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Original Article

Surgical options in thoracic disc herniation: Evaluating long-term outcomes of 21 cases based on a single-center 10-year experience

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ABSTRACT

Background: Symptomatic thoracic disc herniation (TDH) is a rare pathology that is addressed with relatively challenging surgical approaches, the choice and technical execution of which have been well described in the literature. Interestingly, long-term outcomes, including surgical site pain-related disability, the need for instrumentation, and commonly occurring complications such as cerebrospinal fluid (CSF)-pleural fistula have not been widely addressed. Here, we address the complication profiles and long-term outcomes of different surgical approaches for TDH.

Methods: We conducted a retrospective review of 21 consecutive patients who underwent surgery for TDH between 2000 and 2010. We assessed post-operative complications such as CSF-pleural fistulas, as well as long-term outcomes using Frankel grades, the EQ-5D-3L, and the Visual Analog Scale. We also looked at the need for instrumentation postoperatively.

Results: 21 consecutive patients (13 females, 8 males) with a mean age of 55.3 years (Standard deviation 8.1) underwent thoracic discectomy for symptomatic TDH. Surgical approaches included posterolateral thoracotomy (52%, $n = 11$), costotransversectomy (43%, $n = 9$), and transpedicular (5%, $n = 1$). Herniations were classified as soft (38%, $n = 8$), calcified (38%, $n = 8$), or calcified-transdural (24%, $n = 5$). Postoperatively, all patients with calcified-transdural herniations undergoing posterolateral thoracotomy (100%, $n = 5$) developed CSF-pleural fistulas, which resolved spontaneously without the need for surgical re-exploration. 89% ($n = 16$) of patients exhibited sustained improvement in Frankel scores. Persistent wound site pain was reported by 50% ($n = 7$) of patients.

Conclusion: Despite favorable neurological outcomes, patients with symptomatic TDHs can experience long-term surgical site pain, and therefore, a move toward minimally invasive exposure in such cases should be considered. Postoperative complications such as CSF-pleural fistulas are unlikely to require surgical intervention and thus can be managed conservatively.

Keywords: Complex spine, Neurosurgery, Spine surgery, Thoracic disc herniation

INTRODUCTION

Thoracic disc herniation (TDH) represents 0.15–4% of all disc herniations. Patients typically present with back pain and myelopathy attributed to TDH predominantly located below

the T8 level. Most are found at the T10/T11 or T11/12 levels.[10,11] Laminectomy has long been abandoned due to increased perioperative morbidity.[3] At present, the main established surgical techniques include posterior (transpedicular, costotransversectomy, transfacet), lateral (lateral extracavitary), and anterior (transthoracic [i.e., posterolateral thoracotomy]) approaches. Here, we reviewed the postoperative complications and long-term outcomes for 21 consecutive patients undergoing surgery for TDH at a single institution [Tables 1-3].

MATERIALS AND METHODS

Clinical data

We performed a retrospective analysis of the clinical and surgical outcomes for 21 patients undergoing surgery for TDH between 2000 and 2010 [Tables 1-3]. Patients averaged 55.3 years of age and presented with overlapping myelopathy (n = 18) and/or axial pain (n = 12). The average duration of symptoms was 13.9 months. The average postoperative follow-up period was 93 months.

Neurodiagnostic studies

Preoperative computed tomography and magnetic resonance imaging scans showed that TDHs were soft (38%, n = 8), calcified (38%, n = 8), or calcified-transdural (24%, n = 5). Soft discs were predominantly found below T10/11, while calcified discs were mostly above T10/11.

Surgical approaches and operative data

Surgical approaches included two posterior approaches: costotransversectomy (43%, n = 9) and transpedicular (5%, n = 1), and one anterior approach: the posterolateral thoracotomy (52%, n = 11). Figure 1 graphically depicts these approaches. For each surgical approach, the average duration of surgery, estimated blood loss, and length of hospital stay were recorded.

Postoperative complications and long-term outcomes

Postoperative complications as well as long-term outcomes were assessed, using Frankel grades, the EQ-5D-3L, and Visual Analog Scale (VAS). We also looked at the need for instrumentation postoperatively.

Statistical analysis

Descriptive statistics were employed utilizing a commercially available platform (Microsoft Excel) to analyze the data.

RESULTS

Operative data

Thoracotomy had the longest surgery time, highest estimated blood loss, and longest length of hospital stay (6.4 h, 1333 mL, 17.1 days) as compared to costotransversectomy (4.5 h, 533 mL, 6.7 days) and transpedicular (4.0 h, 1000 mL, 8 days).

Cerebrospinal fluid (CSF)-pleural fistulas in TDH surgery

All 5 patients with calcified transdural discs undergoing posterolateral thoracotomy developed CSF-pleural fistulas. These were all treated conservatively as the patients were asymptomatic, and they all resolved spontaneously within 6 months. Within this cohort, 1 developed a pleural empyema secondary to a chest infection, which was successfully treated with antibiotics, without signs of meningitis,wound-related complications, or the need for surgical drainage [Table 1].

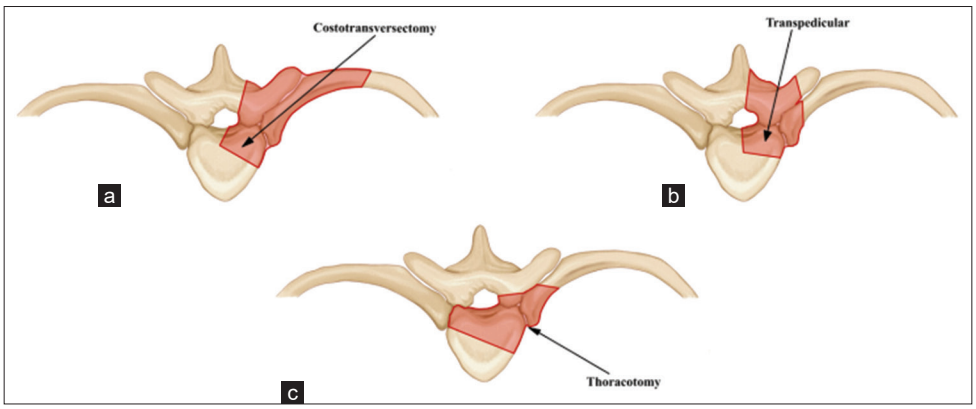

Figure 1: Schematic depictions of the surgical approaches discussed in this study. Anterior approaches include (a) costotransversectomy and (b) transpedicular. Posterior approaches include (c) posterolateral thoracotomy.

Table 1: Summary of postoperative complications with regard to surgical approach and TDH Type.

Surgery for TDH (*n*=21)	Postoperative complications		
	Soft discs (*n*=8)	Calcified discs (*n*=8)	Calcified-transdural discs (*n*=5)
Thoracotomy (*n*=11)	Neuropathic pain at surgical site (*n*=1)	Neuropathic pain at surgical site (*n*=1)	CSF-pleural fistula* (*n*=5), Pleural empyema (*n*=1), Transient neurological deficit† (*n*=1), Back pain and kyphosis requiring instrumented fixation (*n*=1)
Costotransversectomy (*n*=9)		Pseudomeningocele (*n*=1)	
Transpedicular (*n*=1)	Transient neurological deficit† (*n*=1)		

*Resolved spontaneously, †Resolved before discharge, TDH: Thoracic disc herniation, CSF: Cerebrospinal fluid

Table 2: Summary of postoperative Frankel grade improvements.

TDH type	Postoperative Frankel Grade Improvements		
	Improved by two grades (*n*)	Improved by one grade (*n*)	No change (*n*)
Calcified-Transdural (*n*=5)	5	0	0
Calcified (*n*=7)	3	4	0
Soft (*n*=6)	0	4	2

TDH: Thoracic disc herniation

Table 3: Distribution of patient-reported health status across EQ-5D-3L domains.

EQ-5D-3L domains	Minor problems (*n*)	Some problems (*n*)	Major problems (*n*)
Mobility	9	5	0
Self-care	12	2	0
Usual activities	7	5	2
Pain/discomfort	7	4	3
Anxiety/depression	12	1	1

Other postoperative complications

Transient postoperative neurological deficits were observed in 2 patients - one undergoing costotransversectomy and the other a transpedicular approach – both of which resolved by the time of discharge. Another patient who had undergone costotransversectomy developed a pseudomeningocele, requiring dural repair through a posterolateral approach. In the case of posterolateral thoracotomy, 2 patients reported neuropathic pain at the surgical site, and another required a metachronous fixation for progressive back pain and mild kyphotic deformity [Table 1].

Long-term neurological outcomes

Pre- and post-operative Frankel grade assessments were available for 18 patients. All 5 patients with calcified-transdural discs improved by two Frankel grades. In the calcified disc group, 3 patients improved by two grades, and 4 improved by one grade. For patients with soft herniated discs, 4 improved by one Frankel grade while 2 showed no change. These neurological improvements were maintained throughout the follow-up period [Table 2].

Quality of life outcomes

Long-term outcomes were available for 14 patients (67%). The EQ-5D-3L showed that 7 patients (50%) reported persistent wound site pain and limitation of activities of daily living. In addition, 5 patients (36%) reported limited mobility, 2 patients (14%) noted difficulty with self-care, and 2 patients (14%) reported anxiety/depression [Table 3]. The 14 patients' average VAS score was 80 (range: 50–100).

DISCUSSION

We treated 21 patients with TDH utilizing posterior (costotransversectomy and transpedicular) or anterior approaches (posterolateral thoracotomy).

Posterior surgery for TDH

Posterior surgery for TDH no longer includes laminectomy due to unacceptable perioperative morbidity and mortality.[3] Alternative posterior approaches such as costotransversectomy and transpedicular are therefore preferred.[1] In our series, 9 patients underwent costotransversectomy and 1 patient underwent a transpedicular approach, without major complications. Both approaches demonstrated favorable neurological outcomes, as reflected by improved Frankel scores, which were maintained long term. These findings are in line with Scoscina *et al*.,[8] who noted successful decompression and significant functional recovery post-costotransversectomy, and with Sivakumaran *et al*.,[9] whose work on transpedicular approaches similarly indicated favorable outcomes without postoperative complications.

Anterior surgery for TDH

Thoracotomy is considered the optimal approach for managing midline calcified TDHs, particularly in cases involving transdural herniations.[4] We found that all 5 patients with calcified-transdural discs who underwent posterolateral thoracotomy developed CSF-pleural fistulas. This is likely because a dural incision is required to remove the disc. These were self-limiting, and all resolved spontaneously within 6 months. This approach demonstrated favorable neurological outcomes, with a two-grade Frankel score improvement noted in all 5 patients. Within this cohort, only 1 patient required postoperative instrumentation due to mild kyphotic deformity. Furthermore, 2 patients reported neuropathic pain at the surgical site, suggesting that while neurological recovery is positive, postoperative pain remains a significant issue. This is in keeping with the findings demonstrated by Oltulu *et al*., who observed that patients undergoing thoracotomy for TDH might experience higher rates of postoperative pain despite improved neurological improvement.[6] The EQ-5D-3L data, along with Frankel grades, indicate that surgical site pain may be a principal contributor to disability post-thoracotomy.

This evidence points to the need to consider minimally invasive exposure in such cases. Utilizing approaches such as mini-thoracotomy,[7] thoracoscopic techniques,[2] or the use of advanced circular retraction systems that offer between-the-ribs access[5] could mitigate such complications and improve patient recovery.

CONCLUSION

Posterolateral thoracotomy is safe and effective for treating TDH. CSF-pleural fistulas are a common complication, but these typically resolve spontaneously and can be managed through a "wait and see" basis. Furthermore, the need for postoperative instrumentation is rare. However, despite favorable neurological outcomes following thoracotomy, patients often experience significant surgical site pain, which can lead to disability. Thus, minimally invasive exposure such as mini-thoracotomy and thoracoscopic techniques should be considered, as well as the use of a circular retraction system that enables between-the-ribs access to reduce discomfort.

Ethical approval

Ethical approval was not required for this study as it involved a retrospective review of anonymized data that was already available and did not involve any direct interaction with patients or the collection of new data. All patient data were fully anonymized before access and analysis, and the institution where the data were sourced is not named to further protect patient confidentiality. Given these factors, it was deemed that no formal ethical approval was necessary.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript, and no images were manipulated using AI.

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