The Presence of Furcal Nerves in the Foramen Affects the Incidence of Post-operative Dysesthesia, an Unavoidable Risk of All Transforaminal Surgical Approaches

A.T. Yeung¹, Y. Zheng¹, C.A. Yeung¹, J. Field¹
¹Desert Institute for Spine Care, Phoenix, AZ, United States

Introduction: Post-operative dysesthesia is a known surgical risk of the transforaminal approach. With endoscopic foraminal surgery, however, visualization of furcal nerves in the foramen has identified a patho-anatomical cause of dysesthesia. An anatomic study in fresh cadavers was initiated to learn more about the incidence of furcal nerves, correlating them with post-operative dysesthesia.

Method: Micro-dissection of the foramen from L1-S1 in 10 fresh cadaver trunks, evaluating variations of exiting nerve position with the presence of anomalous and furcal nerves. Cadaver findings were then correlated with the incidence of these nerves identified in-vivo endoscopically. The incidence and severity of post-operative dysesthesia was then determined when these furcal nerves are visualized, surgically irritated, ablated, or transected. Meticulous dissections revealed the presence of a fine nerve network that was usually destroyed during the surgical exposure in traditional surgery, or the existence of these tiny 1mm nerve branches were not appreciated.

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. On rare occasion autonomic nerves were seen in the foramen.
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 the L2, L3, and L4 ventral rami in a regular pattern and descend to join the lumbar plexus. It was discovered that these nerve branches, described “furcal” or “forked” nerves with appear commonly in the foramen, but may be mistaken for the foraminal ligament in endoscopic surgery or inconsequential nerves that can be ignored.
4. In a study of 136 consecutive patients undergoing foraminal endoscopic surgery, 35 furcal nerves were documented from 208 levels (35/208=16.8 %). The highest incidence was at L2-3, L3-4 (11/33=33%) with L4-5 (16/94=17%) and L5-S1 (8/80=10%). In the 35 patients with furcal nerves 17/35=48.6% developed dysesthesia. The highest level at risk for dysesthesia was L3-4 (3/10=70%). Among the 208 levels the risk of dysesthesia is 17/208 =8%
5. Treatment with foraminal epidural and sympathetic blocks mitigated the patient's dysesthesia. 11/17 65% received sympathetic blocks. 8 patients became asymptomatic within 1-3 months, and 1 patient took 6 months to resolve. At the conclusion of this one year study, 2 patients had continued residuals manifested by mild numbness and weakness, but they were never-the-less satisfied that they were relieved of their pre-operative pain. 10 patients with dysesthesia did not have a furcal nerve. Only one had severe enough dysesthesia to need a sympathetic block.

Conclusion: It is not possible to eliminate post-op dysesthesia when performing surgery through the foramen, whether open or endoscopically. Recognizing the variability of spinal nerve anatomy and the existence of furcal, autonomic and sympathetic nerves in the foraminal “hidden zone” will allow the surgeon to properly advise his patients of the risk/benefit of foraminal surgery. Still, foraminal MIS surgery has less surgical risk and morbidity than traditional open surgery in skilled hands.