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The Surgical Anatomy of Lumbar Sympathetic, Autonomic, and Furcal Nerves: Their Significance in Selective Endoscopic Discectomy

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Introduction: Endoscopic discectomy was introduced over 20 years ago. Its efficacy and advantage in minimally invasive spinal procedures was accepted by traditional spine surgeons only recently. An endoscopic cannula is placed in the triangular zone close to the exiting nerves and axilla, an area know as the “hidden zone”. With regular frequency, a network of “anomalous” nerves such as furcal nerves, or autonomic nerves innervating the disc are encountered.

The purpose of this anatomic study in fresh cadavers was to report dissection findings of sympathetic nerves and furcal nerves, as well as subsequent endoscopic visualization of patho-anatomy in the foramen and surrounding area.

Materials and method: First part of this study was dissection of the lumbar foramen, looking for anatomic relationships of nerves in the foramen with the endoscopic identification of patho-anatomy encountered. The second part was to correlate the patho-anatomy with clinical consequences when the foraminal structures are surgically altered or ablated.

Fresh cadavers were used for anatomic dissection using fine microscopic dissection technique. The meticulous dissections revealed the presence of a fine nerve network that was usually destroyed when emphasis was not placed on meticulous dissection. The anterior lumbar sympathetic trunk and ganglia, autonomic nerves, ventral ramus, dorsal ramus, and furcal nerves were identified. Digital photographs were taken.

Results:

1. Ganglia trunk and ganglia: The lumbar portion of each trunk lies on the anterolateral portion of the vertebra bodies along the anterior border of the psoas muscles. Surrounding the disc, there are anterior and posterior complicated plexuses of nerves.
2. Lumbar ramus: After leaving spinal canal just outside the foramen, the spinal nerve divides into a larger ventral ramus innervating the lower extremity and a smaller dorsal ramus innervating the zygapophysial joint, back muscles and ligaments.
3. Furcal nerves come off L2, L3, and L4 ventral rami in regular pattern and descend to join the lumbar plexus. After placing the YESS endoscopic cannula to the disc from posterolateral approach via “hidden zone”, it was observed that these nerve networks, involving furcal nerve and fine branches from ganglia trunk, often connect with the major spinal nerves, especially the exiting nerve, in the foramen.

Conclusions: Previous studies determined that the sinuvertebral nerve originates from the ventral spinal nerve, with a recurrent course entering the intervertebral foramen to the spinal canal. Later studies identified the sinuvertebral nerve also connects to the sympathetic chain. The grey rami communicantes at L3, L4 and L5 send off sinuvertebral nerve to innervate the posterior portion of disc and to participate in the microscopic anterior, posterior and lateral nerve plexus surrounding the circumference of lumbar disc. The anterior nerve plexus of lumbar discs is networked with two lumbar sympathetic trunks. The anterior and posterior plexuses are connected around the vertebral bodies and discs by the lateral plexus that is formed by branches of the grey rami communicantes.

Endoscope cannula passes through the “hidden zone” underneath the exiting nerve and may encounter the microscopic nerve plexuses and furcal nerve. Unavoidable minor injury to surrounding fine nerve fibers may contribute to the development of postoperative low extremity dysesthesia and is a significant risk of the foraminal surgical approach.