anatomy
An International Journal of Experimental and Clinical Anatomy
http://dergipark.org.tr/en/pub/anatomy

Case Report

http://dergipark.org.tr/en/pub/anatomy
Received: November 12, 2023; Accepted: February 22, 2024
doi:10.2399/ana.23.1455446

A unique variation of the common peroneal nerve: a case report

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Abstract

This variation was observed in the left lower extremity of a 75-year-old male cadaver fixed with formalin, ethanol and glycerol solution. The common peroneal nerve was divided into six terminal branches. These branches were identified as deep peroneal nerve, superficial peroneal nerve, two muscular branches to the tibialis anterior and two muscular branches to the peroneus longus. Knowledge of the variations of the common peroneal nerve and its branches is important in knee and proximal leg operations.

Keywords: cadaver; common peroneal nerve; variations

Anatomy 2024;18(1):30–34

Introduction

The common peroneal (fibular) nerve generally diverges as the terminal branch of the sciatic nerve in the lower 1/3 of the thigh. After leaving the sciatic nerve as a terminal branch, it travels obliquely outward and laterally in the popliteal fossa. During this course it passes between the tendon of the biceps femoris muscle and the lateral head of the gastrocnemius muscle. Continuing its course, the common peroneal nerve enters deep into the peroneus longus muscle by winding from lateral of neck of the fibula. Deep to the peroneus longus muscle, it divides into two terminal branches called the deep peroneal nerve and the superficial peroneal nerve. It gives articular and cutaneous branches before dividing into its terminal branches. It provides innervation of the knee joint and proximal tibiofibular joint through the articular branches. It gives cutaneous branches named lateral sural cutaneous nerve and sural communicating nerve. The lateral sural cutaneous nerve innervates the skin of anterior, lateral and posterior aspects of the proximal part of the leg. The sural communicating nerve participates in the formation of the sural nerve. Its terminal branch named the deep peroneal nerve stimulates all the muscles in the anterior compartment of the leg and two small muscles in the dorsum of the foot. It also receives sensation of the skin between the big toe and second toe. The other terminal branch of the common peroneal nerve named the superficial peroneal nerve stimulates the leg lateral compartment muscles. It also receives sensation of the lateral part of the lower leg and most of the dorsum of the foot and toes.[1–3]

During the 4th week of embryonic life, limb buds appear in the anterolateral region of the body wall. Upper limb buds are located opposite the lower cervical and upper thoracic spinal segments. The lower limb buds are located opposite the lumbar and upper sacral spinal segments. After the formation of the limb buds, nerve fibers from the related spinal segments are distributed into the mesenchymal tissue. The neuromuscular interactions that occur with the nerves distributed between the muscle cells are necessary for the realization of healthy limb functions in the future.[4] Conditions that may occur in these complex pathways where the nerve fibers from the relevant spinal segments travel until they reach the muscle fibers can cause nerve variations.

Common peroneal nerve is one of the most frequently injured nerves of the lower extremity. Its protection against trauma is low due to its superficial course especially when winding around the fibula neck. The common peroneal nerve can also be damaged because of many surgical procedures. It can be injured especially in interventions related the proximal leg, popliteal fossa

and the knee area. It has been stated that the common peroneal nerve can be damaged as a result of total knee arthroplasty.[5] The common peroneal nerve can be damaged as a result of high tibial osteotomy.[6] It has also been reported that the common peroneal nerve can be damaged after the operation of the short saphenous vein.[7] It has also been reported that the common peroneal nerve can be damaged during arthroscopic knee surgery.[8]

In total damage to the common peroneal nerve, result in paralysis occurs in the muscles in the anterior and lateral compartments of the leg. For this reason, extension and eversion movements of the ankle cannot be performed. In those patients, foot drop occurs because the anterior compartment muscles cannot work and therefore the feet rub against the ground while walking. In addition, sensory loss is seen in the anterior and lateral regions of the leg and almost all of the dorsum of the foot.[1–3]

Case Report

A unique anatomical variation of the common peroneal nerve was observed in the left lower extremity of a 75-year-old male cadaver during the dissections we performed in the laboratory of the Department of Anatomy of Istanbul University-Cerrahpaşa, Faculty of Medicine. In this case, the common peroneal nerve divided into six terminal branches deep to the peroneus longus muscle as it looped around the neck of the fibula in the left lower extremity. (**Figures 1** and **2**) In this case, the common peroneal nerve divided into terminal branches before piercing the anterior intermuscular septum. Two of these six branches were the deep peroneal nerve and the superficial peroneal nerve. Two branches were muscle branches to the tibialis anterior muscle. The remaining two branches were muscle branches to the peroneus longus muscle. After separating from the common peroneal nerve, the deep peroneal nerve pierced the anterior intermuscular septum and entered the anterior compartment of the leg. After separating from the common peroneal nerve, the superficial peroneal nerve ran deep into the peroneus longus muscle. The two muscle branches to the tibialis anterior muscle entered the muscle lateral to the muscle after piercing the anterior intermuscular septum. Two muscle branches to the peroneus longus muscle entered the muscle medial to the muscle. The point where the common peroneal nerve divided into terminal branches was determined to be distal to the apex and head of the

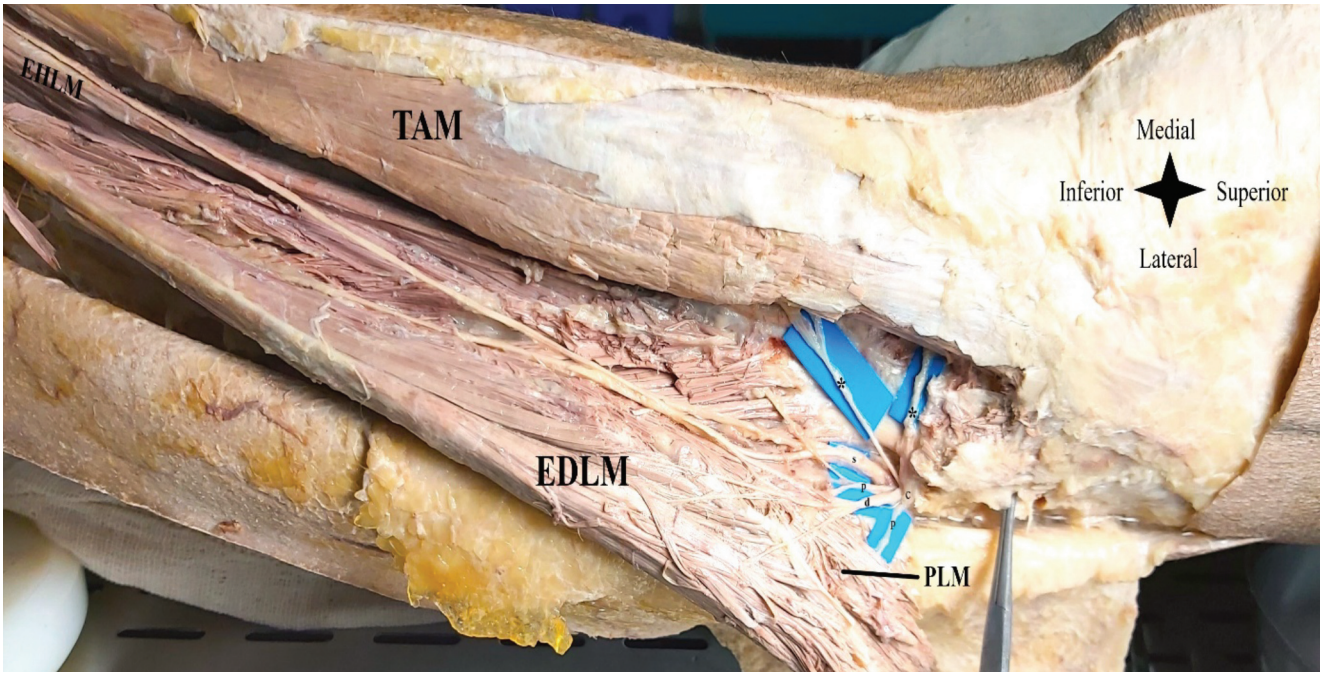

Figure 1. Division of the common peroneal nerve in the left lower extremity. EDML and PML origins were cut and retracted laterally. **c:** common peroneal nerve; **d:** deep peroneal nerve; **EDLM:** extensor digitorum longus muscle; **EHLM:** extensor hallucis longus muscle; **p:** muscular branches to the peroneus longus muscle; **PLM:** peroneus longus muscle; **s:** superficial peroneal nerve; **TAM:** tibialis anterior muscle, ***:** muscular branches to the tibialis anterior muscle.

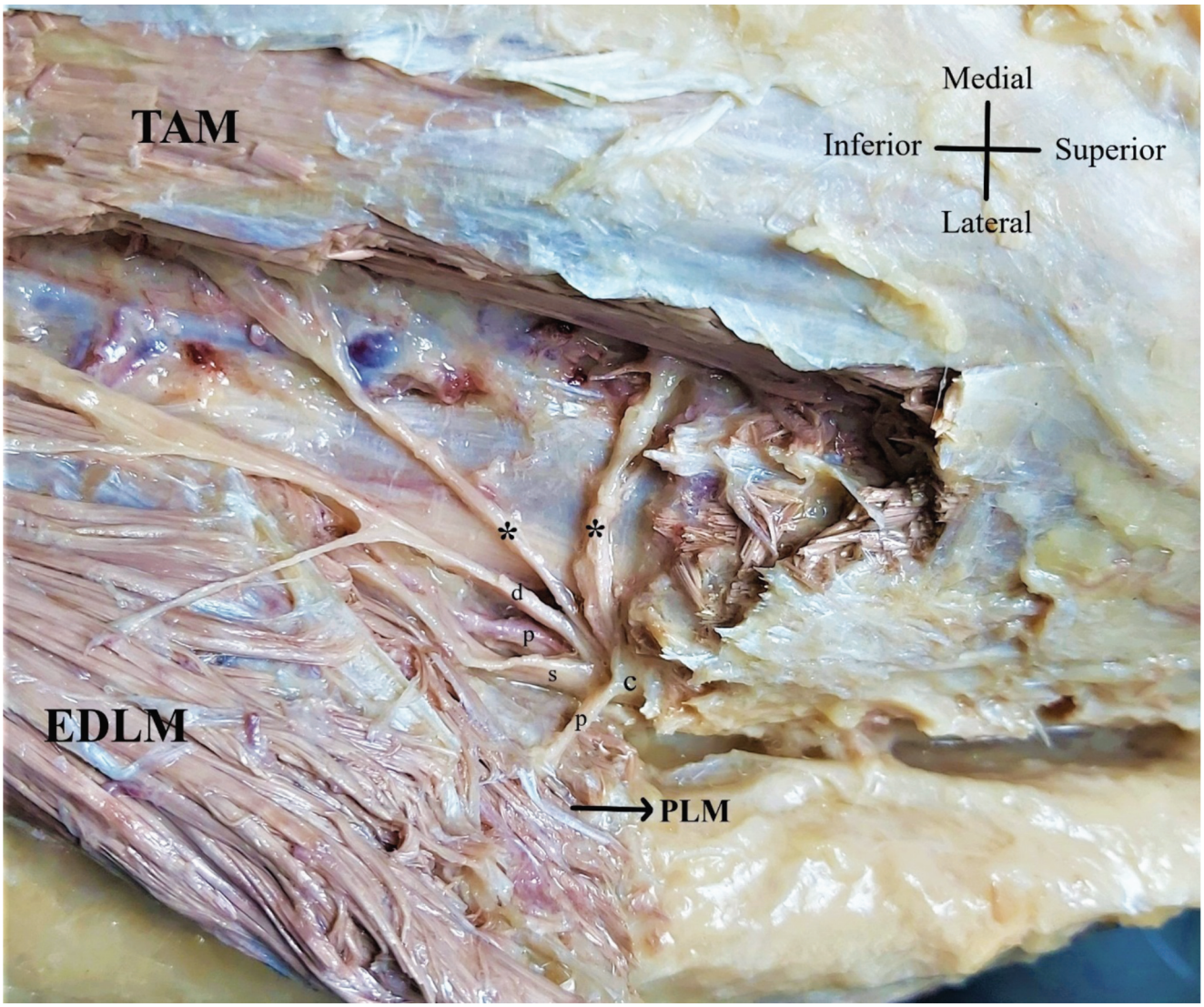

Figure 2. Division of the common peroneal nerve into six terminal branches in the left lower extremity, close-up view of **Figure 1**. **c:** common peroneal nerve; **d:** deep peroneal nerve; **EDLM:** extensor digitorum longus muscle; **p:** muscular branches to the peroneus longus muscle; **PLM:** peroneus longus muscle; **s:** superficial peroneal nerve; **TAM:** tibialis anterior muscle, ***:** muscular branches to the tibialis anterior muscle.

fibula (**Figure 3**). The distance from the point where the common peroneal nerve branches into its terminal branches to the apex of the fibula was 2.8 cm and the distance to the most prominent point of the fibular head was 1.3 cm. In the right lower extremity of the same cadaver, the common peroneal nerve was divided into three terminal branches: deep peroneal nerve, superficial peroneal nerve and muscular branch to the tibialis anterior muscle.

Discussion

The common peroneal nerve may be damaged in operations around the knee and proximal leg. Therefore, it is very important to know the anatomical features and variations of the common peroneal nerve. In the literature, there are studies on the terminal branching characteristics of the common peroneal nerve. However, very few studies have published the variations related to the separation of the common peroneal nerve into terminal branches. In classical anatomy books, it is stated that the common peroneal nerve is divided into two terminal branches called deep peroneal and superficial peroneal nerve.[1–3] Deutsch et al.[9] reported that the common peroneal nerve was divided into two terminal branches as deep peroneal and superficial peroneal nerve in all cases

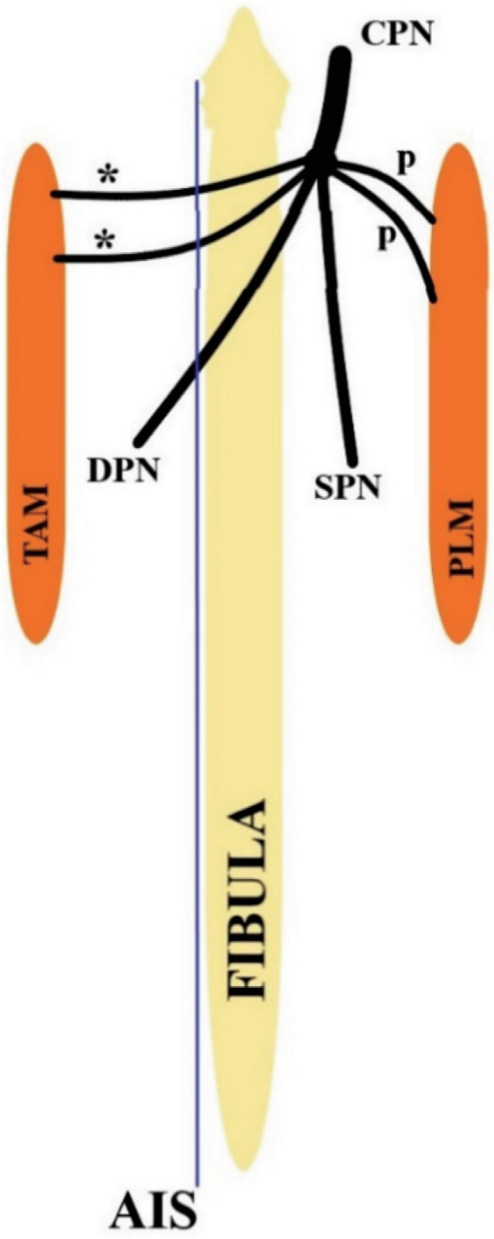

Figure 3. Schematic drawing of the division of the common peroneal nerve into six branches in the left lower extremity. **AIS:** anterior intermuscular septum; **CPN:** common peronal nerve, **DPN:** deep peroneal nerve; **p:** muscular branches to the peroneus longus muscle; **PLM:** peroneus longus muscle; **SPN:** superficial peroneal nerve; **TAM:** tibialis anterior muscle; ***:** muscular branches to the tibialis anterior muscle.

they examined. Kudoh and Sakai[10] found that the common peroneal nerve was divided into two terminal branches as classically described in their study Olcay et al.[11] reported that the common peroneal nerve divides into three terminal branches as anterior recurrent, deep peroneal nerve and superficial peroneal nerve. Chetty et al.[12] reported that the common peroneal nerve divided into two or three terminal branches.

When we look at the classical anatomy books and literature studies, we can say that the common peroneal nerve is divided into two terminal branches as deep and superficial peroneal nerve. In some studies in the literature, it has been reported that the common peroneal nerve is sometimes divided into three terminal branches. The variation of the division of the common peroneal nerve into terminal branches seen in the left lower extremity of the case we examined has not been previously reported in the literature. We think that this variation will be helpful for surgeons especially in operations around the knee and proximal fibula. In addition, in cases with this variation, we can say that isolated muscle weakness or paralysis may be seen in these muscles due to isolated destruction of the muscle branches to the peroneus longus muscle and/or tibialis anterior muscle in traumas that may occur at the level of the fibula head and neck.

Conclusion

We think that this unique variation in the left lower extremity of our case which has not been previously published in the literature will reduce the possibility of injury to the common peroneal nerve and its branches especially in surgical procedures around the knee and the proximal leg.

Acknowledgements

The authors sincerely thank those who donated their bodies to science so that anatomical research could be performed. Results from such research can potentially increase mankind's overall knowledge that can then improve patient care. Therefore, these donors and their families deserve our highest gratitude.

Conflict of Interest

The authors declare that there are no conflicts of interest relevant to this study.

Author Contributions

KG: project development, data collection, manuscript writing; TM: project development, data editing, manuscript editing

Ethics Approval

This study was ethically approved by the Cerrahpaşa School of Medicine Ethics Committee (reference no: E-83045809-604.01.02-54387).

Funding

The authors did not receive support from any organization for the submitted work.

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Conflict of interest statement: No conflicts declared.

 How to cite this article: Goral K, Marur T. A unique variation of the common peroneal nerve: a case report. Anatomy 2024;18(1):30–34.