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ANATOMICAL VARIABILITY OF THE LUMBAR PLEXUS INNERVATION

Knowledge of the variations in the formation and branching pattern of the lumbar plexus is essential to prevent nerve injury during surgical procedures like iliac bone graft, inguinal hernia surgery, low transverse incision of gynecological procedures, and others. The unusual pattern may create confusion in interpretation due to mismatch between symptoms of the patient and the findings in imaging modalities. As a result of the conducted studies, it was established that variations in the formation of the lumbar plexus are not uncommon. [1]

In a clinical study involving 50 dissections from 25 embalmed cadavers (17 men and 8 women) performed at the Institute of Anatomy, Medical College Madurai, India, over a period of 2 years from July 2015 to June 2017, there were established the following changes in the pattern of branching and the formation of the lumbar plexus: in all of the 50 specimens, the lumbar spine has been seen in the posterior portion of the psoas great muscle. This coincides with the observation of Farny J. et al., 1994, who made 4 cadaveric dissections and demonstrated that the lumbar plexus is located in the posterior portion of the large psoas muscle, rather than between the large psoas muscle and the quadratus lumborum muscle. [2] It was also observed that the plexus passes anteriorly by the transverse processes of the lumbar vertebrae, which exit the intervertebral foramen under the corresponding vertebrae, and the

lumbosacral trunk passed down to join the first sacral nerve to form the sacral

plexus. This normal pattern was observed in 49 out of 50 specimens, and in one of the specimens the contribution of the fibers in the formation of the lumbar plexus was cranially shifted and was therefore classified as high shape or prefixed type. [3]

The study realized by Yusuf Izci concluded that the thinnest nerve is L1 (4.1 mm) and the thickest root is L4 (5.5 mm). From the lumbar plexus, the longest was found to be the iliohypogastric nerve (210mm), and the thinnest, the ilioinginal nerve (1.2 mm). [4] Deniz Uzman and others established several variations in a cadaver of a 35 yearold female, the double ilioinginal nerve, an auxiliary branch joined the genital branch of the genitofemoral nerve and the lateral femoral cutaneous nerve resulting from the femoral nerve. [5] Kusum R Gandhi described the prefixed lumbar plexus in a cadaver, bilateral. [6]

Another study, realized by The Anatomy Society of India, also revealed variations in the lumbar plexus. 30 cadavers (24 men and 6 women) embalmed in neutral formalin were dissected. After removal of the abdominal viscera and peritoneum, the lumbar plexus was exposed by an approach from the anterior. The branches were identified as they pierced the anterior, medial and lateral edges of the large psoas muscle. Thus, the lumbar plexus was located in the upper third of the posterior portion of the large psoas muscle. [7]

Another study, published in 2017, is referred to the absence of the lumbosacral trunk. The lumbosacral trunk is usually formed from the ventral branches of a portion of L4 and entirely of L5. [8] It moves medially from the large psoas muscle, descends on the opposite side of the sacral wing, crosses the medial pelvic cavity from the sacroiliac joint, and joins the nerve root S1 thus uniting the lumbar and sacral region through the lumbosacral plexus. [9; 10] In mentioned study, a 79-year-old cadaver was reported, the cause of death being myocardial infarction. There was no history of abdomino-pelvic surgery or other disease, and no surgical incisions were found on the back or abdominal wall. During dissection of the left posterior abdominal wall, after the fragmentary removal of the large psoas muscle, it was observed that the lumbosacral trunk was absent, because the ventral branch L4 does not communicate with the ventral branch L5.

The relative contribution of L4 to the lumbosacral trunk shows wide variation.

Webber describes cases ranging from a minimal contribution of L4 to cases where the entire ventral branch L4 converges with L5. [11] While L5 is thicker than the L4 branch in most cases, there have been proven cases where the L4 to L5 branch exceeds the thickness of L5 itself in 11 out of 51 cases, which means 21,6%. [12] Another anatomical variations also reported were the additional contributing role of L3 to the formation of the lumbosacral trunk. [11,12] Due to this variability, L4 often serves as a boundary root, demonstrating greater participation in the lumbar or sacral plexus.

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