

Original article:

Anatomical variations of the superficial peroneal nerve in the leg - A cadaveric study on Indian population

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ABSTRACT

Introduction: The superficial peroneal nerve provides motor supply to the peroneal compartment of the leg and skin over the dorsum of the foot. The superficial peroneal nerve is simple in its course and termination, but its various anatomical variations has got wide spread medico- surgical implications. Although, different studies on anatomical variations of the nerve are available in the medical literature, such reports are rare in India. Hence the present study was undertaken on Indian population.

Methods: The study was carried out in the Department of Anatomy, Institute of Postgraduate Medical Education and Research, Kolkata, West Bengal. The sample size was 50 lower limbs. The course of the nerve, whether a single trunk or two independent branches on emergence and the compartmental distribution of the nerve when it arises as a single trunk was studied.

Results: In the present study, in 92% cases the superficial peroneal nerve, remained as a single trunk and in the remaining 8 % (04 lower limbs) it divided into 2 independent branches. It was observed that out of the 46 specimens, where it remained a single trunk, in 82.61% it emerged from the lateral compartment, in 6 cases i.e 13.04% it emerged from the anterior compartment and in the remaining 2 cases i.e 4.35% it emerged on the intermuscular septum in the leg.

Conclusion: This study clearly points out the fact that the superficial peroneal nerve has got widespread variations right from its origin at the level of knee to its terminal branches in the dorsum of the foot.

INTRODUCTION

The superficial peroneal nerve, one of the terminal branches of the common peroneal nerve, having root value L4 and L5, provides motor supply to the peroneal compartment of the leg and innervates the skin over the dorsum of the foot and ankle. Although the superficial peroneal nerve is simple in its course and termination, but its various anatomical variations has got wide spread medico- surgical implications. Even a small injury to the anterolateral and distal area of the leg can cause a superficial peroneal nerve section that may initially remain unnoticed unless a specific and targeted examination is performed. Also, iatrogenic injuries to the nerve may occur in various clinical manoeuvres such as poorly applied bandage causing neural compression, fasciotomies, arthroscopic ports and common surgeries during osteosynthesis in distal third of fibula.¹ Thus a detailed knowledge of the nerve anatomy and its variations is very important. Although, different studies on anatomical variations of superficial peroneal nerve are available in the medical literature, such reports are rare in India. Hence the present study was undertaken

on Indian population. The aim of the present study was to give a detailed description of the superficial peroneal nerve regarding its course, termination and anatomical variations.

MATERIALS AND METHODS

The study was carried out in the Department of Anatomy, Institute of Postgraduate Medical Education and Research, Kolkata, West Bengal. The sample size was 50 lower limbs of 25 formalin hardened human cadavers of both sexes of adult age group. All normal cadavers were included; cadavers with traumatized and deformed lower limbs were excluded from the above study. The dissection was carried out as given in Cunninghams manual² with the help of dissecting instruments. The course of the superficial peroneal nerve, whether a single trunk or two independent branches on emergence, was noted. Also, the compartmental distribution of the nerve when it arises as a single trunk and the distance between lateral malleolus and point of emergence of the nerve was noted.

AIMS AND OBJECTIVES

The main aim of the study was to determine whether the nerve emerges as a single trunk or by two independent branches; the compartmental distribution of the nerve while piercing the intermuscular septum and the mean distance from the lateral malleolus to the point of emergence of the nerve. All these data are important to study the variations in the course of the superficial peroneal nerve.

RESULTS

In the present study, out of 50 lower limbs, in 92% cases the superficial peroneal nerve after taking origin from the common peroneal nerve, remained as a single trunk and in the remaining 8%(04 lower limbs) it divided into 2 independent branches. It was observed that out of the 46 specimens, where it remained as a single trunk, in 82.61% it emerged from the lateral compartment, in 6 cases i.e. 13.04% it emerged from the anterior compartment (Fig -2) and in the remaining 2 cases i.e. 4.35% it emerged from the intermuscular septum (Fig -1). The mean distance from the lateral malleolus to the point of emergence of the nerve was found to be 167.98mm and standard deviation was 13.91mm in our study.

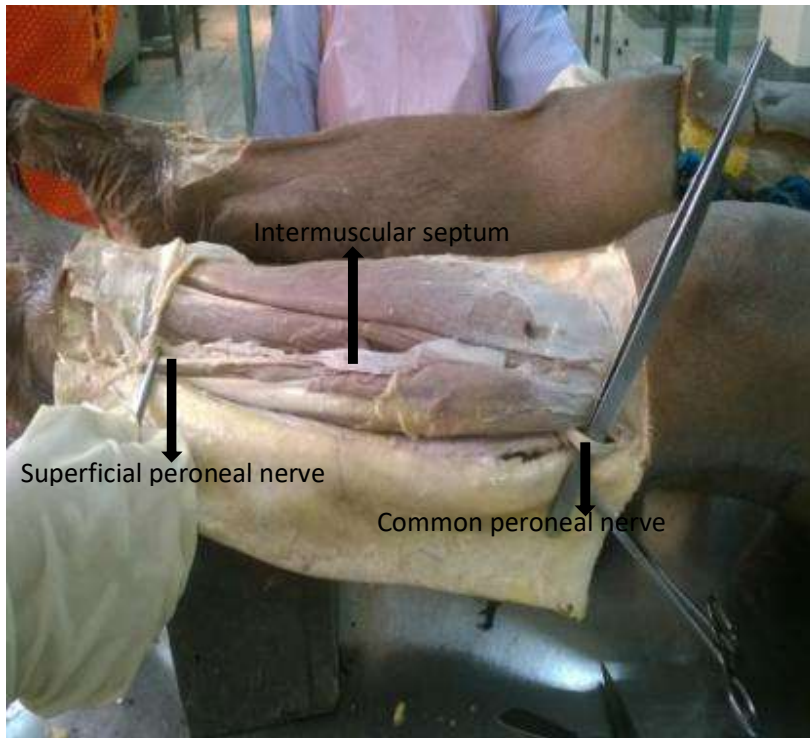


Figure 1: Superficial peroneal nerve emerging from the intermuscular septum.

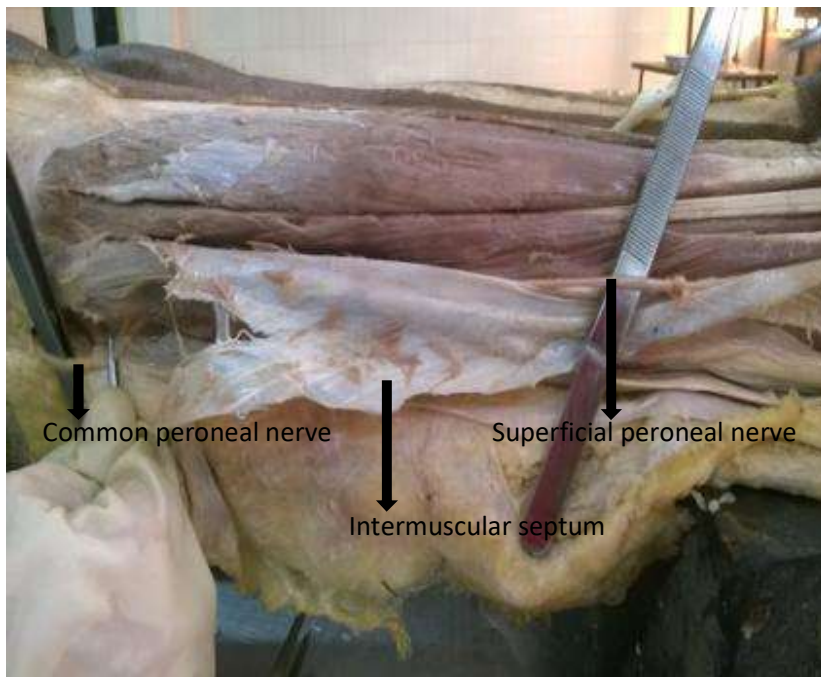


Figure 2: Superficial peroneal nerve emerging from the anterior compartment.

DISCUSSION

The common peroneal nerve takes origin from the sciatic nerve and is classically found superficially winding around the fibular neck from posterior to anterior. The nerve subsequently divides into the deep and superficial peroneal nerves. The superficial peroneal nerve usually travels within the lateral compartment of the lower leg, supplies the peroneus longus and brevis muscle, pierces the deep fascia in the distal third of leg and ends by dividing into medial and lateral branches. Some cases show a single trunk on emergence which later divides into 2 branches and other cases show two different previously divided cutaneous branches.

Table 1 denotes the frequency of a single trunk for superficial peroneal nerve and two independent nerve branches on emergence.

Study (Year of study)	Single trunk %	Two branches %
AdkisonDP et al (1991) ³	88%	12%
Pacha D et al (2003) ¹	75%	25%
Dellon AL et al (2006) ⁴	83.8%	16.2%
Prakash et al (2010) ⁵	80%	20%
Present study (2019)	92%	8%

The above table shows that the emergence of superficial peroneal nerve as 2 independent nerve trunks is not so common and it is a rare occurrence in Indian population. There is very little work in Indian literature in this aspect.

Table 2 denotes the frequency of compartment distribution of the superficial peroneal nerve (when it emerges as a single trunk)

Study (year of study)	SINGLE BRANCH EMERGING FROM		
	Anterior compartment	Lateral compartment	Intermuscular septum
Adkison DP et al(1991) ³	14%	73%	1%
Pacha D et al(2003) ¹	33.33%	55.55%	11.11%
AL Dellon et al (2006) ⁴	8.1%	69.4%	6.3%
Prakash et al (2010) ⁵	28.3%	60%	11.7%
Present study (2019)	13.04%	82.61%	4.35%

The level at which the superficial peroneal nerve pierces the superficial fascia in the leg and penetrates into the subcutaneous cellular tissue is important. The mean distance from the lateral malleolus to the point of emergence of the nerve was found to be 167.98mm and standard deviation was 13.91mm in our study. In a previous study done by D.Pacha et al¹, the nerve becomes superficial at 116.8mm proximal to the lateral malleolus. In another study^{6,7} it was found that the distance between the piercing level and that of lower end of lateral malleolus was found to be 6.5 – 12.3 cm i.e mainly in the lower third. Another study⁸ performed in South India noted that the superficial peroneal nerve divided into 2 branches – medial and lateral; medial piercing the intermuscular septum 23cm above ankle and lateral branch about 12cm above ankle.

There is very less reports in the literature regarding the compartmental distribution of the nerve. During surgeries for entrapment syndrome of the anterior compartment of the leg, surgeon should never cut across the anterior intermuscular septum without examining the presence of superficial peroneal nerve or its branches, as inadvertent injury to the nerve may lead to painful neuroma or unwanted numbness on the dorsum of foot. Also, during resection of neuroma of the superficial peroneal nerve, complete evaluation of the intermuscular septum is necessary, as incomplete resection or release would lead to therapeutic failure.⁸

Superficial peroneal nerve is accompanied by a small artery and a vein. These may be used by orthopaedicians as a vascularized graft in peripheral nerve surgeries and in plastic surgeries for vascularization of skin grafts. The motor supply of the superficial peroneal nerve to the peroneal muscles may be used for neurotization of the anterior tibial muscle in patients with L4 root injuries as in polio, spinal injuries etc.^{9,10} For all of this, a detailed idea about the

course, branches and the termination along with the variations of the superficial peroneal nerve is necessary to avoid iatrogenic injuries to the nerve.

CONCLUSION

The present study clearly points out the fact that the superficial peroneal nerve has got widespread variations right from its origin at the level of knee to its terminal branches in the dorsum of the foot. Knowledge of this variation is very useful in present days in various surgical and orthopaedic procedures to prevent iatrogenic injury to the nerve. The nerve is especially vulnerable to iatrogenic injuries in the following areas – in the lower leg where it becomes superficial; over the ankle where the branches distribute to supply the dorsum of the foot and where it crosses the intermuscular septum. Also precise identification of the second branch of the superficial peroneal nerve is very important during surgery. Thus, a deep knowledge of the nerve anatomy and good surgical skills are necessary to avoid the nerve injury.

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