**Lateral Approach for Anterior Thoracic Spinal Lesions**

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**Abstract**

A lateral approach, consisting of a modified transversectomy, hemilaminectomy, and adequate transversectomy with costectomy of 7-8 cm, was used to treat four cases of anterior or anterolateral thoracic lesions, including two cases of thoracic disc herniations, one of thoracic meningioma, and one of hypertrophic pachymeningitis. All patients presented with gait disturbance, but recovered well postoperatively except for one who needed rehabilitation of the lower extremities. This approach provides a greater access to the anterior thoracic canal, and can achieve effective anterior decompression, and a good outcome for thoracic spinal disease if recognized early.

Key words: lateral approach, thoracic spine

**Introduction**

The thoracic spinal cord is vulnerable to manipulation and trauma because of the narrow spinal canal and tenuous blood supply, and the spinal canal is smaller and more difficult to enter and expose surgically than in the cervical and lumbar areas. Surgical approaches to the thoracic spinal canal include laminectomy, costotransversectomy, and the transpleural approach. Laminectomy was the neurosurgeon's approach of choice for a variety of lesions, but early attempts to treat thoracic disc herniations through laminectomy have met with poor results. Posterolateral approaches such as costotransversectomy offer an excellent exposure to lateral thoracic lesions, but provide an inadequate operative field for the removal of anterior thoracic spinal lesions. The transpleural approach provides extensive exposure of the thoracic vertebral bodies, but requires a thoracotomy that increases the risk factor. A post-thoracotomy pain syndrome occurs in 5% of patients following the transthoracic approach. This procedure should not be undertaken lightly and certainly not without a team of specialists able to cope with every aspect of intraoperative and perioperative care.

We describe a lateral approach consisting of a modified transversectomy, hemilaminectomy, and sufficient transversectomy with costectomy of 7-8 cm for the treatment of anterior or anterolateral thoracic lesions.

**Operative Procedure**

The patient is placed in the prone position on a laminectomy frame with a surgical arrangement that will ultimately provide the surgeon with a direct lateral view of the spine. Intraoperative x-ray films are used to identify the rib to be resected. The side of approach is indicated by the greatest involvement clinically and radiologically. When the lesion is located midline, the approach is from the right side or the side contralateral to the Adamkiewicz artery identified by preoperative selective spinal angiography. The anatomical location of the artery is relatively constant: on the left side in 80% of individuals and usually between T9–11. An L-shaped skin incision, about 8 cm midline incision with an about 8 cm-long lateral incision, is made, and the paravertebral muscles are reflected, or mobilized if possible, from the spines and laminae. The rib is disarticulated from its costotransverse attachment.
with a periosteal elevator and removed about 7-8 cm from the attachment (costectomy). Removal of the rib in this way provides an oblique angle sufficient to visualize the ventral canal. Hemilaminectomy is performed by air drill. Transversectomy is performed with particular attention paid to the radicular artery. If necessary, sufficient lateral rhachotomy (ventral body resection) can be performed and extensive anterior decompression can also be achieved (Fig. 1). The extent of bony resection depends on the individual case.

**Patients and Results**

We treated four patients with anterior or anterolateral thoracic lesions using this lateral approach. The patients were a 58-year-old female with an anterolateral thoracic meningioma at the T10-11 space (Case 1), a 45-year-old male with thoracic disc herniations at the T7-8 and T8-9 spaces (Case 2), a 65-year-old male with thoracolumbar disc herniation at the T12-L1 space (Case 3), and a 56-year-old male with hypertrophic pachymeningitis at the T4-7 (Case 4). All patients presented with gait disturbance, and achieved good recovery from symptoms postoperatively except for Case 3 who needed rehabilitation of the lower extremities. Vertebral reconstruction was not required in our series, and no complication including postoperative instability occurred.

**Illustrative Cases**

**Case 1:** A 58-year-old female with a 2-year history of progressive bilateral foot hypoesthesia presented with gait disturbance. Neurological examination revealed paraparesis and bilateral foot hypoesthesia. Myelography disclosed a defect at the T10-11 space, and metrizamide computed tomography (CT) myelography demonstrated a tumor in the left anterolateral region at the T10-11 space and right displacement of the spinal cord at the T-10 and T-11 (Fig. 2). Spinal angiography revealed slight tumor staining, and a shift of the anterior spinal artery to the right. The artery of Adamkiewicz originated from the right T-12 intercostal artery.

Surgery was carried out using the lateral approach from the right. An L-shaped skin incision consisting of a T9–12 level midline incision and an about 8 cm-long lateral incision at T-12 level was made. Hemilaminectomy and wide costectomy of 8 cm were performed at T-10 and T-11. A small lateral rhachotomy was adequate at T-10 level in this case (Fig. 3). A round small tumor was found and removed. Histological examination demonstrated meningotheliomatous meningioma.

Postoperative improvement of symptoms was dramatic.

**Case 2:** A 45-year-old male presented with a 1-year history of bilateral foot hypoesthesia and 3-month history of gait disturbance. He had paraparesis and hypoesthesia below the level of the T-10 dermatome. Tendon reflexes were hyperactive in the lower ex-

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Fig. 1  Diagram showing the extent of bony resection and angle of approach (arrow) in the lateral approach.

Fig. 2  Case 1. Metrizamide CT myelograms demonstrating a tumor (t) in the left ventrolateral region at the T10-11 space (center) and right displacement of the spinal cord at the T-10 (left) and T-11 (right).
tremities. X-ray films revealed disc space narrowing at the T7-8 and T8-9, and calcification in the anterior T8-9 spaces. Myelography showed incomplete block at T-9. Metrizamide CT myelography demonstrated left displacement of the spinal cord and a calcified protruding disc at the T8-9 space (Fig. 4). Spinal angiography showed no abnormal findings, with the artery of Adamkiewicz originating from the left T-9 intercostal artery.

Surgery through the lateral approach from the left was performed. An L-shaped skin incision consisting of a T6-10 midline incision and an about 10 cm-long lateral incision at T-10 level was made. Hemilaminectomy, wide costectomy of 8 cm, and lateral rhachotomy were performed at T7-9 taking care not to injure the left T-9 intercostal artery. Hypertrophic yellow ligament and the protruding soft disc of the T7-8 space were easily removed, but the protruding disc of the T8-9 space was calcified and removal required an air drill (Fig. 5).

Three months after the operation, the neurological deficit was improved (Fig. 6).

**Discussion**

Symptomatic thoracic spinal disease is uncommon and there is no characteristic clinical presentation, so diagnosis is not easy. The thoracic spine is a challenging area for surgical treatment because of the small spinal canal, encasement by the thoracic cage, and the pleural and mediastinal cavities. No single surgical procedure can achieve both minimal disruption of the normal spinal anatomy and adequate access to the disc space. Each approach has advantages and disadvantages. Choosing the appropriate approach to thoracic lesions depends on the level of the thoracic spine affected, the nature and location of lesions relative to the spinal cord, and the neurosurgeon’s experience with a particular treatment.
Lateral Approach for Anterior Thoracic Lesions

Fig. 6 Case 2. Postoperative CT scans revealing complete removal of the calcified discs and the extent of bony resection. left: T7-8 space, right: T8-9 space.

approach.

Our lateral approach extends the costotransversectomy approach with hemilaminectomy and sufficient transversectomy with a wide costectomy to provide a better access to the ventral spinal canal. The pedicle must be removed to expose the floor of the spinal canal. The disadvantages of this approach are the possibility of postoperative instability and the risk of vascular sacrifice. The possibility of instability must be considered with cases requiring significant bony removal for exposure. Appropriate posterior spinal fixation using an instrument (e.g., Cotrel-Dubousset or Texas Scottish Rite Hospital instrumentation\(^7\)) with or without an autologous bone graft may be necessary. Significant disruption of the paravertebral muscle may also occur, involving the risk of vascular sacrifice, and so requires preoperative spinal angiography to determine the location of the artery of Adamkiewicz so the approach can be modified according to the relationship of the artery to the proposed level of exposure. These problems are also true of costotransversectomy. Exposure must be minimized, and the extent of bony resection depends on the individual case. No vertebral reconstruction was required and no instability occurred in our series.

The transpedicular approach for thoracic disc hernia is also an effective and safe method, but this approach provides no direct visualization of decompression and does not allow removal of hard or central disc. Recently, Le Roux et al.\(^8\) reported excellent surgical results in 20 patients with thoracic disc herniation, including calcified hernia and/or osteophyte, by the transpedicular approach using specially designed curettes. Less invasive approaches will be facilitated by such specifically designed new equipment.

The outcome of thoracic spinal disease is related to early diagnosis and treatment.\(^2,8\) These lesions should be removed if symptoms progress despite medical treatment and before disastrous neurological consequences occur.

Our lateral approach for anterior thoracic spinal lesions provides a greater access to the anterior thoracic canal, and can achieve effective anterior decompression and a good outcome for thoracic spinal disease if recognized early.

References

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