

## EVALUATION OF THE ORIGIN VARIABILITY OF THE LATERAL FEMORAL CUTANEOUS NERVE WITH CLINICAL SIGNIFICANCE

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### ABSTRACT

**Background and Objectives:** The lateral femoral cutaneous nerve (LFCN) of the thigh arises from the dorsal branches of the second and third lumbar ventral rami. Several variations in the formation, course and branches of this nerve have been reported. The regional anatomy of the lateral femoral cutaneous nerve is highly varied and may account for its susceptibility to local trauma. Knowledge of these variations is important for surgeons to avoid injury to the nerve. The aim of this study was to evaluate the variations in the formation of LFCN of the thigh and to discuss its clinical implications.

**Materials And Methods:** The study was conducted on 25(50 sides) adult human cadavers in the Department of Anatomy, Sri Siddhartha Medical College, Tumkur, Karnataka, India by dissection method. The LFCN was looked for, bilaterally, and its formation studied. The specimens were numbered and photographed.

**Results:** In the present study, the lateral femoral cutaneous nerve of thigh arising from dorsal divisions of L2 L3 was observed in 34(68%) specimens. Variations in LFCN were observed in 16 specimens. The variations encountered were the absence of LFCN (2%), the origin of LFCN from ventral ramus of L1 spinal nerve (2%), the origin of LFCN from ventral rami of L1 L2 spinal nerves (8%), the origin of LFCN as a branch of femoral nerve (20%).

**Conclusion:** The present study highlights the necessity for a thorough knowledge of the topographical features of the LFCN so as to increase the efficacy of diagnosis, reduce complications and increase patient comfort.

**KEYWORDS:** Lateral femoral cutaneous nerve of thigh, Meralgia Paresthetica, Entrapment neuropathy, Lumbar plexus.

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### INTRODUCTION

The lateral femoral cutaneous nerve (LFCN) of the thigh arises from the dorsal branches of the

second and third lumbar ventral rami. It supplies the parietal peritoneum in the iliac fossa, passes behind or through the inguinal

ligament, about 1cm medial to the anterior superior iliac spine (ASIS) into the thigh, to supply the skin of the anterior and lateral thigh as far as the knee [1].

The variability in the course of LFCN has been well documented in the literature especially its course related to ASIS [2-4]. But so far very few cadaveric reports have been documented on variations in the formation and branches of this nerve. The lateral femoral cutaneous nerve may arise from the femoral nerve or an independent branch of lumbar plexus. The nerve may be absent on one side and may be replaced by a branch of the anterior femoral cutaneous nerve or by the ilioinguinal nerve [5,6].

The regional anatomy of the lateral femoral cutaneous nerve is highly varied and may account for its susceptibility to local trauma. Knowledge of these variations is important for surgeons to avoid injury to the nerve. The aim of this study was to evaluate the anatomical variations in the formation of lateral femoral cutaneous nerve and to discuss its clinical implications.

## MATERIALS AND METHODS

The study was conducted on 25(50 sides) adult human cadavers in the Department of Anatomy, Sri Siddhartha Medical College, Tumkur, Karnataka, India by dissection method. The skin, superficial fascia and the anterior abdominal wall muscles of each of the 25 cadavers were reflected to expose the posterior abdominal wall. After the locating the lumbar plexus, the course of LFCN was dissected. The pattern of origin of the LFCN was identified. The LFCN was traced from its origin to its extent until the inguinal ligament. Any variations in the lateral femoral cutaneous nerve origin were recorded. The specimens were numbered and photographed.

## RESULTS

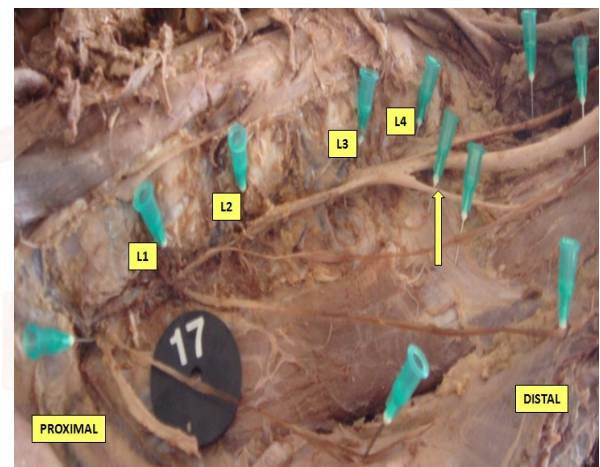
Right and left paravertebral gutters of each of the 25 formalin-fixed cadavers were finely dissected. An observation concerning the different sources of origin of LFCN was shown in table 1. It was observed that 16 of the 50 (32%) lumbar plexus demonstrated a variation of the lateral femoral cutaneous nerve (LFCN). The LFCN was formed by the dorsal division of

ventral rami of L2 and L3 spinal nerves (Figure 1) which are considered as the normal pattern was found in 34 cases i.e. 68% (Table 1).

**Table 1:** Variations in lateral femoral cutaneous nerve.

Type	Total (N = 50)	%
Originating from L2 L3 (Normal)	34	68
Originating from L1	1	2
Originating from L1 L2	4	8
Originating as a branch of femoral nerve	10	20
Absent	1	2

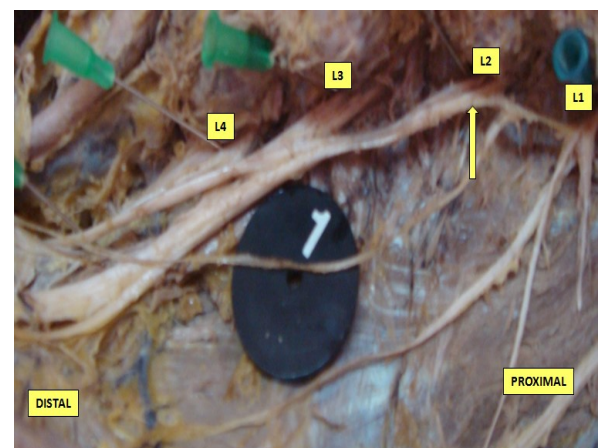
**Fig. 1:** LFCN arising from L2 and L3.



The patterns of the variations of LFCN observed in the present study were as following:

In 2% of cases dissected (one plexus), it was observed that the LFCN arose solely from L1 (**Fig.2**). In 8% of cases dissected (four plexuses), LFCN had its origin from L1 and L2 (**Fig.3**). The nerve was found to arise as a branch of femoral nerve itself in 20% of cases dissected (10 plexuses) whereas, in 2% of cases (one plexus), LFCN found to be absent (**Fig 4 and 5**).

**Fig. 2:** LFCN arising from L1.

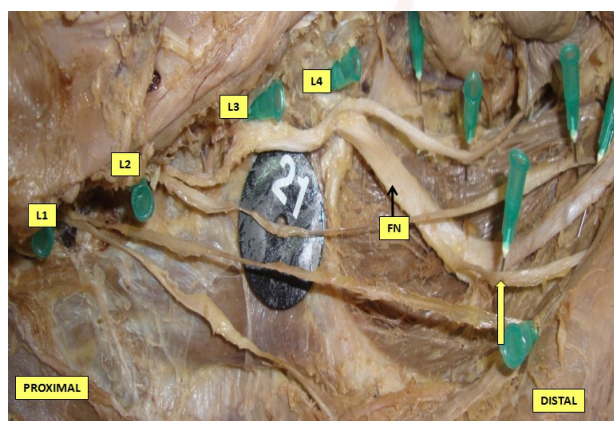




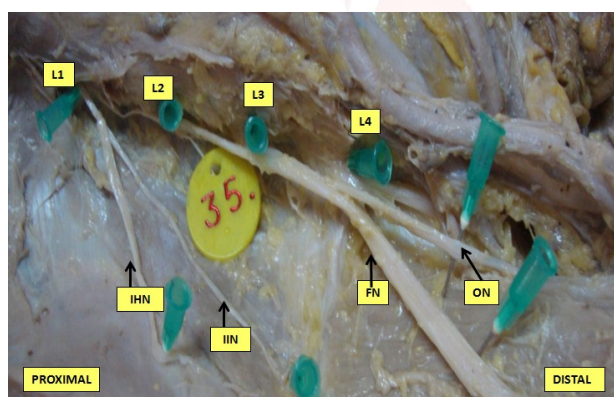
**Fig. 3:** LFCN arising from L1 and L2.



**Fig. 4:** LFCN arising as a branch of Femoral nerve.



**Fig. 5:** Absent LFCN.



## DISCUSSION

Formation of nerve starts during the 4<sup>th</sup> weeks of gestational age along with the formation of the muscles, skin & bones. The sclerotome, myotome, and dermatome are divisions of the somites which are solely responsible for the formation of bones, muscles, and skin respectively. Each myotome is innervated by one spinal nerve and those myotomes giving rise to the muscles of the limbs later migrate towards the limb bud. Any variation in the migratory pathway of the myotomes may lead to variations in the course and formation of the nerves of that region [7].

Lower extremities are supplied by lumbosacral plexus which is homologues of brachial plexus in upper extremities. However, variations of lumbosacral plexus formation as well as injuries are less frequent in comparison with brachial plexus. The lumbar plexus which is an upper component of lumbosacral plexus is formed by ventral rami of upper 3 lumbar nerves (L1, L2 & L3) with a major contribution from 4<sup>th</sup> lumbar nerve and often a minor contribution from the 12<sup>th</sup> thoracic nerve [8]. Various studies have been conducted on the normal anatomy and variation of the lumbosacral plexus since it was first described in detail by Eisler in 1892 [9].

The pattern of formation of lateral femoral cutaneous nerve (LFCN) is altered if the plexus is prefixed or postfixed i.e. the fiber contribution for the formation of LFCN is moved cranially or caudally respectively [10].

In the present study, we observed that the first most common origin of LFCN was from L2 and L3 followed by as a branch of femoral nerve. The incidence of Lateral femoral cutaneous nerve (LFCN) arising from the L2 and L3 in the literature varies from 14% to 95 % [11.16]. In the present study, the incidence of lateral femoral cutaneous nerve arising from the L1 and L2 was 68%.

Our findings were very similar and close to Jayarani et al who also reported the origin of LFCN from L2L3 in 60% of cases<sup>6</sup>. But the incidence was lower than that reported by Fasila P et al (95%) [16]. Comparison of variations related to the origin of the Lateral femoral cutaneous nerve with different studies was tabulated and compared with the present study in table 2.

**Table 2:** Comparison of present study findings with the previous studies.

Authors	L1	L1 L2	L2 L3	As a branch of Femoral nerve	Absent
Webber (1961) [11]	8%	2%	14%	8%	6%
De Ridder (1999) [12]	-	12%		-	-
Sim and Webb (2004) [13]		36.70%		10%	
Carai (2009) [14]	-	-	-	-	8.80%
Erbil KM (1999) [15]	-	Case report	-	-	-
Arora D (2015) [10]	-	13.30%	46.60%	8.30%	16.67%
Jayarani (2015) [6]		4%	60%	4%	
Fasila P (2018) [16]		1.60%	95%		1.60%
Present study (2018)	2%	8%	68%	20%	2%

In the present study, the LFCN second most commonly originates as a branch of femoral nerve. We found the higher incidence of LFCN arising as a branch of femoral nerve and were recorded in 10 plexus (20%). Jayarani et al did the similar study and reported a lower incidence of LFCN arising as a branch of femoral nerve (4%) [6].

In the present study, the formation of LFCN from L1 was 2%. An extensive review of literature about the origin of LFCN from L1 has returned only very few studies. A study conducted by Webber et al had reported that the LFCN arising from L1 was found in 8% of cases [11]. This incidence was higher than the present study.

Additionally, so-called high form i.e. LFCN arising from L1L2 instead of L2L3 was also observed in our study. Various authors reported the incidence ranging from 1.6% to 36.7 % [16,13]. In our study, the incidence of LFCN arising from L1L2 was found in 4 specimens (8%).

In summary, out of 50specimes, we acknowledged the five high form patterns (one specimen showed a prefixed type i.e. from L1 and 4 specimens also showed a prefixed type but it arises from L1 & L2). But we have not documented any low form pattern.

## CONCLUSION

Extensive studies and literature on the regional anatomy and anatomical deviations of LFCN have reported clinically significant variations. These variations gain clinical importance in regional nerve blocks in specific surgeries like muscle biopsy, postoperative pain management and treatment of entrapment syndromes. The present study highlights the necessity for a thorough knowledge of the topographical features of the LFCN so as to increase the efficacy of diagnosis, reduce complications and increase patient comfort.

**Conflicts of Interests: None**

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