

Original Article

Morphology of Lateral Femoral Cutaneous Nerve (LFCN) of the thigh and its clinical significance

Deepthi Arora*, Subhash Kaushal**, Usha Chhabra**

*Assistant Professor, Department of Anatomy, MMIMSR, Mullana, Ambala, Haryana, India.

** Professor and former Head of Department of Anatomy, GMC, Patiala, Punjab, India

DOI: 10.5455/jrmds.2015342

ABSTRACT

Background: The incidence of Meralgia Paresthetica (MP) is increasing and is related to various surgical procedures. The obvious reason is that the description of Lateral femoral cutaneous nerve of thigh is inadequate.

Aims and objectives: This study aims to record variations in origin of lateral femoral cutaneous nerve, to compile the findings and to analyze the clinical aspect related to variations so recorded and to compare the study to previous studies.

Methodology: The study was performed on 30 formalin embalmed cadavers in the department of anatomy, Government Medical College, Patiala. The muscles of the posterior abdominal wall were exposed. The fibers of psoas major muscle were dissected from the transverse processes of lumbar vertebrae and the nerves of lumbar plexus were exposed.

Results: In all the specimens, it was found that the lateral femoral cutaneous nerve was passing through the substance of psoas major muscle and emerged from its lateral border. Lateral femoral cutaneous nerve showed its origin from L2 and L3 only in 46.6% of plexuses. In the rest of the cases, it showed variations in the morphological root value. It was found to be absent in 10 plexuses. It arose directly from femoral nerve in 5 plexuses.

Conclusion: Meralgia Paraesthetica (MP) is very commonly overlooked or confused with femoral or sciatic pain or other nerve root impingements. The knowledge of anatomical variations of the lateral femoral cutaneous nerve of thigh is essential to the surgeons to avoid iatrogenic injury to the nerve and to the clinicians while treating the cases of meralgia paresthetica.

Key words: Meralgia Paresthetica, lumbar plexus, lateral femoral cutaneous nerve

INTRODUCTION

Evidence based practice emphasizes the examination and application of evidence from clinical research into diagnosis, prognosis, and outcomes based on a formal set of rules. However, a detailed knowledge of anatomy often serves to guide clinical reasoning in circumstances where evidences are insufficient. Knowledge of anatomical deviations becomes more important especially in situations where clinical diagnosis is only based on anatomical extrapolation.

The lumbar plexus is one of the potential anatomical fields to show variations in a number of ways. The origin of lumbar plexus and numerous autonomic plexuses and ganglia lie in the posterior abdominal wall. The lumbar plexus takes its origin from the

ventral rami of the first to fourth lumbar nerve roots and projects laterally and caudally from the intervertebral foramina, posterior to the psoas major muscle. The first lumbar nerve is often joined by a communicating branch from the T12, also known as the subcostal nerve. The L2-L4 ventral rami initially bifurcate into an anterior and posterior primary division. Both primary divisions then enter the lumbar plexus and give rise to six nerves. Within this plexus, the first lumbar nerve divides into a cranial and caudal branch. The cranial branch further divides into the iliohypogastric and ilioinguinal nerves. The iliohypogastric nerve is also formed by the subcostal nerve in people where this nerve contributes to the lumbar plexus. The caudal branch of the L1 nerve joins with the anterior division of the second lumbar nerve to form the genitofemoral nerve. The anterior

divisions of the L2-L4 roots form the obturator nerve. The lateral femoral cutaneous nerve arises from the posterior divisions of the L2 and L3 roots; the posterior divisions of L2, L3, and L4 join to create the femoral nerve [1].

The purpose of this study is to describe the anatomical variations in the origin of lateral femoral cutaneous nerve of thigh. Comparing our findings to the previously described variations, we will also suggest possible clinical implications.

Hager first described MP in 1885. It was reported in more details by Bernhardt in 1895, and later Roth (1895) published a paper in which he named it meralgia paraesthetica. The term is derived from the Greek words meros which means thigh and algos which means pain. MP is a sensory mononeuropathy and can be explained as a syndrome of disturbed or altered sensation in the distribution of LFCN. The LFCN is a sensory nerve and starts its life arising from the 2nd and 3rd lumbar nerve roots. It may be derived from several different combinations of lumbar nerves, including L2 and L3, L1 and L2, L2 alone and L3 alone. The nerve courses in the pelvis along the lateral border of psoas major muscle to the lateral part of inguinal ligament. [2].

Though many articles were being published and MP was recognized too early since 1900's, still its diagnosis is missed or delayed, and few practicing physicians are actually aware of the condition or identify the symptoms. Meralgia paresthetica is very frequently seen after spine surgery. The reason for this is that although it is a frequently discussed condition, published in many surgical journals, it appears that it is very rarely discussed in the journals of anaesthesia. The anesthesiologists should be aware of and careful regarding the occurrence of this syndrome [3].

Ontogeny

The limb muscles are innervated by the branches of the ventral primary rami of the spinal nerves C5 through T1 (for the upper limb) and L4 through S3 (for the lower limb). Once the motor axons arrive at the base of the limb bud, they mix in a specific pattern to form the brachial plexus of the upper limb and the lumbosacral plexus of the lower limb. This zone thus constitutes the decision-making region for the axons. The identities of the factors that control the formation of the brachial and lumbosacral plexus are not well known, but hepatocyte growth factor has been implicated as a trophic factor.

Once the axons have sorted out in the plexus, the growth cones continue into the limb bud, presumably traveling along permissive pathways that lead in the general direction of the appropriate muscle compartment. Over the last part of an axon's path, from the part where it leaves its major nerve trunk to the point where it innervates a specific muscle, axonal path finding is probably regulated by cues produced by the muscle itself [4]. Various genetic compositions are inherited over generations and may cause variations. Most of the anatomical variations are benign. These errors of embryological development are responsible for muscular variations [5]. This study aims to record variations in origin of lateral femoral cutaneous nerve, to compile the findings and to analyze the clinical aspect related to variations so recorded and to compare the study to previous studies.

MATERIALS AND METHODS

Lateral femoral cutaneous nerve was studied during routine educational dissection of 30 formalin embalmed human cadavers in the department of anatomy, Government Medical College, Patiala over a period of 3 years (2008-2011). There were no signs of trauma, surgery or wound scars in the abdominal regions of any of the cadavers. The muscles of the posterior abdominal wall were exposed by removing their fascial coverings. While doing so, injury to the vessels and nerves related to the muscles was avoided. The fibres of psoas major muscle were then meticulously detached from the intervertebral discs and vertebral bodies. The genitofemoral nerve on the anterior surface of psoas was traced through that muscle to the lumbar nerves. The removal of psoas from the transverse processes of the lumbar vertebrae was carefully completed, disentangling the ventral rami of the lumbar nerves from its substance. The nerves and their branches were exposed.

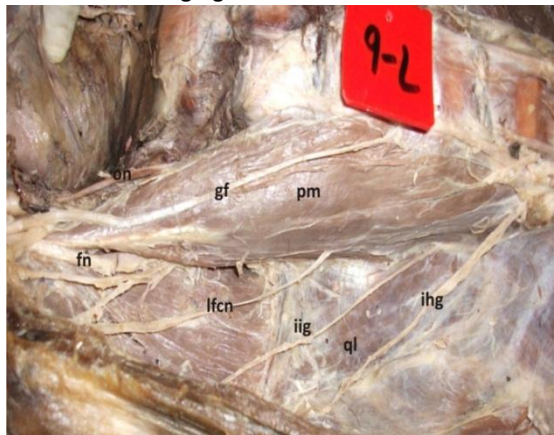
RESULTS

In all the specimens, it was found that the lateral femoral cutaneous nerve was passing through the substance of psoas major muscle and emerged from its lateral border. (figure 1).

Table 1: Origin of Lateral Femoral Cutaneous nerve of thigh

Origin	T12, L1, L2	L1, L2	L3	L1,L2, L3	L2, L3	Femoral nerve	Absent
% age	3.33	13.3	1.67	10	46.7	8.3	16.67

Figure 1: Lateral femoral cutaneous nerve passing through the substance of psoas major muscle and emerging from its lateral border



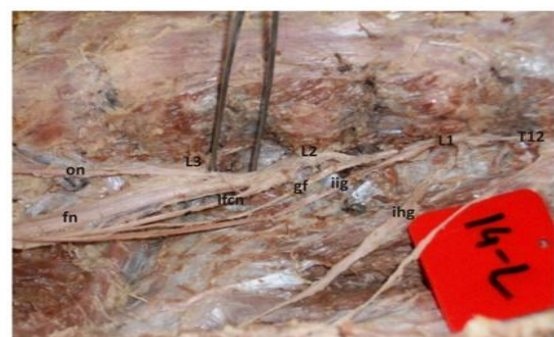
ihg - iliohypogastric nerve, iig-ilioinguinal nerve, gf- genitofemoral nerve, fn- femoral nerve, on- obturator nerve, lfcn- lateral femoral cutaneous nerve, pm- psoas major, ql-quadratus lumborum

Figure 2: LFCN arising from L2 and L3 nerve roots



ihg - iliohypogastric nerve, iig-ilioinguinal nerve, gf- genitofemoral nerve, fn- femoral nerve, on- obturator nerve, lfcn- lateral femoral cutaneous nerve

Figure 3: Trunk divided into obturator and femoral nerves



ihg - iliohypogastric nerve, iig- ilioinguinal nerve, gf- genitofemoral nerve, fn- femoral nerve, on- obturator nerve, lfcn- lateral femoral cutaneous nerve.

Generally described as arising from posterior division of L2 and L3 roots, in the current study Lateral femoral cutaneous nerve arose from these roots only

in 28 lumbar plexuses (figure 2). The nerve was not found in 10 plexuses. It arose from L1, 2 in 8 lumbar plexuses. It was found to arise from L1, 2, 3 roots in 6 plexuses and solely from L3 in 1 plexus. In 5 specimens, the nerve was found to arise from the femoral nerve itself. In 2 out of 60 lumbar plexuses dissected, an unusual pattern of lumbar plexus was observed. The plexuses were prefixed as there was a contribution from T12 and the nerves were forming loops as shown in figure 3. T12 joined L1 and gave out Iliohypogastric nerve. L1 after joining with T12 divided into 2 branches- Ilioinguinal nerve and the other one further divided into Genitofemoral nerve and a branch which completed the loop with L2. L2 gave rise to Lateral femoral cutaneous nerve and then joined with L3 forming a trunk which divided into obturator and femoral nerves. Lateral femoral cutaneous nerve contained the fibres from L2 and preceding segments but it was difficult to comment any contribution from L3. Ultimately the whole trunk divided into obturator and femoral nerves (figure 3).

DISCUSSION

The LFCN originates directly from the lumbar plexus and may be derived from several different combinations of lumbar nerves, including L2 and L3, L1 and L2, L2 alone and L3 alone [6]. In our study, LFCN arose from femoral nerve in 8.3% of plexuses. In another study, it was reported that in 22 (36.7%) of 60 plexuses, the lateral femoral cutaneous nerve arose from L1 and L2; in one plexus (1.7%), the nerve arose solely from L2 and in 6 plexuses (10%), it arose directly from the femoral nerve, making for a total of 48.3% variation for the lateral femoral cutaneous nerve [7]. In the current study, the nerve derived its segmental innervations from segments other than L2 and L3 in 53.3% of plexuses.

A study was done on 200 cadavers. In 24 cases, the lateral femoral cutaneous nerve arose from L1 and L2, and even solely from the second or third lumbar nerve [8]. Erbil et al reported in a case that the lateral cutaneous nerve of the thigh was formed by the union of the anterior rami of the first and second lumbar spinal nerves [9]. In the present study the morphological root value of the nerve was L1 & L2 in 8(13.33%) and L3 alone in 1(1.66%) lumbar plexuses. Another study reported that the lateral femoral cutaneous nerve was not there in 13 (8.8%) of 148 patients who had undergone surgical procedures for meralgia paraesthetica [10]. In the present study the nerve was found absent in 10 (16.6%) lumbar plexuses.

A routine dissection found a LFCN (accessory Lateral Femoral Cutaneous Nerve) was arising 6.5 cm distal and posterolateral to the origin of the femoral nerve. The epineurium of the femoral nerve was further dissected and it showed that the aLFCN had neural contribution from the dorsal rami of L2 and L3 spinal nerves. The femoral nerve was formed by the union of the posterior divisions of L2-4 spinal nerves. It received a thin branch from the LFCN 5.2 cm after its formation. When traced further the nerve followed normal course. 15 (30%) aLFCN were reported by Dias Filho in their bilateral dissection in 26 cadavers. In their series, 3 of the aLFCN were taking origin from the genitofemoral nerve, one of them was arising from the ventral ramus of L1 and L2, another one was arising from the ventral ramus of L2 and L3 and the rest was arising from the ventral ramus of L2. LFCN was also seen arising from the femoral nerve inferior to the inguinal ligament in a case [11].

CONCLUSION

In our present study, the morphological root value of lateral femoral cutaneous nerve was L2 and L3 in 46.7% of plexuses. Although its morphological root value is most commonly L2 and L3 and less commonly L1 and L2. The clinician should be able to easily differentiate between radiculopathy and peripheral neuropathy affecting the nerve as in meralgia paraesthetica where patients report numbness, paraesthesiae, pain or hyperaesthesias in the anterolateral thighs; this may be less easily done in the small percentage of patients where the nerve derives solely from the L2 nerve or L3 nerve.

REFERENCES

- Anloague P, Huijbregts P. Anatomical Variations of the Lumbar Plexus: A Descriptive Anatomy Study with Proposed Clinical Implications. *J Man Manip Ther* 2009;17(4):107-14.
- Williams PH, Trzil KP. Management of meralgia paresthetica. *J Neurosurg.* 1991;74:76-80.
- Ivins GK. Meralgia paresthetica, the elusive diagnosis: clinical experience with 14 adult patients. *Ann Surg* 2000;232:281-6.
- Larsen WJ. *Human Embryology*, Elsevier Churchill Livingstone 2001;3:324-8.
- Ravindranath Y, Manjunath KY, Ravindranath R. Accessory origin of the Piriformis muscle. *Singapore Med J* 2008;49(8):217.
- Aszmann OC, Dellon ES, Dellon AL. Anatomical course of the lateral femoral cutaneous nerve and its susceptibility to compression and injury. *Plast Reconstr Surg* 1997;100:600-4.
- Sim IW, Webb T. Anatomy and anaesthesia of the lumbar somatic plexus. *Anaesth Intensive Care.* 2004;32:178-87.
- De Ridder VA, De Lange S, Popta J. Anatomical variations of the lateral femoral cutaneous nerve and the consequences for surgery. *J Orthop Trauma* 1999;13:207-11.
- Erbil KM, Onderoglu S, Basar R. Unusual branching in lumbar plexus: case report. *Okajimas Folia Anat Jpn.* 1999;76(1):55-9.
- Carai A, Fenu G, Sechi E, Crotti FM, Montella A. Anatomical variability of the lateral femoral cutaneous nerve: Findings from a surgical series. *Clin Anat* 2009;22:365-70.
- Dias FLC, Valenc MM, Guimaraes F, Medeiros RC, Silva RAM, Morais MG et al. Lateral femoral cutaneous neuralgia: an anatomical insight. *Clin Anat* 2003;16:309-16.

Corresponding Author:

Assistant Professor,
Department of Anatomy,
MMIMSR, Mullana, Ambala,
Haryana, India
Email: dr.deeptiarora@gmail.com

Date of Submission: 07/11/2015

Date of Acceptance: 20/12/2015

How to cite this article: Arora D, Kaushal S, Chhabra U. Morphology of Lateral Femoral Cutaneous Nerve (LFCN) of the thigh and its clinical significance. *J Res Med Den Sci* 2015;3(4):256-9.

Source of Support: None

Conflict of Interest: None declared