

# Surgical anatomy of common peroneal nerve

Ankolekar VH<sup>1</sup>, Hosapatna M<sup>2</sup>, Nayak N<sup>3</sup>, Sylvan A<sup>4</sup>, Anne D Souza<sup>5</sup>

<sup>1</sup>Dr. Vrinda Hari Ankolekar, Associate Professor, Department of Anatomy, <sup>2</sup>Dr. Mamatha Hosapatna, Associate Professor, Department of Anatomy, <sup>3</sup>Dr Nivedita Nayak, Postgraduate student, Department of Anatomy, <sup>4</sup>Dr. Antony Sylvan D Souza, Professor and Head, Department of Anatomy, <sup>5</sup>Dr. Anne D Souza, Assistant Professor, Department of Anatomy, Kasturba Medical College, Manipal University, India

**Address for Correspondence:** Dr. Anne D Souza, Assistant professor, Department of Anatomy, Kasturba Medical College, Manipal University, Manipal, Karnataka, India, Email id: annedsouza\_84@yahoo.co.in

## Abstract

**Introduction:** The course and distributions of common peroneal nerve (CPN) are important during surgical procedures viz. arthroscopic knee surgery, tibial osteotomy and traction injuries. The present study aims to investigate the morphometry of CPN and its relationship to the adjacent anatomical landmarks. **Materials and Methods:** The present study was carried on 20 lower limb specimens. The length of the lower limb was measured from the anterior superior iliac spine to the medial malleolus. The distance of origin of CPN from the most prominent points of greater trochanter, iliac crest and ischial tuberosity were measured. The length of CPN was measured from its origin to bifurcation. **Results:** The length of the lower limb ranged from 75 to 91 cm. The distance between the Origin of CPN- iliac crest was  $43.8 \pm 7.6$  and  $40.9 \pm 3.4$  cm on right and left side respectively. The most common origin of CPN was at the lower third of the thigh (N=11), followed by middle third (N= 5) and at the upper third (N=4). The mean length of CPN was  $17.7 \pm 7$  cm on right and  $19.1 \pm 7.1$  cm on left side. **Conclusion:** The present study highlights the morphometry of CPN and its relations to important landmarks, the knowledge of which is important for successful surgery in this region.

**Keywords:** Common Peroneal Nerve, Superficial Peroneal Nerve, Deep Peroneal Nerve, Foot Drop

## Introduction

The CPN is a branch of the sciatic nerve (SN) that arises from the lumbosacral plexus. SN divides into a largertibial and smaller CPN at the superior angle of popliteal fossa. The tibial nerve (L4, L5, S1, S2, S3) innervates the musculature of the posterior compartment of the leg. The CPN (L4, L5, S1, S2) at the lateral side of neck of fibula deep to the peroneus longus, divides into a deep peroneal nerve (DPN) and superficial peroneal nerve (SPN). [1-4]. The course and distributions of CPN are important during surgical procedures such as arthroscopic knee surgery, tibial osteotomy and traction injuries [5,6]. An accurate description of the CPN and its morphometry may decrease its risk of damage during surgical procedures as well as its usefulness as a nerve graft [6, 7].

The surgeons should be aware of the regional topography of the CPN, especially regarding the distribution of its muscular branches while performing correction

osteotomies of the leg, osteosynthesis after knee fracture and microsurgical fibular nerve reconstruction. Compression syndromes of the CPN and its branches frequently occur primarily to trauma and surgery. A keen knowledge of the course and the relationship of the CPN to adjacent anatomical structures in the proximal leg is mandatory [8].

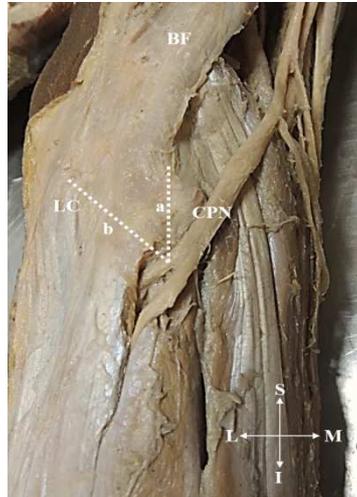
Therefore the present study was aimed to investigate the morphometry of CPN and its relation to the adjacent anatomical landmarks.

## Materials and Methods

The present observational study was carried on the 20 lower limb (11 right and 9 left) specimens procured from the Department of Anatomy, Kasturba Medical College, Manipal. The lower limbs were dissected and the bifurcation point of sciatic nerve into tibial and common peroneal nerves was observed. The length of the lower limb was measured from the anterior superior iliac spine to the medial malleolus. The level of origin point of common peroneal nerve (CPN) was observed.

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The soft tissue was dissected and most prominent point of greater trochanter, iliac crest and ischial tuberosity were demarcated. The distance of origin of common peroneal nerve from these bony points were measured. The length of CPN was measured from its point of origin to bifurcation. The posterior border of the biceps femoris tendon at its insertion point and the prominent point on the lateral tibial condyle were noted. Their distances from the bifurcation of CPN were measured and are shown in figure 1.



**Figure 1** (dimensions-613×967pixels, 150×150dpi): specimen of lower limb showing the bifurcation of common peroneal nerve and the parameters measured

CPN- Common peroneal nerve, BF- Tendon of biceps femoris, LC- Lateral tibial condyle

## Results

The length of the lower limb ranged from 75 to 91 cm. The most common origin of CPN was at the lower third of the thigh (N=11), followed by middle third (N= 5) and at the upper third (N=4). The mean length of CPN was  $17.7 \pm 7$  cm on right and  $19.1 \pm 7.1$  cm on left side.

The mean and standard deviations of distances measured are shown in table 1.

**Table 1: Mean and standard deviations of the measured parameters**

Parameters measured (in cm)	Right (N=11)	Left (N=9)
Origin of CPN- IC	$43.8 \pm 7.6$	$40.9 \pm 3.4$
Origin of CPN- GT	$29.8 \pm 4.9$	$27.4 \pm 4.8$
Origin of CPN- IT	$27.2 \pm 8.3$	$25.1 \pm 4.8$
Bifurcation of CPN- BFT	$2.6 \pm 0.4$	$2.3 \pm 0.3$
Bifurcation of CPN- LTC	$5.6 \pm 0.7$	$4.9 \pm 0.5$

CPN- Common peroneal nerve, IC- Iliac crest, GT- Greater trochanter, IT- Ischial tuberosity, BFT- Biceps femoris tendon (posterior border of biceps femoris tendon at its insertion), LTC- Lateral tibial condyle

No inferential statistics was used to compare the right and left sides as the specimens (lower limbs) belonged to different cadavers.

## Discussion

CPN palsy is more frequent in the clinical practice in relation to the tibial nerve. It usually occurs as a result of compression, torsion and lacerations of CPN caused by fractures to the neck of the fibula. The CPN palsy can also occur as a complication after fractures of the tibia, femur and acetabulum, sports injury of knee ligaments,

orthopedic interventions of the knee joint and ankle joint, long-term immobilization and even rapid weight loss [9-11].

Osteotomy of the fibula is an inseparable component of tibial osteotomy and may be performed at different levels.

Studies have shown that the site of osteotomy of the fibula contributes to the incidence of peroneal nerve palsy [12-16]. In a study, the point of division of the CPN and innervations of its muscles were within the proximal 82 mm of the fibula [17]. A high complication rate is associated with fibular osteotomies in the proximal 15 cm; as a result, this part should be avoided [15].

Surgical procedures are commonly performed at the proximal end of fibula. An adequate knowledge of both normal and abnormal anatomy of the region in relation to CPN is needed for successful surgery in the region. The topographical anatomy of common peroneal nerve is important for biopsy of proximal fibula [5, 18].

In a fetal study carried out by Chetty et al, the average length of the CPN from its point of origin from the sciatic nerve to its termination in relation to the neck of the fibula was  $16.03 \pm 3.53$  (11.01–22.77 mm) and  $16.69 \pm 3.90$  (10.65–24.14 mm), on the right and left sides, respectively. Knowledge of these variations may benefit surgeons, in planning for surgical intervention around the leg, ankle and foot [19].

In the present study the mean length of CPN was  $17.7 \pm 7$  cm on right side and  $19.1 \pm 7.1$  cm on left side. The most common origin of CPN was at the lower third of the thigh which was seen in 11 specimens. The present study compared the length of CPN in reference to the length of lower limb. Various anatomical landmarks were also considered and the distances were measured from the point of bifurcation of CPN.

The CPN and its superficial course in the lateral section of the proximal leg is essential in the field of traumatology and reconstructive surgery. Also iatrogenic nerve damage during osteosynthesis of the proximal tibia or correction osteotomies at the leg are followed by consecutive loss of sensory and foot drop syndromes [20].

Peroneal palsy often happens in clinical practice and leads to a foot drop due to paralysis of the anterior and lateral muscles compartment of the lower leg. In order to explain this problem, researchers are looking into CPN anatomical position, its relation to the neighboring structures, sparse vascularization and fascicular morphology. The vascular supply of CPN also has a clinical relevance in ischemic nerve damage [21, 22]. The present study provides the parameters which would be helpful to avoid injury to the CPN during surgical procedures of proximal leg.

Limitation: The authors could not compare their study with other studies because of lack of literature.

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