



Original Article

Management of single-level thoracic disc herniation through a modified transfacet approach: A review of 86 patients

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ABSTRACT

Background: Symptomatic thoracic disc herniation (TDH) is rare and does not typically resolve with conservative management. Traditional surgical management is the transthoracic approach; however, this approach can carry significant risk. Posterolateral approaches are less invasive, but no single approach has proven to be more effective than the other results are often dependent on surgeon experience with a particular approach, as well as the location and characteristics of the disc herniation.

Methods: This was retrospective review of a prospectively collected database. Eighty-six patients with TDH treated surgically through the modified transfacet approach were reviewed and evaluated for pain improvement, Nurick grade, and neurological symptoms. Patients were followed for 12 months postoperatively; estimated blood loss, length of hospital stay, hospital course, and postoperative complications were also assessed.

Results: All attempts at disc resection were successful. Most patients reported improvement in pain, sensory involvement, and strength. Seventy-nine patients had complete resolution of their symptoms while four patients had unchanged symptoms. Three patients experienced mild neurologic worsening postoperatively, but this resolved back to baseline. One patient experienced myelopathy during the postoperative period that resolved with steroid administration. The procedure was well tolerated with minimal complications.

Conclusion: TDH can be managed surgically through a variety of approaches. The selection of approach is dependent on surgeon experience with an approach, the patient's health, and the location and type of disc. The transfacet approach is safe and efficacious.

Keywords: Pedicle sparing, Thoracic disc herniation, Transfacet

INTRODUCTION

Thoracic disc herniation (TDH), while relatively rare in comparison to cervical and lumbar disc herniation, is not as uncommon as once thought. Advanced imaging techniques have revealed a prevalence of 11–37% in TDH patients who are asymptomatic and an incidence of 15.2% in postmortem patients.^[18,23,25,26] The annual incidence is thought to be as low as one patient per million in the general population.^[4,5,7,22,25,26] Symptomatic patients with TDH comprise only 0.15%–4% of all disc herniations.^[1,2,4,5,18,23,25] TDH classically occurs below T8, with T11–12 being the most

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common level.^[2] This is most likely due to the relatively greater flexibility of these segments and weakness of the posterior longitudinal ligament in that region.^[7,10,13] The primary indications for surgical treatment are weakness, intractable pain, radiculopathy, and myelopathy.^[23,25,26] However, it is not atypical for patients to present with vague symptoms such as chest pain, abdominal pain, pelvic pain, and bowel dysfunction, which can delay diagnosis.^[1,3,12,21,23,26,29,30]

While the transthoracic approach is traditionally viewed, as the gold standard for surgical treatment of TDH, transpedicular, transdural, transfacet pedicle-sparing, and minimally invasive posterolateral approaches are gaining popularity, due to increased evidence of reductions in length of stay and shorter recovery time for patients without sacrificing neurological outcome.^[6,8,9,14,15,19,24,27,28,31] Stillerman *et al.* reported the efficacy of the transfacet approach in a comparison study using different surgical approaches to treat herniated thoracic discs.^[25] We report our experience with 86 patients who presented with symptomatic single level TDH who were treated surgically through a modified transfacet pedicle-sparing approach.

MATERIALS AND METHODS

Patient population

A retrospective review was conducted for patients with symptomatic single level TDHs who underwent surgical treatment at single institution between August 1993 and January 2019. All patients presented with symptoms of either radiculopathy or myelopathy. The patients' preoperative clinic notes, operative reports, and postoperative follow-up clinic notes up to 12 months postoperation were also reviewed. Diagnosis was confirmed by MRI, CT myelogram, or both. Patients with centrally located or calcified disks were not treated via this approach.

Surgical technique

The surgical procedure was previously described.^[2] Patients with single level TDH underwent discectomy through a modified transfacet pedicle-sparing approach. Intraoperative use of C-arm confirmed the appropriate level. A minimal posterior midline incision and unilateral subperiosteal exposure were performed, and the facet joint ipsilateral to the side of the symptomatic herniation is identified and removed using a combination of rongeurs and high-speed drills to allow visualization of the lateral aspects of the spinal cord. A hemilaminectomy is also occasionally performed, which allows visualization of the lateral aspect of the spinal cord. The disc is found directly underneath the resected facet joint. The disc is opened sharply, and then removed with a pituitary rongeur. The last bit of disc can be pushed downward into the disc space with a downward angled curette. Once the lateral

portion of the disc is removed, the more midline fragments can be retrieved, until the nerve root and the spinal cord are decompressed under direct visualization. Adequate decompression of the spinal cord can be assessed by placing a right-angled hook or Woodson instrument in the ventral epidural space. These maneuvers allow for disc resection through a limited midline incision, without the need for removal of any ribs, transverse processes, or pedicles, as in the lateral extracavitary approach.

RESULTS

All attempts at resection of 86 single-level herniated discs were successful in (46 males and 40 females), ranging from 17 to 75 years of age. Pain relief was the preoperative symptom most consistently improved, with 82% of patients achieving good results ($P < 0.005$). About 57% of patients demonstrated improvement in their ability to ambulate, and 51% had postoperative sensory improvement. The most common level of herniation was T7-8^[19] followed by T10-11.^[13] The average Nurick grade was 1.38 (range 0–4) preoperatively and 0.57 (range 0–4) postoperatively ($P < 0.005$). The average length of stay was 4 days (range 1–28) [Table 1]. Complications included one wound infection, one case of pneumonia, and three patients with recurrence of disc herniation, which required a second surgical procedure with posterior fixation. Three patients had transient postoperative weakness, and one patient had worsened myelopathy that resolved with steroid administration. One patient was diagnosed with cervical radiculopathy at 1 year follow-up. One patient who did not show any improvement in preoperative symptoms had a history of spine bifida and previous spinal surgeries.

DISCUSSION

Symptomatic TDHs are as rare as they are controversial in their management, ranging from conservative medical management (e.g., epidural steroid injections, physical therapy, and oral medications) to surgical management.^[2,4,5,10,11,15,17,18] Compounding this problem in management is the significant variation in presentation. The classic presentation of symptomatic TDHs is pain, progressive lower extremity weakness, radiculopathy, and myelopathy; however, patients can present with non-specific symptoms such as chest pain, abdominal pain, pelvic pain, and bowel dysfunction. When approaching patients with chronic non-specific chest, abdominal or pelvic pains, it is important to rule out TDH.^[3,10,12,21,23,25,26,29,30] It has been proposed that irritable bowel syndrome symptoms, patients with a positive Carnett sign, and chronic abdominal pain could have an association with TDH, with one study finding 12 of 18 patients having chronic abdominal pain with concurrent TDH.^[12]

Table 1: Demographics and outcomes of patients with single-level TDH.

Characteristics	
Total patients (M: F)	86 (46:40)
Age range (years)	17–75
Level of herniation	
T1–2	0
T2–3	2
T3–4	3
T4–5	1
T5–6	3
T6–7	10
T7–8	21
T8–9	10
T9–10	5
T10–11	14
T11–12	11
T12–L1	6
Nurick grade (avg)	
Pre Op	1.38
Post Op	0.57
Average blood loss (mL)	155.
Average length of stay (days)	4

TDH: Thoracic disc herniation

In asymptomatic patients, the herniation will not spontaneously regress, but it will typically remain stable.^[29] Patients with no neurological abnormalities and minimal pain may be effectively managed with conservative measures.^[2,5,23,26] In the literature, there have only been three documented cases of spontaneous regression of thoracic herniation, but no disc characteristics or mechanisms of regression have been established.^[20] Conservative management is not effective for symptomatic TDH with neurological abnormalities such as radiculopathy or myelopathy.^[17,22,23] In our study, indications for surgery were radiculopathy, myelopathy, intractable pain, lower extremity weakness, or any other functional neurological impairment.

Surgical management of TDH has remained controversial. The only approach that has effectively been abandoned is laminectomy due to its increased morbidity and mortality and lack of efficacy.^[4,6,7,14,15,17,18,22,25,26] At present, the transthoracic approach is considered the gold standard of surgical management of TDH because of the degree of exposure and direct access of the disc space, offering better results in patients with dense calcifications and intradural herniations. However, due to the significant cardiopulmonary complications that may occur and the precision required of the transthoracic approach, the transpedicular, transdural, transfacet pedicle-sparing, lateral extracavitary, and minimally invasive posterolateral approaches utilizing endoscopy have gained popularity.^[2,4,5,7,15,18,19,22,26–28]

Recent studies indicate that posterolateral approaches such as the transfacet pedicle-sparing approach result in shorter length of stay and decreased complications while still achieving similar outcomes.^[4,5,7,11] Stillerman *et al.* first described the transfacet approach in a case series of TDHs, noting the improved exposure and decreased bone and soft tissue disruption.^[25] Bransford *et al.* reported no pulmonary complications in their 18 case series on a modified transfacet approach.^[5] A number of studies have indicated that the transfacet pedicle-sparing approach is inadequate for central TDH and calcified discs.^[5,6,15,26] Bransford *et al.* described the technique by which central or calcified TDH can be successfully resected by combining a modified bilateral transfacet pedicle-sparing approach with specialized equipment. They also described the lack of complications related to incomplete resection of discs.^[5] The transfacet pedicle-sparing approach has been reported to result in less postoperative axial back pain versus the transpedicular approach, indicating that sparing the pedicle may be a key component in surgical management.^[2,4,5] The transdural approach, while unique in its own right, incorporates aspects of the transpedicular and transfacet approaches because it provides access to the disc space without significant disruption of the facet-pedicle complex. The primary advantage conveyed by a transdural approach is the ability to achieve adequate exposure and removal of the disc without excessive retraction of the spinal cord.^[9,14]

Minimally-invasive approaches are rapidly gaining popularity due to their ability to minimize blood loss, bone, and soft-tissue resection, and eliminate the need for fusion.^[15,19,22,26,27] Recent reports have described using endoscopic-assisted techniques to address both central and paracentral TDH from a minimally-invasive posterolateral approach.^[19,27] The main disadvantage of these approaches are that they have a steeper learning curve than most other approaches and require expensive supplemental equipment such as tubular retractors, endoscopes, intraoperative navigation, and ultrasound equipment. Additional training in minimally invasive instrumentation and intraoperative techniques are also required.^[16,26,27] The goal of any approach is to improve patients' quality of life and helps to improve their neurological symptoms. Thus, the selection of approach in TDH should not necessarily have a universal standard, but should be based multiple factors, including the type and location of the disc herniation, overall health of the patient, and the surgeon's experience with the various approaches.^[2,5,7,15,25,26]

CONCLUSION

Eighty-six patients with single-level TDHs were surgically managed through a modified transfacet approach. All patients presented with complaints of myelopathy, radiculopathy, or intractable back pain. About 82% of

patients demonstrated postoperative pain reduction, and 57% of patients showed improved ability to ambulate. Sensory loss was less consistently improved with 51% of patients showing improvement. Complications occurred at a rate of <4.5%. Surgical management of herniated thoracic discs can be achieved through a modified transfacet approach in a safe and efficacious manner.

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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