

## Case Report



## Endoscopic Transforaminal Discectomy for an Extruded Lumbar Disc Herniation

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Microsurgery for lumbar herniated discs that require surgical intervention is a very successful and well-described technique, whether performed through more traditional “open” microsurgical retractors or through minimally-invasive “tube” retractors. Surgery for extruded lumbar disc fragments that migrate caudad or cephalad from the disc origin may typically require modifying the standard hemilaminotomy by removing additional laminar bone to retrieve the migrated fragment. Although midline and paramedian Wiltse approaches have been the standard methods for resecting herniated lumbar disc fragments, advances in neuroendoscopic techniques have expanded the potential targets for transforaminal endoscopic treatment to include extruded lumbar disc fragments. Sequestrations migrated cephalad or caudal to the disc can be removed using specialized flexible instruments. The instruments enable the surgeon to circumnavigate and reach into the epidural space and as far as the mid-vertebral body.

The authors present a case of an endoscopically resected lumbar herniated disc fragment extruded caudad behind the inferior vertebral body through a transforaminal approach in an awake patient using local anesthetic. Radiographic and endoscopic visualization make it possible to access intracanal pathology. Although more traditional lumbar disc surgery is widely performed and is safe and effective, neuroendoscopic procedures may also allow a safe and effective approach for even extruded disc fragments for patients who cannot tolerate general anesthesia or are seeking the most minimally invasive option. Endoscopic discectomy is a minimally invasive alternative to open back surgery. Maintained spinal stability and absence or minimal formation of scar tissue allow for ease of subsequent surgeries, both open and minimally invasive (if needed).

**Key words:** Endoscopic discectomy, minimally-invasive, transforaminal, TESSYS

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**T**ransforaminal endoscopic lumbar discectomy is a minimally invasive spinal surgery procedure that was introduced by Kambin and Gellman in 1983 (1). Advances in endoscopic visualization and instrumentation, as well as increased patient demand for more minimally invasive procedures, have led to an increased popularity of the technique. In order to gain improved canal access through a transforaminal approach, multiple technical nuances have been described: enlarging the foramen by removing the ventral part of the superior facet and upper border of the inferior pedicle (foraminoplasty) (2), extreme lateral access versus a more traditional posterolateral

access (3), and a contralateral approach (4).

The authors present here a case report describing an endoscopic transforaminal technique utilizing removal of the ventral superior articular process (foraminoplasty), posterolateral approach, and a bendable endoscopic forcep for transforaminal intracanal access for removal of an extruded lumbar disc fragment. The case described here illustrates some of the advances in endoscopic lumbar disc surgery from a percutaneous intradiscal procedure to a transforaminal intracanal surgery that fully utilizes the benefits of advances in endoscopic visualization and technique.

## CASE REPORT

### History

This 80-year old male presented complaining of sharp, shooting pain in his lower back, radiating to his right hip, groin, and right lateral thigh. The pain occasionally radiated in the same distribution on the left. His average visual analog scale (VAS) score was 8/10 and was 9/10 at its worst. The patient had been treated by another physician for over 2 years with multiple epidural steroid injections offering only temporary relief. A magnetic resonance imaging (MRI) showed an extruded disc fragment below the L2-3 disc space adjacent to the L3 pedicle on the right (Fig. 1). The patient had no history of other spinal surgeries and elected for an awake transforaminal endoscopic discectomy and foraminotomy.

### Operation

The patient was positioned in the lateral decubitus position with the operating table reversed and the flank over the break in the table. A roll was placed under the flank and the table flexed to open the disc space. Anesthesia consisted of mild sedation using versed and fentanyl and 1% lidocaine local anesthetic. The level of anesthetic was titrated so the patient was able to communicate with the surgeon throughout the procedure. The Joimax TESSYS endoscopic system was used for the procedure. Percutaneous entry was established at the L2-3 foramen entering through the skin 12 cm lateral to the midline. Using anteroposterior (AP) and lateral fluoroscopy, as well as tunnel view, a 25 cm 18 gauge needle was placed in the L2-3 disc through Kambin's triangle, between the exiting L2 nerve and the traversing

L3 nerve. An AP fluoroscopic view was used so the disc space was not entered before the needle was past the medial border of the pedicle ensuring that the needle did not enter the canal. Sequential reamers were used to enlarge the foramen by removing the ventral aspect of the superior facet. The beveled working canula, 8.0 mm in outer diameter, was then placed over the sequential dilators. The diamond drill was used to further enlarge the foramen and expose the L3 nerve and L3 pedicle. Rotating the beveled canula and endoscope allowed for 360 degree visualization of the annulus and exiting and traversing nerve roots. The endoscope used had an optical angle of 30 degrees. The beveled end of the working canula was also used as a nerve root retractor.

The bendable biting forceps (Fig. 3) (Joimax semi-flexible endoscopic grasper) was curved prior to placing it down the endoscope's working channel. The forceps maintain their curve and can be seen traversing the epidural space behind the vertebral body of L3 on AP and lateral fluoroscopic views (Fig. 2). The forceps are advanced closed and then opened and closed to "fish" out the extruded fragment. The mouth of the forceps can be used so they open horizontally or vertically in the epidural space. Opening the forceps vertically and withdrawing them worked to retract the dura by "tenting" it up to explore the epidural space. The extruded disc fragment in this case was removed in one large piece that required removing the endoscope and forceps together because the fragment would not fit through the working channel of the endoscope. The patient noted no residual leg pain after removal of the fragment. The working channel was then removed after irrigating. A transforaminal epi-

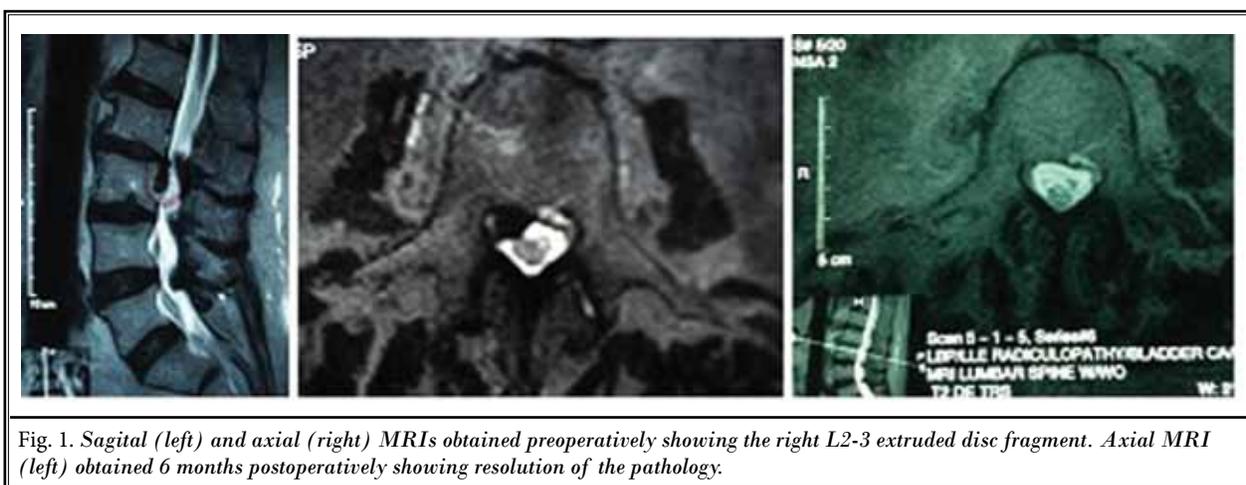


Fig. 1. Sagittal (left) and axial (right) MRIs obtained preoperatively showing the right L2-3 extruded disc fragment. Axial MRI (left) obtained 6 months postoperatively showing resolution of the pathology.

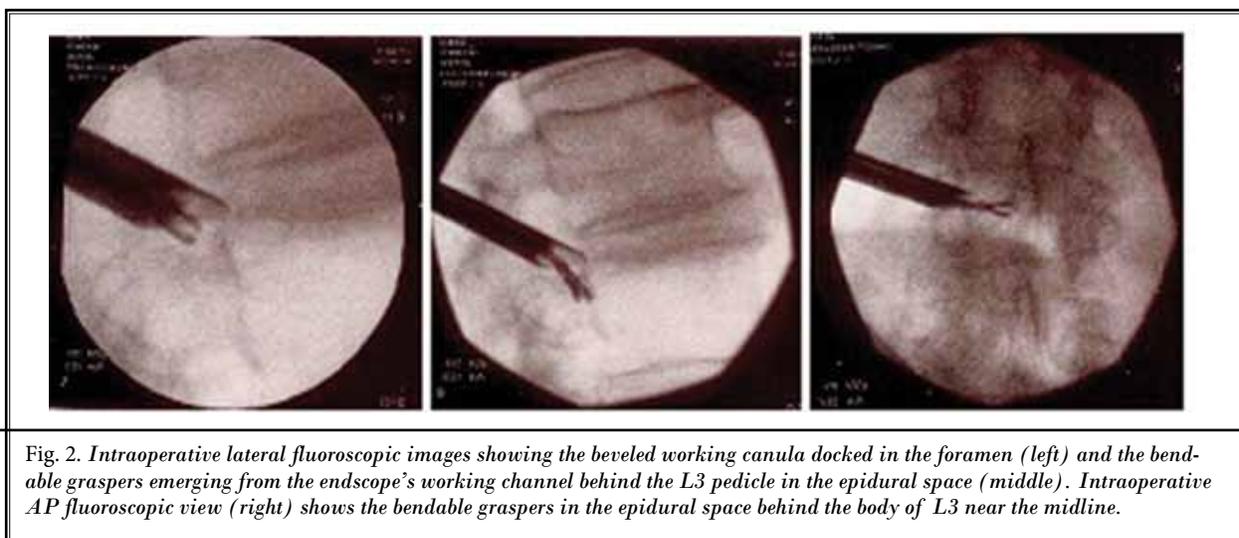


Fig. 2. Intraoperative lateral fluoroscopic images showing the beveled working canula docked in the foramen (left) and the bendable graspers emerging from the endoscope's working channel behind the L3 pedicle in the epidural space (middle). Intraoperative AP fluoroscopic view (right) shows the bendable graspers in the epidural space behind the body of L3 near the midline.

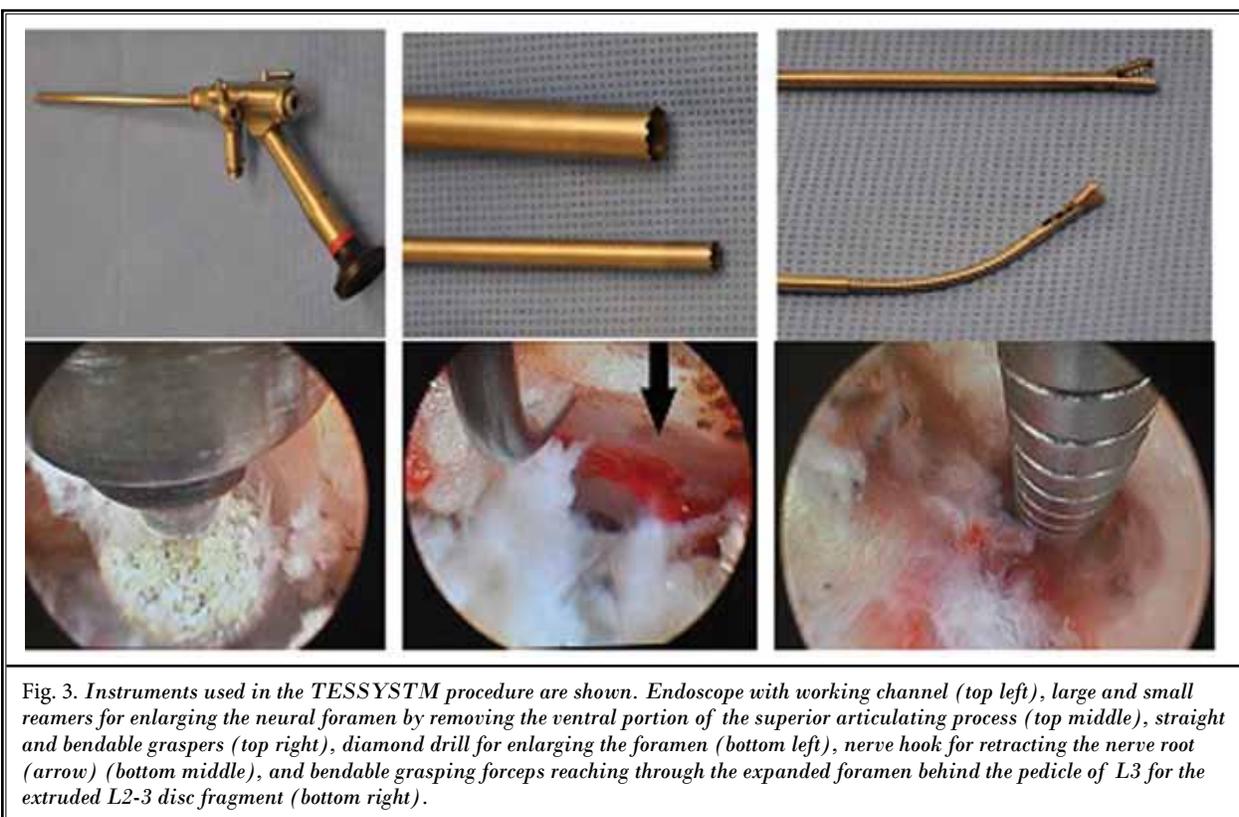


Fig. 3. Instruments used in the TESSYSTM procedure are shown. Endoscope with working channel (top left), large and small reamers for enlarging the neural foramen by removing the ventral portion of the superior articulating process (top middle), straight and bendable graspers (top right), diamond drill for enlarging the foramen (bottom left), nerve hook for retracting the nerve root (arrow) (bottom middle), and bendable grasping forceps reaching through the expanded foramen behind the pedicle of L3 for the extruded L2-3 disc fragment (bottom right).

dural steroid injection was then performed at L2-3 to reduce postoperative nerve irritation.

### Postoperative Course

The patient's postoperative course was notable for 95% pain relief within 20 minutes after the operation

and discharge from the surgery center one hour after the procedure. At his 6-week and 3-month follow-up the patient continued to report pain relief between 90 and 100%. Fig. 1 (left) shows an axial image from a 6-month follow-up MRI indicating the resolution of the disc fragment.

## Discussion

Public demand and technical innovation both fuel advances in more minimally invasive approaches in every surgical field. A detailed technical case report is presented here to illustrate how technology available today is being used for an expanding array of pathology; the presentation of a single case is not intended to motivate a change in clinical practice. The literature on vertebroplasty offers several excellent examples of changes in clinical practice based on case reports or limited retrospective studies (5,6).

Neuroendoscopic spine surgery is a more minimally invasive approach to lumbar disc pathology than open or tube retractor cases that rely on direct or microscopic visualization. By utilizing targeted posterolateral, almost extreme lateral access, widening the foramen, and "smarter" more guided instrumentation, there is less and less disc pathology that would not be accessible to the experienced spine endoscopist. The disc pathology in the case presented here could have been addressed endoscopically by an interlaminar approach (7) or contralateral transforaminal approach (4) instead of an ipsilateral transforaminal approach. Utilizing an endoscopic drill with an interlaminar endoscopic approach also makes addressing central stenosis possible. The transforaminal approach was utilized in this case because the extruded fragment was beneath the traversing nerve root, which would be between the disc extrusion and the endoscope in an interlaminar ap-

proach. The decision of which endoscopic approach (lateral vs. ipsilateral or contralateral transforaminal) to take also involves calculating the possibility of breaking an instrument such as the semi-bendable grasper where it now might be stranded in a not easily accessible location.

Early endoscopic techniques only made intradiscal or extreme lateral disc pathology accessible; now disc pathology that includes central herniations and extruded fragments is accessible. Using an "outside-in" approach with true foraminal surgery makes intradiscal dye injection with methylene blue unnecessary. The authors do not use nerve monitoring because the patient's participation during the procedure seems to be more reliable and informative than nerve monitoring.

Advances in endoscopic techniques and equipment have taken the technique of percutaneous endoscopic discectomy from an intradiscal nucleus removal and thermal annuloplasty to a point where transforaminal extradiscal-intracanal access to epidural pathology is possible. Improvements in technique, equipment, and visualization have made more and more lumbar pathology surgically accessible through the endoscope. The development of instrumentation and technique that is about working through smaller incisions, reaching around corners, and performing procedures on awake patients is "smarter" technology: if a machine/instrument does something we think an intelligent person can do, we consider that machine/instrument to be "smart." Potential and real complications to this technique include infection; spinal fluid leak; dysesthetic radicular-type pain, likely from manipulation of the dorsal root ganglion; recurrent disc herniation; and operative failure. Like others, the authors see fewer cases of operative failures or dysesthetic pain with experience with the technique (8).

## Conclusion

Currently transforaminal endoscopic discectomy is performed more often in ambulatory surgery centers than in hospitals and by neurosurgeons and orthopedic surgeons as well as by anesthesia pain management physicians, radiologists, neurologists, and physiatrists. Because transforaminal endoscopic discectomy lies in exactly that area between truly percutaneous or needle procedures and "open" procedures (where operative fields can be viewed with loupes or the microscope) surgical and nonsurgical practitioners have converged on sharing the technique (Fig. 4). Endoscopic spine surgery techniques have evolved to a point where intracanal,

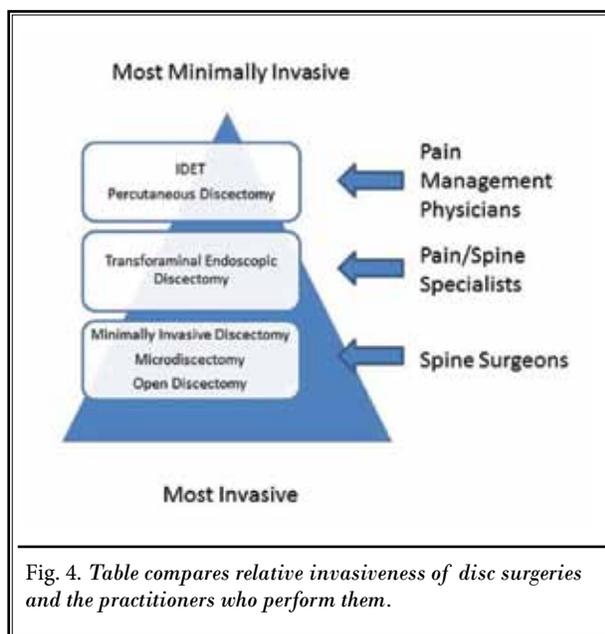


Fig. 4. Table compares relative invasiveness of disc surgeries and the practitioners who perform them.

true “neuroendoscopic” surgery can be performed, and the authors suggest here that spine specialists in multiple subspecialties take a cooperative position in the evolution of these techniques.

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