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Cadaveric Study Suggests Femoral Nerve at Risk During Transpoas Approach to L4-L5 Disc: Commentary on an article by Timothy T. Davis, MD, et al.: "Lumbar Plexus Anatomy within the Psoas Muscle: Implications for the Transpsoas Lateral Approach to the L4-L5 Disc"

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Disclosure statement for author(s): PDF

The author did not receive payments or services, either directly or indirectly (i.e., via his institution), from a third party in support of any aspect of this work. He, or his institution, has had a financial relationship, in the thirty-six months prior to submission of this work, with an entity in the biomedical arena that could be perceived to influence or have the potential to influence what is written in this work. The author has not had any other relationships, or engaged in any other activities, that could be perceived to influence or have the potential to influence what is written in this work. The complete **Disclosures of Potential Conflicts of Interest** submitted by authors are always provided with the online version of the article.

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Commentary

All surgical approaches to the lumbar discs are associated with morbidity and some risk of neurovascular injury. Surgeons choose the approach on the basis of their training, experience, and the pathology to be treated. The lateral retroperitoneal approach has the advantage of minimizing or eliminating manipulation of the large anterior vessels and the contents of the spinal canal. It places the psoas muscle and the adjacent neural structures at risk. A number of surgeons have developed less-invasive techniques to take advantage of this surgical approach, aided by retractors specific to the approach, fluoroscopy, and neuromonitoring.

Clinical experience with this procedure is large, as reflected in the burgeoning literature. The range of reported complications varies widely in magnitude and scope. Among the more common neuromuscular complaints are thigh hypesthesia and paresthesias as well as hip flexor and knee extensor weakness. Both transient and permanent neurological deficits can occur. Rodgers et al. reported a series of 600 cases and noted only four instances (0.7%) of transient quadriceps weakness, attributed to nerve root dysfunction[1]. In contrast, Isaacs et al. noted thirty-six cases of weakness in a series of 107 patients[2]. Seven patients had persistent weakness for at least six months or were diminished by more than two motor grades at any time. Twenty-nine patients had hip flexor weakness, which was attributed to the psoas muscle itself. Weakness could not be correlated to the number of spinal levels treated or to the specific disc treated. In a series of eighty-four patients, Youssef et al. reported that one patient had transient psoas weakness, but their literature review demonstrated that the prevalence of inclusive but nonspecific "thigh symptoms" ranged from

1% to 60.1%[3].

Perhaps it was this wide variation in reported neuromuscular dysfunction that prompted Davis et al. to perform their cadaveric study. It is a carefully performed and well-described anatomic investigation. The investigators dissected eighteen specimens, with the cadaver in the lateral decubitus position, in an effort to mimic the clinical situation. Spinal needles were placed with fluoroscopic guidance into the midcoronal plane of the L2-L3, L3-L4, and L4-L5 discs. Careful blunt dissection through the psoas muscle showed the femoral nerve and not the nerve roots to be at risk at the L4-L5 level. In three specimens, the L4-L5 spinal needle was in close proximity to this nerve. In ten cadavers, the needle was between the femoral nerve and the posterior margin of the disc. In the remaining five specimens, the nerve was posterior to the disc margin. The femoral nerve was formed at the level of the L4-L5 disc in thirteen specimens and caudal to that disc in the remaining five. The authors logically speculate that further dissection with tube dilators and retractor expansion could injure the femoral nerve at L4-L5 by traction or compression against the L5 transverse process. If the nerve were transfixed by the initial guidewire, direct injury could occur.

The authors are to be commended for a well-done investigation that gives spine surgeons good anatomical data. The strengths of the study include a relatively large number of cadavers, compared with other reports of anatomic dissections, and the use of the lateral decubitus position. It was internally funded, eliminating the potential bias of industry support. However, there are limitations and weaknesses. Spinal needles were placed, but then the dissection deviated from that used in surgery. Detachment of the posterior psoas attachments could have resulted in anterior migration of muscle and the nerves within it. The authors countered that the lateral decubitus position eliminated the effect of gravity, but some distortion of the anatomy likely occurred. Of course, this would be expected to increase the measured femoral nerve proximity. Furthermore, the blunt dissection of the psoas may have changed the position of the femoral nerve and other nearby nerves. The study design does not provide any information on what happens with dilation and retractor deployment. The study does not address clinical variables such as body-mass index, age, sex, and deformity that potentially could alter the nerve's size, location, and susceptibility to injury. Finally, the authors' statistics concerning femoral nerve location are useful but cannot predict where the nerve location is in any given patient. One cannot make a direct correlation between their anatomic data and the prevalence of femoral nerve dysfunction found in the current literature.

Despite these limitations, Davis and coworkers have provided the spine surgeon with valuable data. They have clearly demonstrated the femoral nerve to be a structure at risk when approaching the L4-L5 disc via a transpsoas approach. It may inform preoperative counseling and increase intraoperative vigilance at L4-L5. Kudos to the authors.

References

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