ORIGINAL RESEARCH

A human cadaveric study on the variation in formation of lateral femoral cutaneous nerve

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ABSTRACT

Introduction- The lumbar plexus is a network of nerves which comprises of the ventral primary rami of the first, second, third and fourth lumbar spinal nerves (L1 - L4).Compression and effacement of the Lateral femoral cutaneous nerve (LFCN) results in a condition known as Meralgia Paresthetica.This is often related to severe toxic disorders, such as lead poisoning, chronic alcoholism and diabetis mellitus. This would also be useful information for Anatomists, Anaesthesiologists, Gynaecologists, Orthopedicians and Surgeons. **Aim-** The aim of this study was to evaluate the incidence and variation in the formation of Lateral femoral cutaneous nerve. **Material and method-** The study was carried out on a total of 60 lumbar plexuses taken from 30 cadavers in the department of anatomy index medical college (MP), and govt medical college, doda (J&K). For the purpose of providing a more transparent depiction of the observed variation, each item has been photographed with a digital camera. **Result-** On studying 60 lumbar plexus we found that there was abnormal contribution of dorsal division of L1 spinal nerve along with L2 in the formation of LFCN and this was seen in 3.33% cases on right lumbar plexus and 6.67% cases on left .In 2 cadavers LFCN was arising from the dorsal division of L3 spinal nerve without the contribution of L2 and LFCN absent in 8.3% of plexus. **Conclusion-** The current study found that in 11.6% of plexuses, the Lateral femoral cutaneous nerve got its segmental innervations from segments other than L2 and L3

Abbreviation: Lateral femoral cutaneous nerve (LFCN), Lumbar plexus (LP)

INTRODUCTION

The **lumbar plexus** is a network of nerves which comprises of the ventral primary rami of the first, second, third and fourth lumbar spinal nerves (L1 - L4). The Lumbar Plexus lies within the posterior part of the psoas major muscle in front of the transverse processes of the lumbar vertebrae.

The dorsal branches of L2 and L3 nerves each divide into a smaller and a larger part; the smaller parts unite to form the lateral femoral cutaneous nerve (LFCN), and the larger parts join with the dorsal branch of the L4 to form the femoral nerve (FN).

The lateral cutaneous femoral nerve travels obliquely across the iliacus muscle in the direction of the anterior superior iliac spine & passes beneath the inguinal ligament and divides into anterior and posterior branches.The anterior branch supplies the skin on the antero-lateral aspect of thigh. The distal branch communicates with the anterior cutaneous fibers of the femoral nerve and its infrapatellar branches (of the sephanous nerve) forms the patellar plexus. The posterior branch pierces the fascia lata and supplies the skin of the lateral aspect of thigh (from greater trochanter to mid thigh).

Compression and effacement of the Lateral femoral cutaneous nerve (LFCN) results in a condition known as Meralgia Paresthetica, causing tingling and burning sensations along the anterolateral aspect of the thigh. This is often related to severe toxic disorders, such as lead poisoning, chronic alcoholism and diabetis mellitus (Brian. 1979, Grossman. 2001). Historically, the most common etiological factor causing direct impingement of the nerve has been related to tethering of a belt in an obese individual (Boyce. 1984). The

LFCN may become involved in any pathological process along the nerve's course such as abscess, hematoma and sarcomas (Majkrzak et al. 2010).

AIM AND OBJECTIVES

The aim of this study was to evaluate the incidence and variation in the formation of lateral cutaneous femoral nerve of thigh.

MATERIAL & METHODS

The research was carried out on a total of 60 lumbar plexuses taken from 30 adult human cadavers, with 30 taken from the right side and 30 taken from the left. The lumbar plexus was exposed bilaterally in respect to the psoas major muscle after it was dissected on both sides using an anterior approach.

The psoas major muscle was left intact and in its original position after all of the viscera that were located in front of the peritoneum were removed in order to expose the posterior abdominal cavity via the anterior approach. We looked into the connection between the psoas major muscle and the lumbar plexus. After that, the muscle was meticulously dissected and cut into pieces so that the branching pattern of the nerves could be observed.

RESULT

Origin	L1,L2		L2,L3		L3		Absent		Unusual branching	
Side	Rt	Lt	Rt	Lt	Rt	Lt	Rt	Lt	Rt	Lt
N	1	2	24	24	2	2	3	2	1	1
%	3.33	6.67	80	80	6.67	6.67	10	6.67	3.33	3.33

- The normal origin comes from the dorsal division of the L2 and L3 nerve roots in 80% of cases. (Figure 1)
- There was abnormal contribution of dorsal division of L1 spinal nerve along with L2 in the formation of LFCN and this was seen in 3.33% cases on right lumbar plexus and 6.67% cases on left .
- In 2 cadavers LFCN was arising from the dorsal division of L3 spinal nerve without the contribution of L2.
- LFCN was not detected in five out of sixty (8.3%) of the plexuses. (Figure 12)
- An atypical branching was found in 2 out of 60 (3.33%) plexuses.

Figure 1: Showing normal roots of the LFCN (dorsal division of L2,L3 roots)

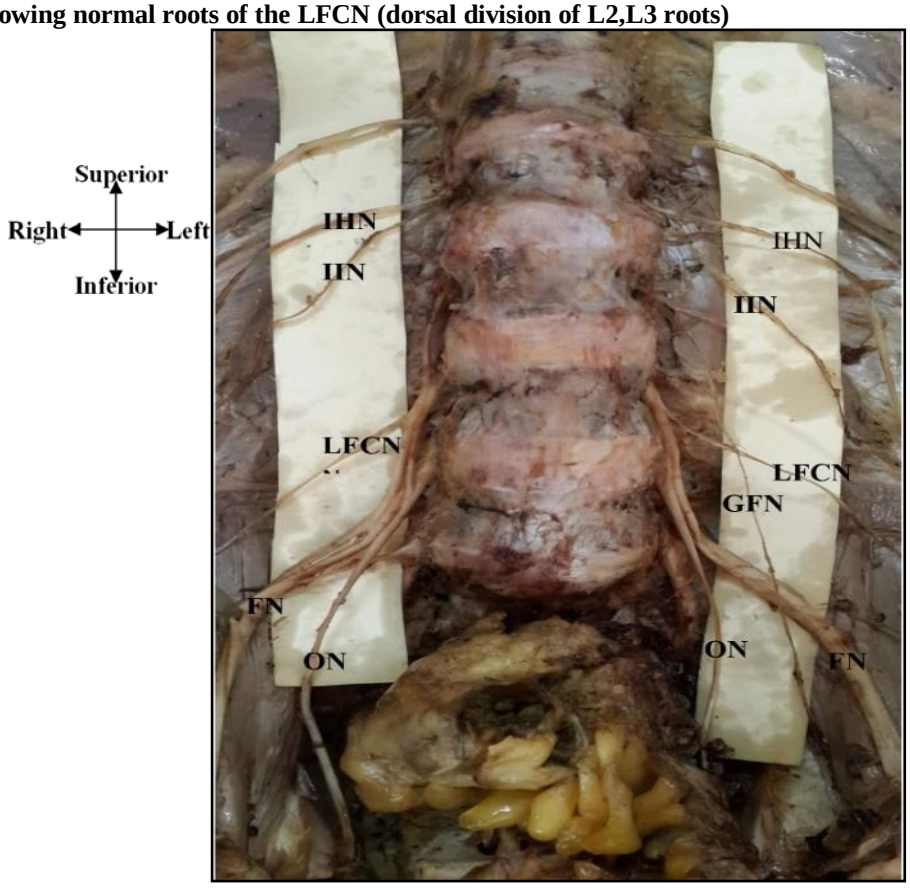

Figure 2: Showing the absence of LFCN bilaterally and normal origin of FN from dorsal division of L2, L3, L4 root

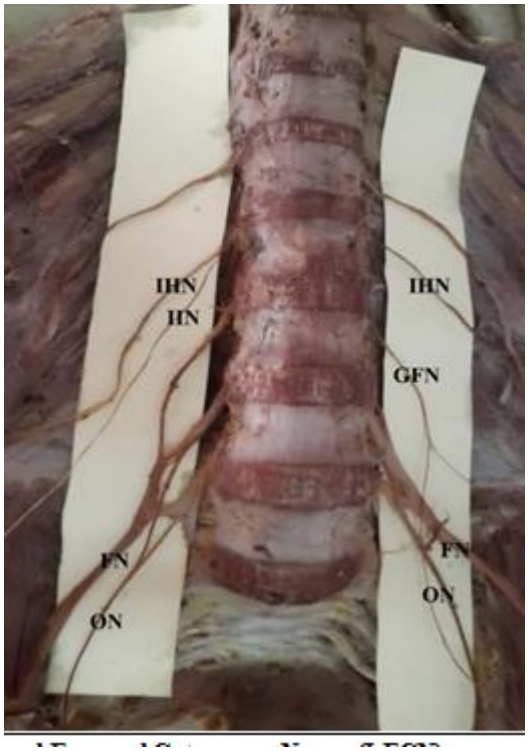

Table 15: Comparison of Lateral Femoral Cutaneous Nerve (LFCN)

Author	Total No.of Lumbar Plexuses	Nerve Derived from (Origin)	N	%	Absent		Unusual Branching	
					N	%	N	%
De Ridder et al. (1999)	400	L1-L2 L2/L3	24 374	6 94	-	-	-	-
Erbil et al. (1999)	2	L1-L2	1	50	-	-	-	-
Sim and Webb (2004)	60	L1-L2 L2 Femoral nerve	22 1 6	36.7 1.7 10	-	-	-	-
Yusuf et al. (2005)	20	-	-	-	-	-	-	-
Uzmansel et al. (2006)	2	L2-L3	2	100	-	-	-	-
Anloague et al. (2009)	34	L1-L2 L2 L2-L3	4 1 28	11.76 2.94 82.35	-	-	-	-
Astik and Dave (2011)	64	Femoral Nerve	4	6.25	-	-	-	-
Arora et al. (2014)	60	T12, L1 and L2 L2-L3	1 33	1.67 55	-	-	-	-
P. Notasaen et al. (2016)	131	L2 L2-L3 L2-L3-L4	4 110 17	3.05 84 13	-	-	-	-
Arora et al. (2016)	60	T12,L1,L2 L1,L2 L1,L2,L3 L2,L3 Femoral	2 8 6 28 5	3.33 13.30 10 46.66 8.33				

		nerve L3	1	1.66	10	16	-	-
Present study	60	L1-L2 L2-L3 L3	3 52 4	5 78.75 3.75	5	12.5	2	6.25

N: Number of lumbar plexuses Showing variant origins/absent nerve/unusual branching pattern.

- Arora et al. (2014,2016) report that less than 5% of instances of LFCN originate from T12, L1, or L2 patients. No other researcher has spotted such an LFCN origin in their investigations.
- Erbil et al. (1999) conducted research on 2 lumbar plexuses and found that in 1 of the cases, the LFCN originates from the L1-L2 roots. It was found by De Ridder et al. (1999) that the origin of LFCN can be traced back to L1-L2 roots in 6% of cases, which is comparable to the 5% of cases that we found. On the other hand, Sim and Webb (2004), Anloague et al. (2009), and Arora et al. (2016) reported that its origin from L1-L2 root occurred in more than 10% of cases, with Sim and Webb (2004) finding the highest incidence of 36.7%. Arora et al. (2016) reported that its origin occurred in more than 10% of cases.
- Less than five percent of instances of LFCN were found to originate from the L2 root, according to Sim and Webb (2004), Anloague et al. (2009), and P. Nontasaen et al. (2016). The current investigation did not uncover any such point of origin.
- Arora et al. (2014, 2016) reported the origin of LFCN from L2-L3 roots in 40 to 50 percent of cases, but De Ridder et al. (1999), Anloague et al. (2009), Uzmansel et al. (2006) and P. Nontasaenet al. (2016) reported the origin of LFCN in more than 80 percent of cases. In the current investigation, it was recorded as high as 78.75%.
- According to Arora et al. (2016), the origin of LFCN can be traced back to an L3 root in 1.66% of cases, whereas the origin can be found in present study in 3.75% of cases.
- Researchers such as Sim and Webb (2004), Astik and Dave (2011), and Arora et al. (2016) suggest that the origin of LFCN can be traced back to the femoral nerve in up to ten percent of their patients' cases.
- According to P. Nontasaen et al. (2016), the origin of LFCN was found to come from L2, L3, or L4 roots in 13% of the instances.
- 12.5% of cases in this study did not have LFCN, according to the findings of the present investigation. According to Arora et al. (2016), there were 16.66% of cases in which LFCN was not present. Nobody else has mentioned the absence of the nerve in their work.

CONCLUSION

The current study found that in 11.6% of plexuses, the Lateral femoral cutaneous nerve got its segmental innervations from segments other than L2 and L3. Although it receives multisegmental innervation from mostly L2 and L3, and less commonly from L1 and L2, the differentiation between radiculopathy and peripheral neuropathy affecting the Lateral femoral cutaneous nerve, such as in meralgia paresthetica, in which patients report numbness, paresthesia, pain, and/or hyperaesthesia in the anterolateral thigh should be made by the clinician without difficulty. This is because radiculopathy is more likely This may be more difficult to accomplish in the small percentage of patients in which the nerve originates only from the L2 nerve, as was the case in 5 percent of the plexus in the current study.

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