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Original Article

Anatomical and histological morphometry of the sural nerve in human fetuses

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ABSTRACT

Introduction: In our study, the aim was to anatomically and histologically investigate the morphometric structures of the branches involved in the sural nerve and sural nerve formation.
Method: The study was conducted on 46 lower extremities of 23 fetuses which were obtained from Izmir Katip Çelebi University, Atatürk Training and Research Hospital, with ages from 18 and 32 gestational weeks, without any external pathology or anomaly. During the study period, the posterior-side skin dissection of the lower extremity was performed with the aid of a surgical dissection microscope initially, and the structures forming the sural nerve and the sural nerve were exposed and made visible. Afterwards, sections were taken from these structures for morphometric measurements and histological examination.
Results: The mean values and standard deviations of morphometric measurements obtained were determined. Separately, it was determined that there was no statistical difference between right-left sides and genders in morphometric measurements ($p > 0.05$). The sural nerve was determined to be differentiated into 4 types as A, B, C and D according to the way the nerve branches forming sural nerve join. In addition, differing characteristics pertaining to the sural nerve and branches were determined.
Discussion: We are of the opinion that the data obtained in our study will be of use to neurologists, orthopedists and clinicians engaged in this region during interventional procedures.

1. Introduction

The sural nerve (SN) is formed by the juncture of the medial sural cutaneus nerve (MSCN), which is a branch of the tibial nerve (TN), and the lateral sural cutaneus nerve (LSCN), which is a branch of the common peroneal nerve (CPN), in the posterior of the leg.[1] Afterwards, it follows the small saphenous vein as far as the posterior of the malleolus lateralis. On the exterior part of the dorsum of the foot, it extends up to the little toe as the lateral dorsal cutaneous nerve.[1] The SN receives cutaneous sensations from the posterolateral part of the distal region of the leg, malleolus lateralis, lateral part of the feet, and 4th and 5th toes on the feet.[1–4]

The fact that the SN shows variation was reported in former studies.[4,5] In studies conducted on adults, it is reported that the nerve branches forming the SN join at the popliteal fossa in 5.9%, in the middle of the leg in 1.9%, in the distal region of the leg in 67.4%, and at the ankle in 25.5% and, thus, they form the SN.[4,6] It is also stated in studies that the sural nerve originates directly from the sciatic nerve (ScN), CPN or TN.[6–10]

In general, although the SN is a sensory nerve, the fact that it may variationally show motor function and contain motor fibers has been emphasized in studies.[2,4,11] For this reason, the SN is of clinical importance in the diagnostic evaluation of tissue biopsies, in nerve grafts, and in the identification of sensory losses that develop due to distal neuropathies, since mono-neuropathies pertaining to the sural nerve are stated to be quite rarely seen.[4,9,12–14] Separately, in human fetus studies conducted previously, there is some information in regard to the morphometric structure and anatomic variations of the SN.[15,16]

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In our study, we aimed to morphometrically investigate the anatomic and histological structures of the SN in human fetuses as well as its neighboring relations with the gastrocnemius muscle and calcaneal tendon.

2. Material and method

Our study was conducted on 46 lower extremities (16 male and 7 female fetuses) of 23 fetuses, the ages of which varied between 18 and 32 gestational weeks, without any external pathology or anomaly. The fetuses were obtained from Izmir Katip Çelebi University, Atatürk Training and Research Hospital with the approval of parents. Separately, permission was received for the study from the ethics committee of Izmir Katip Çelebi University, Atatürk Training and Research Hospital.

During the study, firstly a longitudinal skin incision was made via a surgical dissection microscope (Leica M320F12) on the posterior side of the lower extremity, from the gluteal fold up to the protrusion of the heel so it was mid-line. Later, the superficial and deep fascia were removed, and the SN structures and the structures involved in the formation of the SN were exposed. Afterwards, morphometric measurements were taken from the anatomic structures that were exposed by using a digital compass. The lengths of the SN, MCSN and LSCN were taken as morphometric measurements. The length of the SN was taken as the distance remaining between the starting point of the nerve and malleolus lateralis; whereas the length of MSCN was taken as the distance remaining between the starting point of the nerve and the point at which it participated in sural nerve formation. The length of LSCN was taken as the distance remaining between the starting point of the nerve and the point at which it was involved in SN formation. Separately, the typology of the SN and the variations related to the sural nerve were determined. The SN, as in the former fetal studies, was typologized as Type A–D.[8] If the SN was formed by the juncture of MSCN and the peroneal communicating branch (PCB) parting from CPN or by the juncture of MSCN and PCB parting from

Fig. 1. Types of sural nerves. A: Formed by the juncture of MSCN and PCB parting from LSCN (Type A); B: Formed only by MSCN (Type B); C: Formed only by PCB (Type C); D: Formed by the juncture of MSCN, LSCN and (ScN) (Type D).