Case Report: Variation in the Cutaneous Branch of Femoral Nerve

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ABSTRACT

Understanding the regional anatomy and variations of femoral nerve -as highly essential in daily life activities- is important for surgeons, orthopaedicians, and anesthetists. It helps to prevent iatrogenic femoral nerve palsy in clinical practices. During the dissection of the right lower limb of the cadaver of a 35 years old male, we observed one additional cutaneous branch separated from the posterior division of the femoral nerve. This branch crossed with femoral artery at the beginning and continued to descend into the medial side of the thigh medial to Gracilis muscle. At the end, it pierced through the deep fascia near the knee joint.

1. Introduction

The main objective of this report was to dissect, determine, and record variations in the anatomy of the femoral nerve and its branching arrangement. This observation could afterward be used to improve the existing anatomy and various surgical accesses to expose the femoral nerve.

The femoral nerve is the main nerve in the anterior compartment of the thigh. It is the largest branch of the lumbar plexus and made from the dorsal branches of the anterior primary rami of L2, L3, and L4 nerves. It reaches the thigh by passing behind the inguinal ligament, just lateral to the femoral sheath. The subdivision of femoral nerve to anterior and posterior branches occurs almost 2 cm below the inguinal ligament; where they are separated by the lateral circumflex femoral artery.

The anterior division gives off the anterior cutaneous nerve of the thigh (cutaneous branch) and one branch that motor supply the Sartorius muscle. The posterior division gives off the main cutaneous branch, called the saphenous nerve, and 4 muscular branches that innervate the quadriceps femoral muscle.

Two branches of the anterior cutaneous nerve include an intermediate cutaneous and a medial cutaneous nerve of thigh. The intermediate (middle) cutaneous nerve usually pierces the fascia lata (and most of the Sartorius muscle) 8 cm below the inguinal ligament; i.e. either as two branches or one trunk, which are shortly divided and descend on the front of the thigh, supplying the skin

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as low as the front of knee and the patellar plexus ending. In the upper thigh, the lateral branch of intermediate cutaneous nerve joins the branch of genitofemoral nerve. The medial (internal) cutaneous nerve obliquely crosses the artery at the apex of femoral triangle and divides into two branches.

The anterior branch descends on the Sartorius, pierces the fascia lata at the lower third of the thigh, and divides into two branches; one branch supplies the skin as low as the medial side of the knee and the other crosses to the lateral side of former and conjoint with the infrapatellar branch of the saphenous nerve. The posterior branch descends along the posterior border of Sartorius to the knee. That is where it perforates the fascia lata, connects with the saphenous nerve, and gives off several cutaneous branches. It gives off a cutaneous rami supply to the medial side of the leg [1]. Due to occasional peculiarities observed in its course, there have been a few studies on the variations of this nerve. In this case, a rare variation of the posterior division of femoral nerve has been reported.

2. Case Report

During an anatomical dissection of the right lower limb of a male Iranian cadaver in the Abadan School of Medical Sciences, a unique variation in the branching of the femoral nerve course was observed. The skin and fascia of the right lower limb were perfectly dissected, and the neurovascular bundle of thigh and the whole limb were distinctly explored. The course of the nerves and their branches were completely traced, and the anatomical variations were reported.

The anterior division of femoral nerve was divided into intermediate cutaneous, medial cutaneous, and saphenous nerves (Figure 1). The saphenous nerve descended on the medial side of the thigh, medial to Sartorius muscle. The saphenous branch of femoral nerve was laterally redirected after crossing with Sartorius muscle. We noticed an additional cutaneous branch that was separated from the posterior division of femoral nerve. This branch crossed with femoral artery at the beginning and continued to descend in the medial side of the thigh, medial to Gracilis muscle. At the end, it entered the deep fascia, near the knee joint. Other branches of the femoral nerve had ordinary anatomical courses. The vessels and the other nerves of femoral region had no anatomical variations, either.

3. Discussion

Advances in medical knowledge and techniques of new clinical diagnoses necessitate filling the gap between the classic anatomic descriptions of the cutaneous innervation and the atypical patterns of sensory loss observed in clinical practices [2-4]. The anatomical variation of cutaneous nerves may be due to axonal growth, path-findings, and the different patterns of branching formation during the development of the human body. Different mechanisms, such as various

Figure 1. Right lower limb showing femoral nerve and the branching pattern in thigh

molecular signals and principal directions might have caused these differences [5, 6].

The femoral nerve typically derives from L2-L4 lumbar roots. However, many studies have reported prevalent anatomic variations in this nerve and its branches. Here, a single anterior femoral cutaneous nerve was presented rather than the normal presentation of two separated anterior femoral cutaneous branches. Furthermore, the major motor branches of the femoral nerve involved in standing are centrally located; while, the sensory branches and the branches not implicated in standing are located in the medial or lateral parts. Another study reported that the medial cutaneous nerve branches and muscular branches for four heads of quadriceps femoris muscle were arranged medially to laterally, respectively [7-9].

4. Conclusion

Classifying the variations in the branching pattern of the femoral nerve will help with the presentation and differential diagnosis of patients. The proximity of femoral nerve to the large vessels increases the risk of nerve damage through vessel manipulation [10]. In addition, identifying these variations has been useful in the blockade of the femoral nerve. Moreover, it is essential for neurosurgeons to avoid iatrogenic injury to the femoral nerve and its branches or related fascicles. Conclusively, we suggest that more research be conducted to examine the relationship between anatomical variations and their effects on imaging clarification.

Ethical Considerations

Compliance with ethical guidelines

This is an anatomical case report article and don't have any ethical guidelines.

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Authors contributions

Investigation and Dissection: Alborz jafaee soog; Writing, original draft preparation, editing: Forouzan Absalan.

Conflict of interest

All authors certify that this manuscript has neither been published in whole or in part nor is it being considered for publication elsewhere. The authors have no conflict of interest to declare.

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References

[1] Singh I. Textbook of anatomy with colour atlas, 4th ed. New Delhi: Jaypeem Brothers; 2014.

[2] Haładaj R, Wysiadecki G, Macchi V, de Caro R, Wojdyn M, Polguj M, et al. Anatomic variations of the lateral femoral cutaneous nerve: Remnants of atypical nerve growth pathways revisited by intraneural fascicular dissection and a proposed classification. World Neurosurgery. 2018; 118:e687-e98. [DOI:10.1016/j.wneu.2018.07.021] [PMID]

[3] Gasparotti R, Padua L, Briani C, Lauria G. New technologies for the assessment of neuropathies. Nature Reviews Neurology. 2017; 13(4):203-16. [DOI:10.1038/nrneurol.2017.31] [PMID]

[4] Haładaj R, Pingot M, Topol M. The effectiveness of cervical spondylosis therapy with Saunders traction device and high-intensity laser therapy: A randomized controlled trial. Medical Science Monitor. 2017; 23:335-42. [DOI:10.12659/MSM.899454] [PMID] [PMCID]

[5] Carmeliet P. Blood vessels and nerves: Common signals, pathways and diseases. Nature Reviews Genetics. 2003; 4(9):710-20. [DOI:10.1038/nrg1158] [PMID]

[6] Maina F, Hilton MC, Ponzetto C, Davies AM, Klein R. Met receptor signaling is required for sensory nerve development and HGF promotes axonal growth and survival of sensory neurons. Genes & Development. 1997; 11(24):3341-50. [DOI:10.1101/gad.11.24.3341] [PMID] [PMCID]

[7] Anloague PA, Huijbregts P. Anatomical variations of the lumbar plexus: A descriptive anatomy study with proposed clinical implications. Journal of Manual & Manipulative Therapy. 2009; 17(4):107E-14E. [DOI:10.1179/106698109791352201] [PMID] [PMCID]

[8] Gustafson KJ, Pinault GC, Neville JJ, Syed I, Davis Jr JA, Jean-Claude J, et al. Fascicular anatomy of human femoral nerve: Implications for neural prostheses using nerve cuff electrodes. Journal of Rehabilitation Research and Development. 2009; 46(7):973-84. [DOI:10.1682/JRRD.2008.08.0097] [PMID]

[9] Aizawa Y. On the organization of the plexus lumbalis. I. on the recognition of the three-layered divisions and the systematic description of the branches of the human femoral

nerve. Okajimas Folia Anatomica Japonica. 1992; 69(1):35-74. [DOI:10.2535/ofaj1936.69.1_35] [PMID]

[10] Reddy YM, Singh D, Chikkam V, Bommana S, Atkins D, Verma A, et al. Postprocedural neuropathy after atrial fibrillation ablation. Journal of Interventional Cardiac Electrophysiology. 2013; 36(3):279-85. [DOI:10.1007/s10840-012-9724-z] [PMID]