

Case report

Bifurcation of sciatic nerve in the sacral fossa and other variations in the lower limbs of a single cadaver

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Abstract:

Neurovascular variations in the lower limb are of interest to the surgeons, anaesthetists (for regional anaesthesia) and anatomists. While doing the routine dissection for the MBBS Students, in the Department of Anatomy, NRS Medical College, Kolkata, few neurovascular variations were found in the inferior extremities of a 70 years old male cadaver in November, 2014. Variations were present in the sciatic nerve (SN), intermediate cutaneous nerve of the thigh, anterior tibial artery and deep fibular (peroneal) nerve. The SN divided in the sacral fossa, the lateral branch of the intermediate cutaneous nerve of the thigh pierced the sartorius muscle, the deep fibular (peroneal) nerve crossed the anterior tibial artery from lateral to medial side and again from medial to lateral side. This case report will contribute in the field of Gross and Clinical Anatomy.

Key Words: Sciatic Nerve, intermediate femoral cutaneous nerve, deep fibular (peroneal) nerve, anterior tibial artery and arteria dorsalis pedis

Introduction

The sciatic nerve is 2cm. wide at its origin from the sacral plexus. It is the thickest nerve of the body with the root value – ventral rami of L₄₋₅, S₁₋₃. It leaves the pelvis via the greater sciatic foramen below the piriformis and above the gemellus superior, descends between the greater trochanter and ischial tuberosity to reach the back of the thigh. The SN divides into tibial and common peroneal (fibular) nerves at a varying level proximal to the knee, usually near the

apex of the popliteal fossa [1]. These two terminal branches may arise directly from the sacral plexus, may be separated in the greater sciatic foramen by the piriformis muscle and descend as separate structures [2].

Intermediate cutaneous nerve of the thigh arises from the anterior division of femoral nerve, either as two branches or as one trunk that quickly divides into two which pierce the fascia lata (about 8cm. below the

inguinal ligament) to supply the skin as far as the knee and end in the peripatellar plexus [1].

The deep fibular (peroneal) nerve is a branch of the common fibular nerve. It runs in the anterior compartment of the leg at first lateral to the anterior tibial artery (in proximal third of the leg), then anterior (in middle third), and finally lateral again (in distal third) [1, 2]. This nerve runs lateral to the dorsalis pedis artery at the ankle and so also its medial terminal branch on the dorsum of foot [3]. The anterior tibial artery is a branch of the popliteal artery. It runs the anterior compartment of leg with venae comitantes and is renamed as the dorsalis pedis artery distal to the ankle [1,4].The aim of this study was to know about the variations in nerve supply and blood vessels of the inferior extremity with their clinical significance.

Materials and methods

Few anatomical variations were found in the inferior extremities of a male cadaver in the Department of Anatomy, NRS Medical College, Kolkata, while doing the routine dissection for the MBBS students in November, 2014. The subject was about 70 years old.

Proper dissection was done in both the lower limbs. Structures were observed carefully and photographs were taken.

Observations

On the left side the sciatic nerve divided into common peroneal and tibial nerves in the sacral fossa. Both these branches emerged below the piriformis muscle in the gluteal region and passed into the back of thigh as contiguous but separate structures. On the right side the sciatic nerve bifurcated at the junction of upper two-third and lower one-third of the back of the thigh as usual.

On the right side the lateral branch of the intermediate cutaneous nerve of the thigh pierced the sartorius muscle, but not on the left side. In the right lower limb, the deep peroneal nerve passed medial to the anterior tibial artery in the proximal part of the leg. Over the ankle joint, the nerve crossed the proximal part of the dorsalis pedis artery (continuation of the anterior tibial artery) from medial to the lateral side. On the left side no such crossing was found.

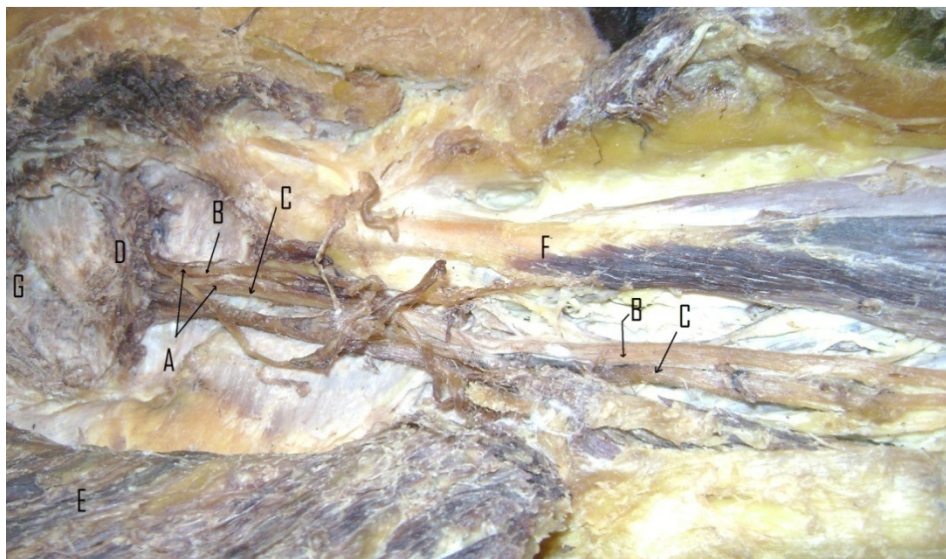


Figure – 1, Two divisions of the Sciatic Nerve (Tibial and Common Peroneal) emerged below the piriformis muscle in the gluteal region separately and passed to the back of the thigh on the left side.

Index : **A** – the two divisions of the sciatic nerve, **B** -Tibial nerve, **C** – Common Peroneal nerve , marked similarly in the back of thigh, **D** – Piriformis muscle , **E** - Gluteus maximus, **F** – origin of the hamstring muscles, **G** - gluteus medius.

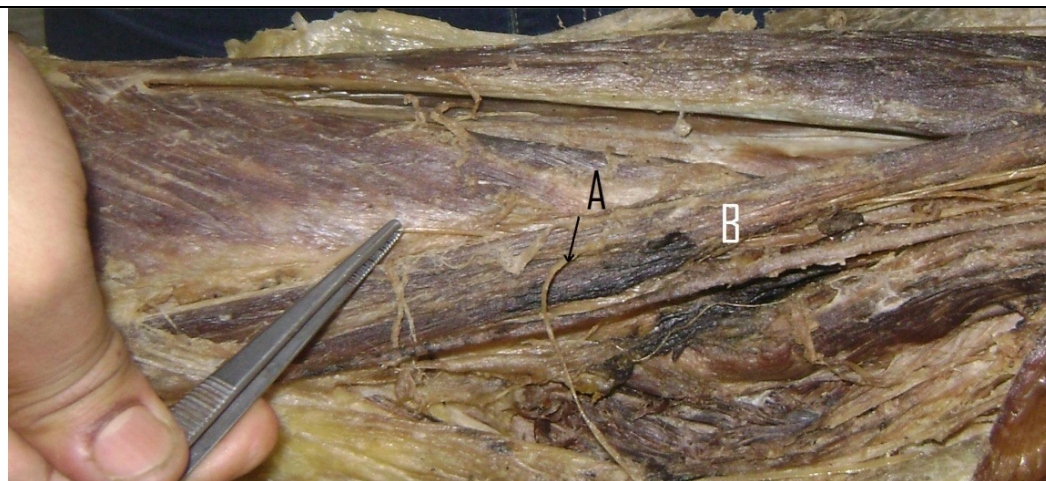


Figure – 2, On the right side the lateral branch of the intermediate cutaneous nerve of the thigh [A] pierced the Sartorius muscle [B]. The medial cutaneous nerve of the thigh is also visible.

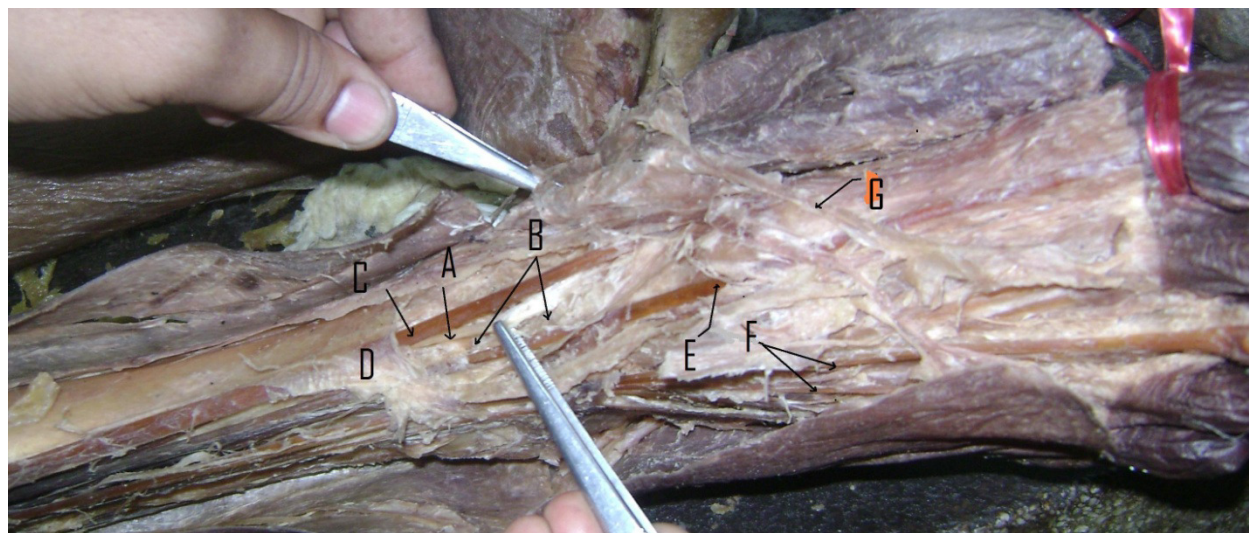


Figure – 3; The deep peroneal nerve crossed the proximal part of the dorsalis pedis artery from medial to the lateral side in the right lower limb.

Index : **A** – Deep peroneal nerve, **B**- dorsalis pedis artery, **C**- Tendon of tibialis anterior, **D**- superior extensor retinaculum, **E**- extensor hallucis longus tendon, **F**-tendons of extensor digitorum longus. **G** – Dorsal venous arch.

Discussion

According to Saritha et al, in 85-89% cases, the sciatic nerve [SN] divides into the terminal branches at the apex of the popliteal fossa [5]. Smoll compiled the results of 18 previous studies and 6,062 cadavers

to find that the prevalence of high division of sciatic nerve in cadavers was 16.9% and in surgical case series was 16.2% [6].

In 2011, Khan et al described a rare case with bilateral high division of sciatic nerve and unilateral divided piriformis [7].

In 2013, Bhattacharya et al presented a case with unilateral double piriformis and bilateral high division of sciatic nerve. On the left side, SN bifurcated in pelvis and the common peroneal nerve emerged between the two piriformis muscles, whereas the tibial nerve passed below the lower piriformis. On the right side SN divided in the gluteal region [8].

The high division of SN may give rise to complications during therapeutic intramuscular injections, anaesthesia or surgery in the gluteal region and the nerve is vulnerable in posterior dislocation of hip joint [1,7,8]. This variation can cause nerve entrapment under other anatomic structures, resulting in non-discogenic sciatica, piriformis syndrome or coccydynia, muscle atrophy, failed SN block during regional anesthesia and injury to SN during posterior hip operations [5,8,9,10].

Piriformis syndrome is caused by an entrapment of the sciatic nerve in the gluteal region due to a myospasm or contracture of either of the piriformis and gemellus superior muscles leading to pain along the back of the thigh to the knee along with loss of sensation or numbness, tingling in the sole of foot [8,9,10]. This syndrome is a cause of soft tissue problem of the hip, especially among the athletes and often mimics its infamous counterpart sciatica with almost similar symptoms. Low back pain, caused by a compression or irritation of the sciatic nerve is

called sciatica and it is directly due to a lumbar disc pressing on the SN as it comes out of the intervertebral foramina [8,10,11].

The lateral branch of the intermediate cutaneous nerve of the thigh communicates with the femoral branch of the genitofemoral nerve, frequently pierces the sartorius and sometimes supply it [1]. The main nerve to sartorius arises from the femoral nerve in common with the intermediate cutaneous nerve of the thigh [1].

In 2013 Majumdar et al described a case with the bilateral high division of the sciatic nerve and unilateral crossing of the anterior tibial artery by the deep peroneal nerve as it happened in the present case [10].

The deep peroneal (fibular) nerve and the dorsalis pedis artery (continuation of the anterior tibial artery) crossed over each other at multiple levels in 26.7% of the limbs, as was revealed in a study conducted by Chitra R [3]. In Plastic Surgery, the design of a neurovascular free dorsalis pedis flap requires detailed knowledge of the nerve and vascular supply of foot and ankle [3].

Conclusion - Neurovascular variations of lower limb, as described in the present case, have importance in Anatomy, Surgery, Plastic Surgery, Orthopaedics, Regional Anaesthesia, Physical and Sports Medicine.

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