Indications for Foraminal Endoscopic Surgery: Part 2

Percutaneous Transforaminal Endoscopic Spine Surgery

Anthony T. Yeung, M.D.
Orthopaedic Spine Surgeon
Arizona Institute for Minimally Invasive Spine Care
Phoenix, AZ

Christopher A. Yeung, M.D.
Orthopaedic Spine Surgeon
Arizona Institute for Minimally Invasive Spine Care
Phoenix, AZ

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Most disc herniations are amenable to endoscopic disc excision, and the timing of surgical treatment is similar to transcanal discectomy. The size and types of herniations chosen by the surgeon for endoscopic excision depends on the skill and experience of the surgeon, as well as anatomic considerations in the patient relative to location of the herniation. All contained disc herniations are appropriate for endoscopic decompression. The tissue-sparing approach also offers consideration for earlier surgical timing when approach-related risk/benefit ratios are factored in after patients fail conservative treatment and continue to have debilitating pain without neurologic deficit.

These quality-of-life and functional issues associated with chronic discogenic pain can be addressed with SED™ and thermal-annuloplasty. Therefore, small disc herniations with predominant leg pain, central disc herniations with predominant back pain, and annular tears that cause chemical sciatica are amenable to disc surgery by endoscopic means. Yeung and Tsou reported on Selective Endoscopic Discectomy™ (SED™) with visualized thermal discoplasty and annuloplasty for large disc herniations producing radiculopathy; unequivocal candidates for traditional surgery. (3,4) This visualized endoscopic technique (5,6), producing results equal to microdiscectomy, was trademarked in order to prevent confusion with other percutaneous endoscopic techniques that were popularized, but fell out of favor when the results failed to match the results of traditional microdiscectomy.

Annular tears demonstrated in the process of SED™ for disc herniations were demonstrated to contract and shrink when a 4.0 MHz bipolar flexible radiofrequency probe (Ellman Trigger-Flex Probe™), Ellman International, Hewitt, New York, USA) is activated next to the annular defect. (7) Inflammatory tissue will ablate

and disc tissue will contract on contact. This endoscopic method of treating discogenic back pain from annular tears has shown promising results in relieving chronic lumbar discogenic pain (Figures 6a, 6b).

Figure 6a. Ellman Trigger-Flex Probe™ performing thermal discoplasty/annuloplasty. 4.0 MHz frequency shrinks the annulus and ablates inflammatory tissue effectively.

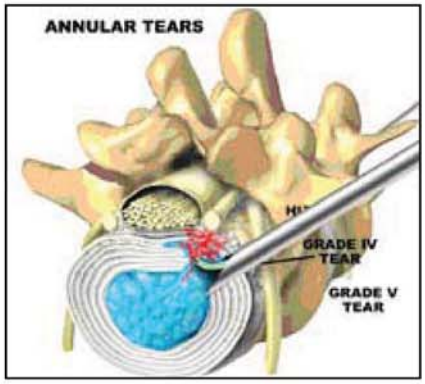

Figure 6b. Illustration of the annuloplasty technique with the Ellman Trigger-Flex Probe™. The annular tear is infiltrated with inflammatory tissue and granulation tissue. The radio-frequency probe is directed to the annular tear under endoscopic visualization to ablate the granulation tissue and shrink the collagen fibers at the tear. (Illustration by David Azarello and Christopher Yeung)

Selective Endoscopic Discectomy™ with thermal annuloplasty is differentiated from IDET because SED™ is a visualized and targeted surgical procedure. (8) A minimal discectomy is done to decompress the intradiscal pressure and more importantly, remove any interpositional nuclear material within the annular fibers that may be preventing the tear from healing. SED™ also utilizes continuous cool irrigation, which flushes out the neurotoxic chemicals within the disc and removes any by-products of thermal modulation.

One ideal indication for Selective Endoscopic Discectomy™ and disc debridement is discitis. (9) This condition can occur as a postoperative infection or as a disc infection from hematogenous inoculation of microorganisms. Severe back pain and spasm is the usual presenting symptom. Current methods rely on needle aspiration followed by prolonged antibiotic treatment. Needle aspirations are not as reliable as disc debridement with tissue sampling, and are often negative in the presence of bacterial discitis. Surgeons are hesitant to perform open debridement because of the morbidity of the open approach, creation of dead space and devascularized tissue, and concern of spreading the infection in the spinal canal. Endoscopic excisional biopsy and debridement through the posterolateral portal has provided almost immediate pain relief and a much more reliable tissue sample for laboratory analysis and culture (Figure 7). As only tissue dilation is used, no dead space is created that would allow the infection to spread. This minimally invasive technique, under local anesthesia, also decreases the morbidity of a general anesthetic.

Figure 7. Endoscopic view of sterile discitis. Most discitis following Selective Endoscopic Discectomy™ is not suppurative or bacterial. Inflammatory cells are identified in the tissue specimen, but cultures are usually negative. Occasional positive cultures have only produced alpha strep, a normal skin contaminant sensitive to a wide spectrum of anti-biotics. Back pain is relieved immediately after debridement.

Perhaps the ideal pathologic lesions for Selective Endoscopic Discectomy™ are the lateral (foraminal) and far lateral (extraforaminal) disc herniations. Although a skilled spine surgeon can access the lateral zone of the disc with a paramedian incision, the posterior approach used by most traditional surgeons requires removal of a significant portion of the facet to reach the herniation, and/or manipulation of the sensitive exiting nerve root and dorsal root ganglion through the paramedian approach. Accessing the extraforaminal zone with the endoscope is easier. The exiting nerve is visualized and protected routinely, and the cannula approaches the herniation site directly.

For the skilled spinal endoscopist, diagnostic endoscopy can be used to augment or confirm traditional imaging studies. Yeung has used evocative chromo-discography and spinal endoscopy for diagnostic purposes; i.e., to inspect a spinal nerve suspected to be irritated by orthopedic hardware, and to inspect annular tears. Most tears that do not heal are too extensive to heal or are caused by interpositional disc tissue keeping the tear open. Removing the disc tissue adjacent to the tear enhances annular healing. (10)

Endoscopic removal of disc herniation is only limited by the accessibility of endoscopic instruments to the herniation site. Whereas many consider only contained disc herniations as an indication for endoscopic disc decompression, experienced and skilled surgeons have demonstrated the ability to extract protruded, extruded, and sequestered fragments. Even mild lateral recess and foraminal spinal stenosis in selected patients respond to foraminoplasty by endoscopic techniques. (11,12) The technique of decompressing the traversing and exiting nerves is accomplished by resecting the ventral surface of the superior articular process (superior facet of the inferior vertebra). In lateral recess stenosis, a simple ablation of the facet capsule and attachment of the ligamentum flavum by resecting the tip of the superior articular process will decompress the exiting nerve. Decompression is confirmed by visualization of perineural fat and pulsation of the epidural fat around the nerve. Resection of the bulging dorsal annulus will decompress the traversing nerve in central stenosis (Figure 8). The disc space is usually already collapsed, so no significant instability is created.

Figure 8. Foraminoplasty for foraminal and lateral recess stenosis is accomplished by resecting the bulging annulus and resecting the undersurface of the superior articular process with cutting basket forceps and a side firing Ho:yag laser.

In knee and shoulder arthroscopy, more detailed findings are possible with arthroscopic probing and imaging of joint anatomy than magnetic resonance imaging (MRI). The same is true with spinal endoscopy.

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