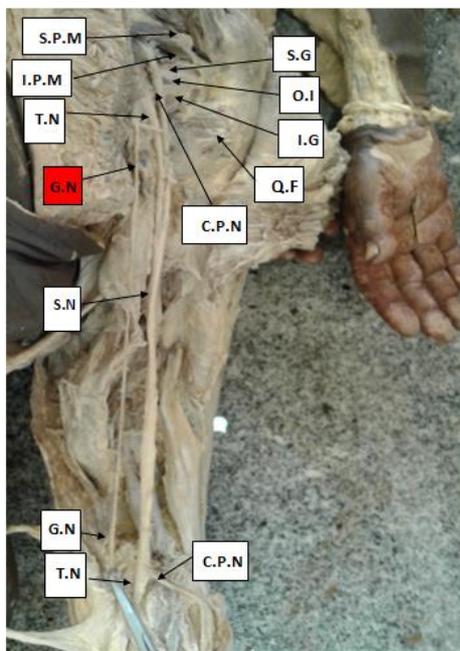
During routine dissection of Cadaver for teaching purposes for undergraduate students in our institute , it was found that 43 year old male Sudanese Cadaver have a bilateral high division of sciatic nerve . Here the sciatic nerve divided in tow terminal branches : common fibular nerves and tibial nerves within the pelvis Bilaterally , and there is unilateral divided piriformis on the right side ' piriformis muscle hare two parts : superior large and inferior small ' on the right side the common fibular nerves pass between two heads of piriformis and tibial nerves pass bellow superior gemillus muscle. Then these two branches united again at the level of the lower gluteal fold to become a single sciatic nerve and took the same passage of the normal sciatic nerve, then divided again at the level of the middle popliteal fossa , also we seen another very rare variation on this side which is origination of genicular branch from the Tibial nerve just at the point of emergence from the inferior boarder of superior gemillus and descend on the medial side of

Tibial nerve to be terminated at the medial aspect at the posterior part of the knee joint which is very rare and very unusual. 'Normally this genicular branch originated from the common fibular nerve at the popliteal fossa.'

On the Lt side both branches common fibular and tibial nerves pass bellow undivided piriformis then united again at the level of the middle of the thigh and 'just between two heads at biceps femoris ' to become a single sciatic nerve and took the same passage as normal sciatic nerve then divided again into common fibular and tibial nerves at the popliteal foss.

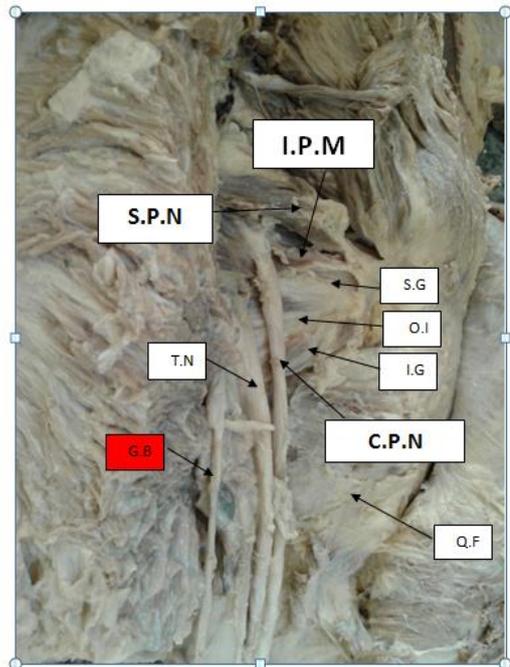
All above variations make this case is a very rare case of bilateral high division of sciatic nerve and unilateral divided piriformis.

To our knowledge there is no literature describing this type of variation.



**Fig-1: Right gluteal region**

S.P.M: Superior Piriformis Muscle – S.G.: Superior Gemillus Muscle – C.P.N: Common Peroneal Nerve, I.P.N: Inferior Piriformis Muscle- I. G: Inferior Gemillus Muscle- T.N.: Tibial Nerve – O.I: Obturator Internus, S.N: Sciatic Nerve – Q.F: Quadratus Femoris . G.N: genicular nerve from Tibial nerve



**Fig-2: Right gluteal region**

S.P.M: Superior Piriformis Muscle – S.G.: Superior Gemillus Muscle – C.P.N: Common Peroneal Nerve, I.P.N: Inferior Piriformis Muscle- I.G: Inferior Gemillus Muscle- T.N.: Tibial Nerve – O.I: Obturator Internus , S.N: Sciatic Nerve – Q.F: Quadratus Femoris . G.N: genicular nerve from Tibial nerve

## DISCUSSION

Sciatic nerve is a common nerve in the body that shows wide range of variations. These variations commonly termed in form of high division, but termination and its course shows a lot of variations.

High division of sciatic nerve may result in sciatic nerve injury during deep intramuscular injection at gluteal region, during surgery for hip replacement by posterior approach and piriformis syndrome [6].

Piriformis syndrome is one of the causes of the non-discogenic sciatica, which occurs usually as a result of compression of sciatic nerve by abnormal piriformis like divided piriformis as in our case

There are different types of higher division of sciatic nerve usually bilateral and if unilateral other side will always remain normal [5].

The classifications of high division of sciatic nerve were attempted by large numbers of authors, but all these classifications not suit for our case as it's not mention divided piriformis.

The best known classification is by Beaton and Anson's [7] as cited by Shailesh Patel *et al* [5] Which classified all variations under 6 types as follows

- Type 1: Undivided nerve bellows undivided muscle
- Type 2: Division of nerve between and Bellow undivided muscle
- Type 3: Division above and below undivided muscle
- Type 4: Undivided nerve between heads
- Type 5: Division between and above two heads
- Type 6: Undivided nerve above undivided muscle

According to this classification our case is could be type 2 for left side ,the right side is not belong to this classification as it doesn't mention common fibular nerve passing between two heads of divided piriformis and tibial nerve bellow superior gimellus muscle. We need another classification or modification of above one to include nerves between the divided piriformis and bellow superior gemillus.

Classification is very important for surgeons, physicians and orthopaedicians as its help them in assessing the cause and site of compression of the Sciatic nerve [6].

Machado *et al.* studied 100 gluteal regions but didn't find even a single divided piriformis [8]. Also Ugrenovic *et al* Studied 200 gluteal regions but didn't find even a single divided piriformis muscle [9]. A. D. Shewale studied 45 cadavers but didn't find a case of divided piriformis [10]. Shailish Patel *et al* studied 86 gluteal regions but didn't find a case of divided piriformis [5]. Sabnis *et al* studied 70 cadavers but didn't find a case of divided piriformis [11].

Mangistue Desalegn *et al* studied 36 gluteal regions but didn't find a case of divided piriformis [4]. Yusuf *et al* reported a case of bilateral high division of sciatic nerve with unilateral left divided piriformis muscle, common fibular nerve pass between two heads and tibial nerve bellow the divided piriformis [6]. But in our case the tibial nerve bellow the superior gemillus.

Demiryurek *et al* described a case of bilateral divided piriformis as in our case [10]. A case of bilateral high division of Sciatic nerve reported by Mas et al with tibial nerve passing under superior gemillus [13], consistent with our case but our case is unilateral.

Papado Poulos *et al* mention that the incidence of piriformis syndrome due to abnormal piriformis muscle is six times higher in female than male [14] which is inconsistent with our case as our case as it's a male. Jawish *et al* [15] found a single case of divided piriformis among 26 cases selected from 3550 cases complaining of sciatica.

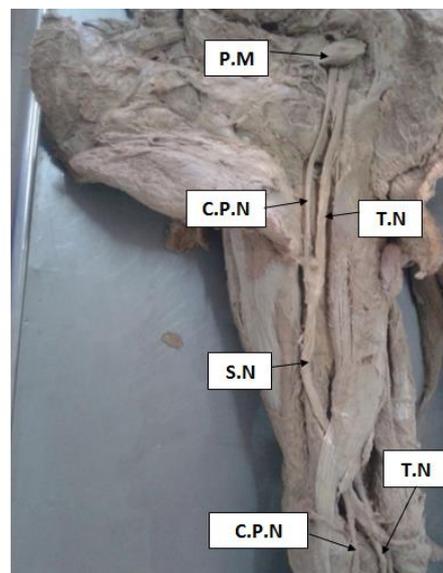
It was also observed that our case had a very rare and unusual origination of genicular branch from tibial nerve on the right side .It originated just at the lower boarder of superior gemillus, where tibial nerve

emerged from pelvis and descend medial to the tibial nerve and pierced the medial aspect of the posterior surface of the capsule of the knee joint.

Yusuf *et al* reported a case of unusual high origin of genicular branch, but in their case the genicular branch originated from common fibular nerve at the level of 13cm below piriformis, and running lateral to common fibular nerve to pierce the capsule of the knee joint posteriorly [6].

Also a similar finding has been reported by Ali and Eweidah [16] in their cases the sciatic nerve divided outside the pelvis and genicular branch originated from common fibular nerve as the level of 20cm from division of sciatic nerve below piriformis, and running medial to common fibular nerve (their case showed no divided piriformis). Unlike in our case as the origin of genicular branch from the tibial nerve at the lower boarder of superior gemillus and running medial to the tibial nerve and pierced the medial aspect of the posterior surface of the knee joint.

Unilateral divided piriformis, bilateral high division of sciatic nerve and unitation, then division at popliteal fossa and unusual origination of genicular branch from the Tibial nerve just at the point of emergence from the inferior boarder of superior gemillus and descend on the medial side of Tibial nerve to be terminated at the medial aspect at the posterior part of the capsule of the knee joint, make our case is very unique and most interest among sciatic nerve variations.



**Fig-3: Left gluteal region**

P.M: Piriformis Muscle – S.G.: Superior Gemillus Muscle – C.P.N: Common Peroneal Nerve , I.G: Inferior Gemillus Muscle- T.N.: Tibial Nerve – O.I: Obturator Internus , S.N: Sciatic Nerve – Q.F: Quadratus Femoris

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## CONCLUSION

Anatomical knowledge about variations of sciatic nerve in exit from pelvis and division into two terminal branches is of great importance. Specially variation in gluteal region which is very importance for surgeons and orthopaedicians as its area of common surgical manipulation. Knowledge of these variations helps a surgeons and orthopaedicians to avoid injury to Sciatic nerve during hip and gluteal surgery. Abnormal course and division may cause neuropathy, non discogenic sciatica and piriformis syndrome.

## CONFLICT OF INTEREST

There is no conflict of interest in this study

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