

Research Article

A Rare Case of Higher Division of Tibial Nerve: Clinical Implications and Anatomical Considerations

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ABSTRACT

Introduction: The tibial nerve, a prominent branch of the sciatic nerve, serves as a principal neural pathway supplying the musculature of the posterior leg. Upon division, it gives rise to the medial and lateral plantar nerves, the precise location of which holds significance for surgical interventions. This study aims to document a specific division pattern of the tibial nerve and discuss its clinical implications. **Case Report:** During routine cadaveric dissection of the posterior thigh and leg compartments, an anomalous variation of the tibial nerve was observed in a male cadaver. Notably, the tibial nerve divided 6.2 cm proximal to the medial malleolus on the left side, while other neurovascular structures exhibited typical morphology.

Conclusion: This case highlights a superficial course of the tibial nerve in an Indian cadaver, revealing a rare instance of higher division. Such occurrences are exceedingly uncommon, with only a few documented cases reported till date. The clinical relevance of this unique finding lies in its potential implications for surgical planning and the understanding of foot and ankle nerve anatomy, particularly in the context of compression syndromes. This report contributes valuable insights to the field of anatomical variation and underscores the importance of thorough anatomical knowledge in clinical practice.

INTRODUCTION

Tibial nerve is related with back of the leg. Tibial nerve is a bigger component of the sciatic nerve. It emerges from ventral branches (Foremost Division) - L4, L5, S1-S3 then it descends into the back of the popliteal fossa. The tibial nerve passes under the tendinous arch framed between the fibular and tibial heads of the soleus muscle and goes vertically through the deep region of the back of the leg on the surface of the tibialis posterior muscle with the posterior tibial vessels (1). The tibial nerve leaves the posterior compartment of the leg at the ankle by going through the tarsal tunnel behind the medial malleolus. It enters the foot to supply most intrinsic muscles and skin. In the leg, the tibial nerve leads to: branches that supply every muscle in the back of the leg, and gives off two cutaneous branches, the sural nerve and medial calcaneal nerve. Parts of the tibial nerve that innervate the superficial group of muscles of the back of the leg and popliteus muscle of the deep group originate at higher level in the leg between the two heads of the

gastrocnemius muscle in the distal region of the popliteal fossa. Branches innervate the gastrocnemius, plantaris and soleus muscles and passes into the popliteus muscle. Branches to the deep muscles of the back of the leg arises from the tibial nerve deep to the soleus muscle in the upper portion of the leg and innervate the tibialis posterior, flexor hallucis longus and flexor digitorum longus muscles (2).

Tibial nerve is the branch of the sciatic nerve and it is the principal nerve innervating the muscles of the posterior compartment of the leg. The tibial nerve divides into medial and lateral plantar nerves. The level of division might be significant for surgeons. Anatomic variations in tibial nerve branches might assist with making sense of disparities between clinical assessment and electrophysiologic tests regarding the area of neuronal lesions. Considerable variations have been accounted for in regards to the branching pattern of tibial nerve (TN) near its termination in foot. To understand the clinical anatomy of heel pain awareness of all the possible variations in

relation to terminal branching pattern of TN (near the tarsal tunnel) is essential. The current study is led to embrace an extensive survey of the variations in TN branches in foot with specific accentuation on the ramifications for sensory distribution of these branches. Compression of the tibial nerve in the tarsal tunnel can cause tarsal tunnel syndrome. Numerous surgeries need tibial nerve block which demands detailed information on its variation. The tibial nerve and its divisions are significant for performing fruitful nerve blocks and insertion of plates while treating fracture (3).

Knowledge of the bifurcation distance can be actually utilized for planning minimal skin incisions in the case of tibial nerve decompression by the release of known anatomical compression points, the soleus arch, and the tarsal tunnel syndrome. Understanding variations of the tibial nerve branches might explain clinical inconsistencies with electrophysiologic studies and may help stay away from surgical errors (4).

The clinical implications associated with several neurovascular structures at the medial side of the ankle such as nerve entrapment and impaired blood circulation. The tarsal

tunnel (TT) is the important structures which house the posterior tibial nerve (PTN) and the posterior tibial artery (PTA) including the associated branches of nerve and artery (5).

CASE REPORT

- During the routine dissection of posterior compartment of thigh, leg and foot in adult male cadaver was performed according to the guidelines mentioned in Cunningham's practical manual, in Department of Anatomy at King George's Medical University, Lucknow.
- The specimen was photographed by DSLR camera and compared with the normal. During a routine dissection of the posterior compartment of the thigh, leg and foot was dissected to trace the tibial nerve and its branches (fig 1). Variation of tibial nerve was found on the left side of a male cadaver. The skin and soft tissues of the plantar area were elevated over the plantar area of the feet. The subcutaneous fat and the plantar aponeurosis were carefully removed. The tibial nerve divided at a distance 6.2 cm above the medial malleolus (fig 2). There was no variation in the other neurovascular structure.

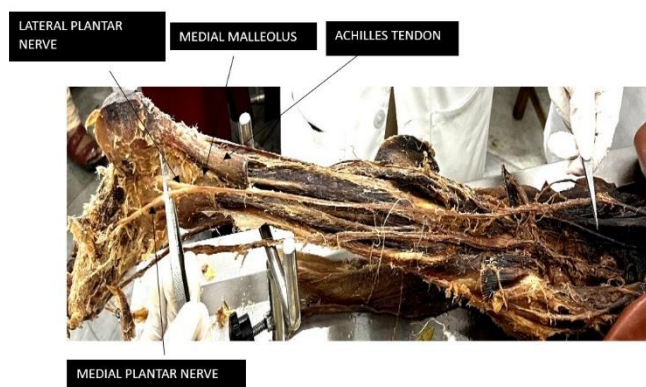


Fig 1. Branching Pattern of Tibial Nerve in Posterior Compartment of Leg And Foot



Fig 2. Level of Division of Tibial Nerve Measured by Measuring Tape

DISCUSSION

Norzana A.G et al. found the failure of the TN to divide in the tarsal tunnel and was related with tarsal tunnel syndrome. He described the significance of the presence of the anomaly and its relevance to surgical procedure in the region of the back of the ankle. This is on the grounds that the presence of anomaly of the higher division of tibial nerve except if known to the surgeons, may cause accidental injury (3).

Bainik S et al. observed that tibial nerve bifurcated roughly 1.86 cm above the miedomalleolar-calcaneal axis (1).

Torres ALG, Ferreira MC observed the tibial nerve bifurcation into medial and lateral plantar nerves occurred inside the retinaculum. In six pieces the division occurred proximal to the flexor retinaculum (6).

According to Apaydin N et al, in 22 cases (61.1%), the FHL was innervated by proximal and distal branches of the tibial nerve. In 14 cases (38.9%), it was innervated simply by one proximal branch (7).

According to A. Priya et al, The termination points of Tibial nerve ranged from 3 cm proximal to 3 cm distal to malleolar-calcaneal axis. MCN showed considerable variations in its origin both in trifurcation and bifurcation pattern pertaining to number of branches at the point of origin(8).

According to D. Malar, The tibial nerve bifurcation occurred within 2cm of medio-malleolar calcaneal axis(9).

Koo GB et al, observed thatthe tibial nerve was divided into the lateral and medial plantar nerves beneath the plantar flexor (10).

In the current study, we found thatthe tibial nerve divided 6.2 cm proximal to the medial malleolus on the left side. The tibial nerve and its branching pattern might have been 100 percent effective in complete nerve block for tibial nerve or any of its branches. There was higher branching of tibial nerve as found in the current study.

CONCLUSION

We exhibited superficial course of tibial nerve in Indian cadaver. our case showed that higher division of tibial nerve. Comparative case was very rare and just a single case has been accounted for. Consequently, this report is especially remarkable case and it might have clinical significances. The anatomy of the nerves of the foot and ankle is very complicated. Different compression syndromes might include foot nerves, and this report

might help in diagnosis. The tibial nerve is frequently iatrogenically injured during any graft harvest for fibula, high tibial osteotomy and fascial release procedures. Following an injury, clear understanding of the involvement of the motor branches are significant for clinical reason. Any surgical procedure on the back of the leg might include the tibial nerve and its branches. Consequently, appropriate understanding of the anatomy of tibial nerve might be advantageous for Surgeons and Orthopaedicians.

DECLARATION

Originality – The work is original.

Conflict of interest – No conflict of interest

Funding – No financial support

Ethical Clearance – not applicable

We declare that this case report is our original work, and it has not been submitted elsewhere.

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