

Minimally Invasive Treatment of Thoracic Disc Herniations

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KEYWORDS

- Thoracic disc • Minimally invasive • Disc herniation • Microendoscopic discectomy
- Microscopic discectomy • Costrotransversectomy • Lateral extracavitary approach

KEY POINTS

- Although thoracic disc herniations can be a challenging pathologic abnormality, they can be treated minimally invasively as multiple techniques have been developed.
- The microendoscopic and microscopic discectomy can be performed for soft, lateral, and smaller thoracic disc herniations using skills with which most minimally invasive surgeons are already comfortable.
- The mini-open lateral approach may be better used for large, calcified central disc herniations.

INTRODUCTION

Thoracic disc herniations present significant challenges for the spine surgeon in their diagnosis as well as in their treatment. As only one in one million people will present with a clinically significant thoracic disc herniation, most spine surgeons are less experienced in treating this disease process.¹ Knowledge of thoracic spinal anatomy is critical for the safe application of surgical techniques for thoracic disc treatment. This article addresses the nuances of evaluation, surgical planning, and treatment of thoracic disease pathologic abnormalities. Furthermore, it highlights the expanding role of minimally invasive techniques in the treatment of this challenging pathologic abnormality.

PREOPERATIVE EVALUATION

Challenges in thoracic disc herniation include identifying the source of the patients' symptoms. The symptom that commonly brings these patients to a spine surgeon's attention is unilateral radicular pain, or pain radiating from the upper or middle

back to the chest. Numbness or strange sensations in similar radicular distributions are also possible, but many patients will complain of strange sensations or shooting, electric shocklike pains into the legs or abdomen that do not necessarily follow classic radicular patterns. Furthermore, patients may also complain of difficulty ambulating, feeling off balance, and feeling that their legs are heavy. On examination, patients may or may not demonstrate symptoms of myelopathy. Lower extremity reflexes may be hyperreflexic, and Babinski testing may demonstrate upgoing toes. Patients can have difficulty with tandem gait or with toe proprioception. When patients do demonstrate weakness on examination, often it is a generalized weakness of the legs or decompensation of the leg muscles due to decreased use. Rarely is one leg weaker than the other, and this may or may not correlate with which side the offending thoracic disc herniation abuts the spinal cord.

Often patients may have very vague complaints and a nonlocalizing examination that surgeons must sort through. A detailed history and examination are pertinent because many patients with

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signs and symptoms from a thoracic disc may present with multiple thoracic disc herniations on magnetic resonance imaging (MRI). In many cases, a cervical spine MRI is warranted to rule out potential cervical disease contributing to myelopathy. Symptomatic patients without evidence of cord compression should be given a trial of conservative therapy for 4 to 6 weeks, including physical therapy, nonsteroidal anti-inflammatory drugs, and oral or epidural steroids. Symptomatic patients with evidence of cord compression should be considered surgical candidates and conservative therapy is not warranted in these patients.

SURGICAL PLANNING

For all techniques, preventing intraoperative injury starts before incision. The preoperative MRI should include imaging that allows the surgeon to determine the correct herniated thoracic disc level counting from C2 down or from the sacrum up. Intraoperatively, it is usually easier to count the thoracic level upward from the sacrum or using the ribs as a reference because the shoulders can obstruct the view of the cervical and upper thoracic spine. Thus, all patients should have preoperative chest anteroposterior and lateral radiographs as well as lumbar anteroposterior and lateral radiographs for intraoperative reference, in case a patient should have transitional lumbar vertebrae or an extra rib. To assist with intraoperative localization, some surgeons prefer that interventional radiology place a preoperative fiducial at the correct thoracic level, although this requires that the surgeon trust the radiologist.² Furthermore, preoperative somatosensory evoked potentials and motor evoked potentials should be obtained on positioning to monitor any changes with dissection intraoperatively.

Once the offending level is verified, surgeons have a few options in deciding surgical treatment. A midline open laminectomy is never recommended, because even mild retraction or manipulation of the thoracic cord can lead to significant postoperative deficits.³⁻⁸ Soft, lateral disc herniations have been traditionally accessed via a unilateral transpedicular approach or costotransversectomy on the side to which the disc is eccentric.⁹⁻¹⁵ Because of the stabilization of the rib on the other side and the rest of the rib cage, disruption of the facet at the level of the thoracic disc often does not require surgical stabilization of the level.¹⁵⁻¹⁷ Many of the currently described minimally invasive techniques for thoracic disc herniations are best used for treatment of these soft, lateral discs.¹⁸⁻²¹

For central disc herniations or calcified disc herniations, traditional thoracotomy with an

anterolateral transpleural or lateral extracavitary technique has been used to remove the thoracic disc safely without retraction of the thoracic cord or accidental injury to the surrounding great vessels.^{5,22} Calcification may be present in anywhere from 30% to 70% of thoracic disc herniations.²³ Thus, a computed tomographic scan of the thoracic spine should be considered as part of preoperative planning to help determine the proper approach. As thoracic pedicle anatomy can be variable, a computed tomographic scan also allows for pedicle evaluation in case stabilization or fusion is determined to be necessary. Although there are minimally invasive techniques for central disc herniations and calcified discs, it must be noted that even with these advancements, depending on the experience of a given surgeon, a calcified disc or a large central disc may still often be more safely and properly treated with an open approach.²⁴⁻²⁷

SURGICAL TECHNIQUE

Thoracoscopic Disc Removal

In the early 1990s, thoracic surgeons had identified video-assisted thoracoscopic surgery (VATS) for lung lesions as a way to improve pulmonary function and decrease pain over thoracotomy. In 1993, Mack and colleagues²⁸ reported a reliable way to access the thoracic spine using VATS.^{29,30} In 1994, Horowitz and colleagues³¹ described the use of VATS for thoracic discectomy, which was expanded on by Caputy in 1995.³² Multiple series followed that identified VATS as a less morbid approach than thoracotomy to perform thoracic disc resection from an anterior approach.³³⁻³⁷ A series by Rosenthal and Dickman³⁶ in 1998 evaluated the thoracoscopic approach and demonstrated that it had less morbidity than costotransversectomy as well, with less neurologic deficits and less intercostal neuralgia. More recent series have continued to demonstrate efficacy in these techniques because disc removal is sufficient and improvement in outcomes is long-term.³⁸⁻⁴⁰

In this technique, the patient is placed in the lateral decubitus position, and the surgeons stand on the patient's ventral side. Three port sites are usually planned with fluoroscopy localization of the operating level, one port site for thoracoscopic visualization and two port sites for entry of working instruments. A Kelly clamp is used to enter the pleural space after incision at one of the port sites, and the pleura is taken down away from the chest cavity. The patient is turned slightly ventrally to have the collapsed lung fall away from the thoracic spine. The pleura over the desired disc level is

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