



Full-endoscopic thoracic spine approaches

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The interesting article (1) provides the spine surgeon a nice demonstration of the transforaminal full-endoscopic thoracic discectomy. The figures and video as well as the descriptions and tips for all steps of the procedure, are a good guide for those willing to perform the technique. Although it is an already well-established procedure, the quality in the details make this an article every surgeon planning to perform thoracic endoscopic discectomy should read.

Deciding the best approach

In thoracic decompression, avoiding surgical manipulation of the spinal cord is the main concern. Therefore, various approaches exist to cover the entire area around the spinal cord (2-6) depending on the location and consistency of the disc herniation. The most direct access route to the disease, without manipulation of the spinal cord is usually the best choice. Posterior approaches may involve difficult or inadequate visualization or handling of the area anterior to the spinal cord, with the associated increase in risk of neurological injury and approach-related damage of the posterior structures. The larger, more medial, or more calcified a disc herniation is, the more likely that a lateral (transthoracic) or an anterior approach should be considered (4,6,7).

Development of minimal invasive techniques such as the full-endoscopic spine surgery (FESS) provide additional alternatives to treat thoracic disc herniations or other degenerative diseases. The postero-lateral or transforaminal approach is by far the most recognized and most reported endoscopic approach in the literature (2,6,8-12) and was well described by the authors (1).

The first case presented by Telfeian and Wagner is a typical case for transforaminal approach. Although the second case was also elegantly treated by the transformational approach, it was also suitable for an interlaminar full-endoscopic approach, as previously described (6,12) with only a medial partial facetectomy, and with the advantage of more unrestricted maneuverability of the endoscope and clear visualization of the neural structures, without destabilization of the spine (*Figure 1*). A similar disc herniation with a severe migration, for instance, would be a contraindication for the transforaminal approach and would most likely require an interlaminar procedure. Other thoracic diseases such as flavum ligament ossification would certainly not be suitable for transforaminal procedures, but are good indications for the posterior (interlaminar) approach (10,13). Adamkiewicz and anterior medullary arteries that enter the spinal canal through the intervertebral foramina should also be remembered when considering a transforaminal procedure (14).

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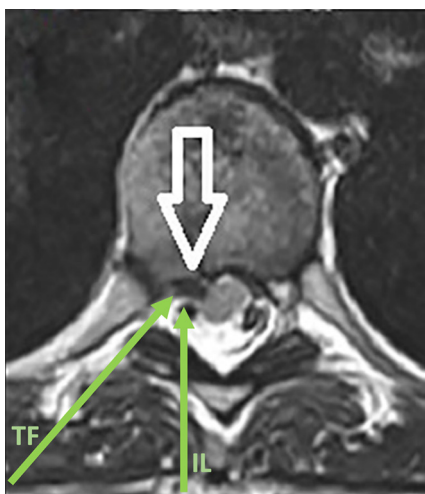


Figure 1 Possible approaches to case 2, adapted from Telfeian *et al.* (1). TF route and IL route to a right T8–9 herniated disc (white arrow) in an axial T2 MRI. TF, transforaminal; IL, interlaminar route; MRI, magnetic resonance imaging.

More challenging cases of thoracic disc herniations, with ventral compressions without a corridor to a posterior or postero-lateral approach might be treated by full-endoscopic transthoracic approach as described by Ruetten *et al.* (6).

Surgeons usually start their practice in FESS with lumbar procedures. There are some that prefer the transforaminal approach or were trained solely on that technique, and therefore develop expertise in that approach while lacking training in the interlaminar technique. The opposite is also true. The most important is to decide the approach based on the location of the compression and the anatomy. The individual selection of the respective FESS approach enables different working areas to be used and makes it possible to reach the target area without manipulating the spinal cord (6). In addition to the transforaminal, the interlaminar and even the less usual transthoracic approach each have their role when facing a thoracic disc herniation and should be considered along with the other open approaches, even though “*posterior approaches are dangerous and ventral and lateral approaches require dealing with pleural contents*” (1). Only then the surgeon can offer the patient the best treatment strategy.

Benefits of FESS and cost-effectiveness

Another main point discussed in the article was regarding

the necessary investment in money and time. Spine surgeons and surgical facilities need to acknowledge this barrier and develop strategies on how to overcome it. The growing number of articles demonstrating the benefits of FESS might be enough to convince individual surgeons to invest their time and money in proper training, but there is still a lack of motivation for hospitals to invest in new equipment, specific instruments and to include training in the residence programs. More studies showing the cost-effectiveness of the technique are still required, so that patients are not prevented of having the FESS as an option along with other strategies, especially in complex cases as thoracic spine diseases. In any event, such discussions are of extreme value within all health care environments.

FESS has already proven its technical advantages such as skin incision of only approximately 8 mm, an enlarged visual field due to the 30° view angle, excellent illumination and visualization, dissection of less tissue, reduced bleeding due to continuous irrigation, minimal damage to the paraspinal muscles, and low complication rates (6,10). As a result, FESS can reduce the length of hospital stay and is also more favorable in terms of outcome, duration of surgery, and overall complications when compared to open or microendoscopic surgery for lumbar procedures (15). Similar benefits have been reported for cervical disc herniations and spinal canal stenosis in the cervical and lumbar spine (16,17), and FESS for the thoracic spine achieves technically sufficient decompression based on the clinical results, radiological outcomes, intraoperative findings, and patient satisfaction (8,9,18,19). Gibson *et al.*, in a review of FESS for thoracic pathology, reported low rate of complications that consisted of 2% of dural tears, 2% of transient neuralgia, 1.5% of revision surgery, 0.6% of neurological injury, and 0.6% of dural hematoma (19). The duration of surgery is markedly shorter than that of the methods described in the literature (6,12,19).

As a result of the above-mentioned advantages, FESS can reduce the length of hospital stay and the cost of medical treatment and although the endoscopic surgery itself can be more costly, it provides good socioeconomic benefits (15,20,21). As mentioned in the literature, Hasan *et al.* support that the benefit zone for FESS increase as the complexity of surgeries also increase (22). As a result, the socioeconomic benefits can be even more substantial.

Another clinical and economic benefit of the FESS approaches to the thoracic spine is to avoid the need for fusion. Fusion is sometimes necessary for traditional transpedicular and transfacet approaches which damage

posterior structures or result in more than half of the vertebral body resection. The provided structural preservation of FESS may avoid the need for fusion, thus making FESS also an alternative choice for underprivileged patients, elderly patients with comorbidity or for whom major surgical trauma would be harmful (6,10,23).

Conclusions

FESS of the thoracic spine is evolving fast. The individual selection of the respective FESS approach enables proper decompression by making it possible to reach the target area without manipulating the spinal cord, sparing healthy structures, and preventing destabilization of the spine. Transforaminal, interlaminar and transthoracic approaches are safe, efficient, and minimally invasive alternatives that should be considered along with conventional methods for all cases of thoracic spine compression on a case-by-case basis.

The cost-effectiveness of FESS might be clear to those centers already performing the technique, but the investment needed for equipment and training is still an issue in many hospitals since further studies that show its cost-effectiveness are needed.

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Ethical Statement: The authors are accountable for all

aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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