

Aberrant Origin of the Ilioinguinal Nerve from L1-L3: A Case Report

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ABSTRACT

The Ilioinguinal Nerve (IIN) has a crucial role in providing sensory innervation to the groin region. The literature has extensively documented variability in IIN formation, particularly in relation to the iliohypogastric nerve. However, there is a scarcity of cadaveric studies that specifically document variations in the origin of the IIN. Herein, we report a case of an aberrant variation in the origin of the IIN. Instead of following the usual origin from the first lumbar (L1) nerve root, the right IIN was observed to arise from a broader contribution spanning the L1-L3 nerve roots, indicating an atypical, more extensive segmental origin. In contrast, the contralateral IIN followed the conventional anatomical pattern, originating solely from the L1 spinal nerve without additional contributions. Thorough knowledge of any variation concerning the IIN is crucial for surgeons, Orthopaedics, and anaesthetists, as it enables them to prevent iatrogenic injuries.

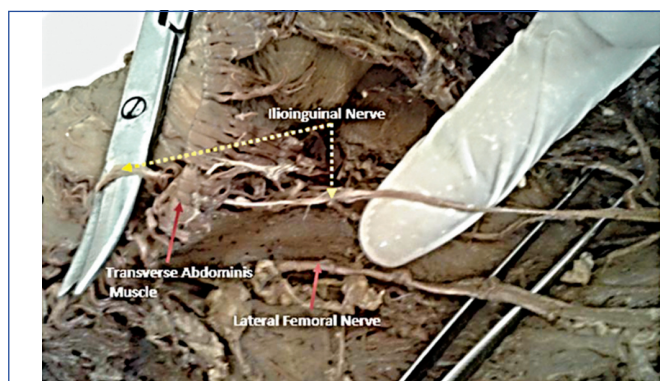
Keywords: Anatomical variant, Cadaveric dissection, Lumbar plexus, Nerve mapping

CASE REPORT

During the systematic cadaveric dissection of the lumbosacral plexus in the dissection room, a unique anatomical variation of the root value of the IIN was encountered on the right-side. This distinctive variation was observed in a 43-year-old formalin-fixed, African male cadaver.

The dissection consisted of removing the anterior abdominal wall skin, superficial fascia, and muscles from the diaphragm to the symphysis pubis. The abdominal structures and retroperitoneal organs were then removed to expose the posterior abdominal wall in the retroperitoneal space. The IIN was identified and isolated bilaterally from its origin at the lateral border of the psoas major muscles by blunt dissection. Then the psoas muscles were removed to identify each branch of the lumbar plexus. After the initial examination, IINs were photographed using a Canon digital camera (model: Canon EOS R5). Their length was measured from their origin to the Anterior Superior Iliac Spine (ASIS), and then from ASIS to their termination. The IINs were then sectioned at their origin, and their diameters were measured. Instead of the typical origin from the root value of L1, the right IIN was found to originate from the root value of L1-L3. In contrast, on the contralateral side, the IIN originated solely from the first lumbar spinal nerve [Table/Fig-1].

The right IIN assumed an oblique anterior trajectory, traversing the upper region of the iliacus muscles and the quadratus lumborum. It pierced the transversus abdominis muscle close to the anterior edge of the iliac crest [Table/Fig-2]. Following its course across the quadratus lumborum and the upper region of the iliacus muscles,

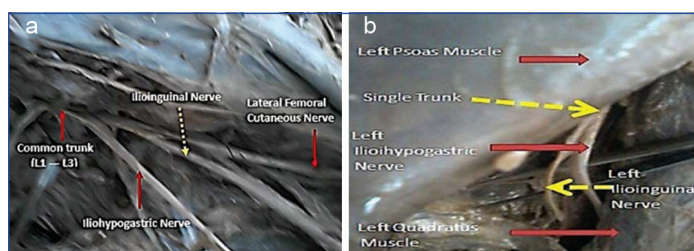


[Table/Fig-2]: Displays right IIN piercing the transversus abdominis muscle.

the right IIN continued its journey. It proceeded to penetrate the internal oblique muscle, specifically targeting a location about 4 cm medial from the ASIS [Table/Fig-3].



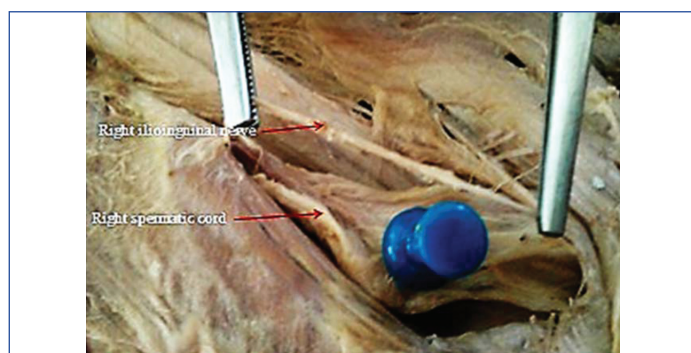
[Table/Fig-3]: Displays the right IIN piercing the internal oblique muscle.



[Table/Fig-1]: a) Depicts the emergence of a right common trunk originating from the first, second, and third lumbar spinal segments; b) Illustrates the origin of the left IIN and iliohypogastric nerves as a common trunk from the first lumbar spinal segment.

The measured whole length of IIN from the origin to its termination was 17.8 cm on the right and 18.3 cm on the left. During its emergence, the right and left IINs had thicknesses of 2.8 mm and 2.4 mm, respectively.

Navigating through the intricate pathways of the inguinal canal, the IIN passed beneath the protective covering of the spermatic cord. As its expedition drew to a close, the nerve emerged alongside the spermatic cord, making its grand appearance through the superficial inguinal ring [Table/Fig-4].



[Table/Fig-4]: Illustrates the emergence of the right IIN as it passes across the superficial inguinal ring along the course of the spermatic cord.

DISCUSSION

Traditionally, the IIN originates from the L1 ventral ramus. It appears from the lateral aspect of the psoas major muscle, either in proximity or slightly underneath the iliohypogastric nerve. It takes an inclined path across the broad abdominal muscles before entering the internal oblique muscle. Subsequently, it traverses the inguinal canal beneath the spermatic cord in males [1]. It provides innervation to the skin located between the anterior abdominal wall and the thigh [2]. During various lower abdominal surgical procedures, minimal-invasive retroperitoneal approaches, as well as orthopaedic surgeries such as pelvic surgeries and gynaecological procedures requiring lengthy lithotomy positioning, there is a potential risk of injury to the IIN [3]. Furthermore, anatomical variation significantly affects the safety and efficacy of regional anaesthesia during nerve blocks [4].

Traditional anatomical references commonly indicate that IINs typically stem from the L1 level. However, it is imperative to note that deviations from this pattern can occur. During motor nerve fibre development, transcription factors regulate their creation, relationships, and distribution. Neural cell adhesion molecules, such as L1 and N-cadherin, are surface receptors that facilitate neurite growth by binding to extracellular matrix components. Their expression is influenced by trophic factors from target tissues, including nerve growth factor and neurotrophins three and four. Axonal growth cones navigate towards targets by detecting trophic gradients, with their growth regulated by chemoattractants and chemorepulsants. Changes in signalling in neuronal growth cones and mesenchymal cells can lead to variations in growth patterns [5].

Klaassen Z et al., reported that approximately 65% of individuals exhibit IIN derivation from the L1 level [6]. These findings were further supported by a cadaveric study conducted by Gogi P, which observed the presence of the IIN at the L1 level in 67.5% of cases [7]. In contrast, Anandhi PG et al., found that 84% of cases originated from L1 [8].

Studies have shown that the IIN can originate from both T12 and L1. Arora D et al., found it arising from T12 & L1 in 8.33% [9], whereas Klaassen Z et al., observed its origin from T12 and L1 in 14% [6].

On the other hand, in the study by Nontasaen P et al., it originated from L2 alone in 0.8% [10], and Arora D et al., documented that 1.66% were originated solely from L2 [9].

The literature found that the nerve can also be derived from both L1 and L2. In the study by Nontasaen P et al., the IIN was formed from L1 and L2 in 3.8% [10], in 11% in the study by Klaassen Z et al. [6], and as high as 22.5% in the study by Gogi P [7].

Klaassen Z et al., reported that approximately 10% of individuals had IIN arising from both L2 and L3 [6].

Furthermore, some studies also identified the absence of IIN. It was absent in 3.3% of cadavers in Pandey JC and Prasad CK [11], 10% in Gogi P [7], and 14.97% in Arora D et al., [9].

These findings highlight the diverse root origins of the IIN, indicating that its source may extend beyond the commonly cited L1 level.

CONCLUSION(S)

This case report described a rare anatomical variation in which the ilioinguinal nerve (IIN) originated from the L1–L3 nerve roots rather than its typical L1 origin. Awareness of such variations is essential, as they may complicate the diagnosis and management of conditions involving the ilioinguinal region and necessitate modifications to conventional surgical, anaesthetic, and diagnostic approaches.

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