

Study of Variations in the Course and Level of Termination of Common Peroneal Nerve and its Clinical Implication - A Cadaveric Study

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ABSTRACT

Introduction:

The knowledge of anatomy and anatomical variations of Common Peroneal Nerve (CPN) is important because the severance of this nerve will result in flaccid paralysis of all muscles in anterior and lateral compartment of leg. CPN is vulnerable to injury as it is superficial over a bony prominence covered only by skin and superficial fascia for about 3-4 cms up to middle 1/3rd of the fibula, and is susceptible to direct blows and lacerations.

Aim and Objectives:

To study the course and level of termination of CPN into Superficial Peroneal Nerve (SPN) Deep Peroneal Nerve (DPN)

Materials and Methods:

Ethical clearance has been obtained 50 lower limb specimens of 25 formalin fixed cadavers were studied, dissection was done as per Cunningham's manual of practical anatomy. CPN was traced from its origin to its terminal branches Superficial and Deep Peroneal Nerve. The level of termination was recorded with respect to bony prominence tuberculum of fibula using a measuring tape.

Results:

In present study, in 46 (92%) specimens the CPN divided deep to peroneus longus (PL) into superficial and deep peroneal nerve. In 4 (8%) specimen the CPN divided into superficial and deep peroneal nerve approximately 1-4cms proximal to the head of fibula.

Conclusion:

Common Peroneal Nerve is very susceptible to injury because of its superficial course and variations in its level of termination, hence this study will be helpful to surgeons during various procedures and operations like fibular osteotomy, fibular head wire insertion, plaster cast application, arthroscopic lateral meniscus repair etc

Key words:

Common peroneal nerve, Deep peroneal nerve, Superficial peroneal nerve.

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INTRODUCTION

The Common peroneal nerve (CPN) is a branch of sciatic nerve, it descends obliquely along the popliteal fossa and curves lateral to the neck of fibula, passes deep to peroneus longus (PL) muscle and divides into Superficial Peroneal Nerve (SPN) and Deep Peroneal Nerve (DPN)¹.

Several studies have revealed the anatomical variations in the course and branching pattern of CPN, the nerve is said to divide into SPN and DPN proximal to the knee joint. Understanding such variations is a prerequisite in successfully carrying out procedures like arthroscopic meniscectomy or arthroscopic assisted meniscus repair, fibular osteotomy, etc.

The CPN is one of the most commonly injured nerve in the lower limb, due to its superficial course around the neck of fibula. Some the common reasons which causes pressure on this nerve are, fracture of neck of fibula followed by considerable displacement of hypertropled callus, adduction injury to knee, application of very tight plaster cast, rupture of fibular collateral ligament etc.

Hence a thorough knowledge of this nerve is utmost essential to anatomists and surgeons²

METHODOLOGY:

The common peroneal nerve was studied in 25 embalmed cadavers obtained from the Department of Anatomy Bangalore Medical College and Research Institute. The samples comprised of 25 right and 25 left lower limbs. The samples included limbs from both sexes.

The lower limbs were dissected according to guidelines given in the Cunningham practical manual. The Common peroneal nerve was traced from its origin, its course and branches were identified and photographed.

Any variations in the origin, course, branching pattern of the Common peroneal nerve was noted.

RESULTS:

In the present study, in 46 specimen the common peroneal nerve divided deep to peroneus longus (PL) muscle into superficial and deep peroneal nerves.

In 4 specimen the common peroneal nerve divided into superficial and deep peroneal nerve approximately 1-4 cms proximal to the tuberculum of fibula. (Table 1).

Table 1: Termination of CPN within PL and Proximal to tuberculum of fibula.

Terminal branches of CPN divided	Number of specimens	Percentage
Within peroneus longus muscle	46	92%
Proximal to the tuberculum of fibula	4	8%

Fig 1 CPN (Common Peroneal Nerve) dividing into terminal branches SPN (Superficial Peroneal Nerve) and DPN (Deep Peroneal Nerve) above the Tuberculum of fibula (TOF).

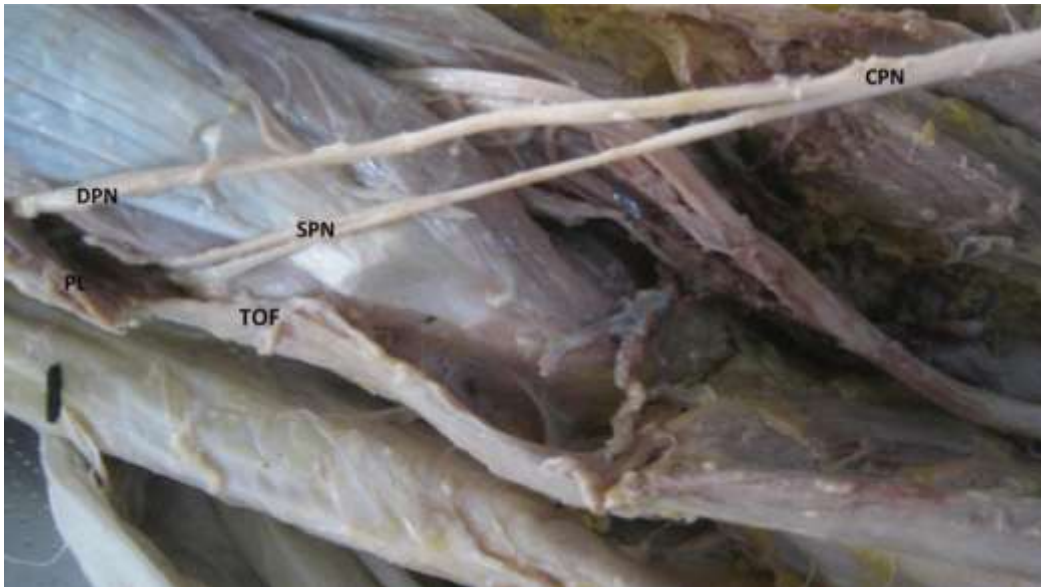


Fig 2 CPN (Common Peroneal Nerve) dividing into its terminal branches SPN (Superficial Peroneal Nerve) and DPN(Deep Peroneal Nerve) above the Tuberculum of fibula(TOF)



DISCUSSION:

The present study involved dissection of 50 lower limb specimens to study the course and termination of CPN. We observed that in 46 (92%) specimens the CPN had normal course and divided into SPN and DPN deep to PL muscle. (Figure 1). In 4(8%) specimen the CPN divided into SPN and DPN approximately 1-4 cms proximal to the tuberculum of fibula. (Figure 2). Rodeo et al., reported injury to DPN after routine arthroscopic partial lateral meniscectomy. On

surgical exploration of CPN it was found that it divided into superficial and deep peroneal nerve approximately 4 cms proximal to knee joint³. A study done by Allen Deutsch et.al revealed that the division of CPN proximal to joint line was observed in 10% (7 out of 70) specimens. Which is slightly more than our study⁴.

Paul Dearden studied ten cadaveric knee specimens and revealed that the distance from the tip of styloid process of fibula to the nerve as it winds around the neck of fibula was 34.8 mm (range 21.5 - 44.3 mm) this study recommends that the proximal fibular head wire should not be inserted beyond 2 cms distal to the tip of fibular head⁵. Rupp et al revealed that the CPN wraps around fibular neck at an average of 3.5 cms from tip of styloid process range(3-4.4 cms)⁶.

A study was done by J RWotton et al., on 12 cadaveric lower limbs. In this study it was found that the common peroneal nerve divided within the peroneus longus muscle into superficial and deep peroneal nerve. Both the nerves stayed closely related with fibula for 12 cms below the head of the fibula and migrate away from the bone as they move distally. This study states that the fibular osteotomy should not be performed in the area just below the fibular head and approximately 15 cms below fibular head⁷.

Vanden bergh et al states that the peroneal nerve is more susceptible to injury when it bifurcates proximally which is reported in

10 % of preserved specimen during arthroscopic inside out lateral meniscus repair. The study also states that when common peroneal nerve bifurcates proximal to fibular neck, the peroneal nerve can be captured in sutures during inside out arthroscopic meniscus repair. It could be prevented by posterior incision and retractor.⁸ Cao Thi et al dissected 30 lower limb specimens and found that the distance from fibular head to origin of Deep peroneal nerve was 26.4 mm and the findings were very similar with that of study done by chompoopong et al 28.4 mm. this study reveals that surgery in proximal 1/3rd of the leg the incidence of common peroneal nerve damage is more⁹.

In a case report Eric Rousseau mentions that the common peroneal nerve could be compressed by fabella an accessory sesamoid bone as it passes in between tendon of biceps femoris and lateral head of gastrocnemius muscle in 8.5% of the individual. It is also mentioned that as the common peroneal nerve enters the lateral compartment winding around the neck of fibula and piercing posterior inter muscular septum of leg and entering fibular tunnel between the two heads of peroneus longus muscle, this location is perceived to be main culprit for common peroneal nerve entrapment¹⁰.

Niall et al conducted a study called palsy of Common peroneal nerve after traumatic dislocation of knee, the study was conducted on 55 patients with dislocation of knee and

found that the Common peroneal nerve was injured in 14 of 55 patients (25%). The fixed attachment of CPN at the neck of fibula is one of the reason making it more susceptible to injury. When knee is subjected to varus and hyperextension forces common peroneal nerve proximal to the neck of fibula is vulnerable to traction injury¹¹.

CONCLUSION:

50 lower limb specimens were dissected to study the variations in the level of termination of common peroneal nerve. 8% incidence of proximal bifurcation (approximately 4 cms above the tuberculum of fibula) into superficial and deep peroneal nerve was observed. The knowledge of such variations could prevent injury to the common peroneal nerve and its branches during various procedures and surgeries.

REFERENCES :

1. Spinner RJ, Howe BM. Pelvic Girdle and Lower Limb. In: Susan Standring (ed). Gray's Anatomy-The anatomical basis of clinical practice. 41st ed. London: Elsevier Limited. 2016;1415-1416.
2. Ihunwo AD, Dimitrov ND, Anatomical basis for pressure on common peroneal nerve. Central African journal of medicine. 1999;45(3):77-78.
3. Rodeo SA, Sobel S, Weiland AJ: Deep peroneal-nerve injury as a result of arthroscopic meniscectomy. A case report and review of the literature. J Bone Joint Surg 1993;75A:1221-1224.
4. Deutsch A, Richard J. Wyzykowski. Evaluation of the Anatomy of the Common Peroneal Nerve. The American journal of sports medicine. 27(1):10-15.
5. Dearden P, Lwery k, Sherman K et al. Fibular head transfixion wire and its relationship to common peroneal nerve: cadaveric analysis. Strat Traum Limb Recon 2015;10:73-78.
6. Rupp RE, Podeszwa D, Ebraheim NA. Danger zones associated with fibular osteotomy. J Orthop Trauma 1994; 8(1):54-58
7. Wotton JR, Maclaren CAN, Ashworth MJ et al. Neurological complications of high tibial osteotomy- the fibular osteotomy as a causative factor: a clinical and anatomical study. Ann R Coll Surg Engl 1995; 77:31-34
8. Van den bergh FRA, Vanhoenacker FM, De Smet E et al, Peroneal nerve: Normal anatomy and pathologic findings on routine MRI of the knee. Insights Imaging 2013;4:287-299
9. Thi C, Van Huy N, Chi Nguyen N et al, Applied Anatomy of Common Peroneal Nerve: A Cadaveric Study. International journal of Medicine and Pharmacy. Jun 2018; 6(1)6-10

10. Rousseau E. The anterior recurrent peroneal nerve entrapment syndrome: A patellar tendinopathy differential diagnosis case report. *Manual Therapy* 2013; 18:611-614
11. Niall DM, Nutton RW, Keating JF. Palsy of common peroneal nerve after traumatic dislocation of the knee *J Bone Joint Surg (Br)* 2005; 87-B: 664-7.

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