

# Spinal cord decompression by minimally invasive transthoracic lateral approach.

## Case report

Augusto E. Martínez,<sup>\*</sup> Felipe J. Lanari Subiaur,<sup>\*\*</sup> Carlos M. Mounier,<sup>\*</sup> José R. Prina,<sup>\*\*</sup> Ramiro Gutiérrez,<sup>\*\*</sup> Enrique A. Gobbi<sup>\*\*</sup>

<sup>\*</sup>Department of Orthopedics and Traumatology, Spinal Unit, CEMIC (Buenos Aires, Argentina)

<sup>\*\*</sup>Grupo Médico Vertebral (Buenos Aires, Argentina)

### ABSTRACT

There are multiple techniques for spinal cord decompression in the thoracic spine, each with its advantages and disadvantages, and requiring different surgical skills. Recently, minimally invasive techniques have been developed, reducing morbidity rates and achieving good functional results.

We present the case of a 64-year-old male with spinal compression symptoms, central disc herniation calcified at the fifth thoracic vertebra, which migrated to the lower end of the sixth thoracic vertebra. Diagnosis was clear for spinal cord compression. Partial posterior corpectomy of the sixth vertebra was performed with a minimally invasive transthoracic transpleural lateral approach and without additional fixation. The patient had a good outcome on follow-up, without progression of neurological symptoms or residual rib pain.

Minimally invasive lateral approaches are valid techniques for the treatment of compression disorders of the thoracic spine, with low rates of morbidity and mortality, and a rapid recovery.

**Key words:** Spine; minimally invasive approach; decompression; thoracotomy.

**Level of evidence:** IV

### Descompresión medular mediante abordaje lateral transtorácico mínimamente invasivo. Reporte de un caso

### RESUMEN

Existen múltiples técnicas para la descompresión medular en la columna torácica, cada una con sus ventajas y desventajas, y con distintos requerimientos de destrezas quirúrgicas. Se han desarrollado técnicas mínimamente invasivas que disminuyen las tasas de morbilidad, con buenos resultados funcionales. Se presenta el caso de un hombre de 64 años, con clínica de compresión medular, una hernia de disco central, calcificada a nivel del quinto disco torácico, migrada hasta el borde inferior de la sexta vértebra torácica, con franca compresión medular. Se realizó un abordaje lateral transpleural mínimamente invasivo, con una corpectomía parcial posterior de la sexta vértebra, sin fijación adicional. El paciente tuvo una buena evolución, sin progresión del cuadro neurológico ni dolor costal residual.

Los abordajes laterales mínimamente invasivos son técnicas válidas para tratar patologías compresivas de la columna torácica, con bajas tasas de morbimortalidad y una rápida recuperación.

**Palabras clave:** Columna; abordaje mínimamente invasivo; descompresión; toracotomía.

**Nivel de Evidencia:** IV

### INTRODUCTION

Until the mid-20th century, most compressive conditions of the thoracic spine were treated with laminectomy. However, it is known that compressions of the thoracic spine treated only by posterior decompression are associated with poor clinical results, sometimes with a worsening of the symptoms<sup>1,2</sup>.

Received on April 2, 2018. Accepted after evaluation on April 16, 2018 • AUGUSTO E. MARTÍNEZ, MD • [augustomartinez.ojt@gmail.com](mailto:augustomartinez.ojt@gmail.com) 

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Different approaches have been developed with the aim of improving clinical outcomes, each with its advantages and disadvantages, and requiring different surgical skills (costotransversectomy<sup>3</sup>, transpedicular approaches<sup>4</sup>, traditional thoracotomy<sup>5</sup>, and thoracoscopy<sup>6</sup>).

More recently, minimally invasive approaches have been reported<sup>7, 8</sup>, reducing postoperative morbidity, mainly in the short term, and allowing the spinal surgeon to master them with specific training. However, they involve basically no modifications to the basis of traditional surgical approaches.

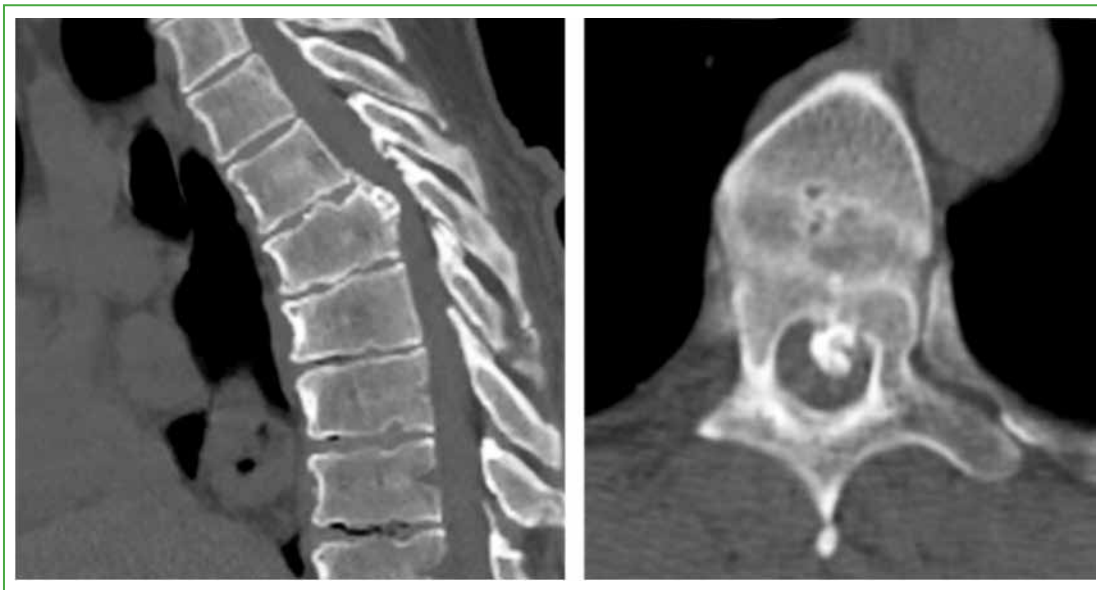
We present the case of a patient with a calcified migrated thoracic disc herniation treated by a minimally invasive transpleural lateral approach with a posterior partial corpectomy without additional fixation.

## CLINICAL CASE

A 64-year-old man with a history of adult-onset degenerative scoliosis came to our Service due to a progressive gait disorder.

The physical examination revealed a wide-based gait, live reflexes in lower limbs, exhaustible clonus and absence of the Babinski sign.

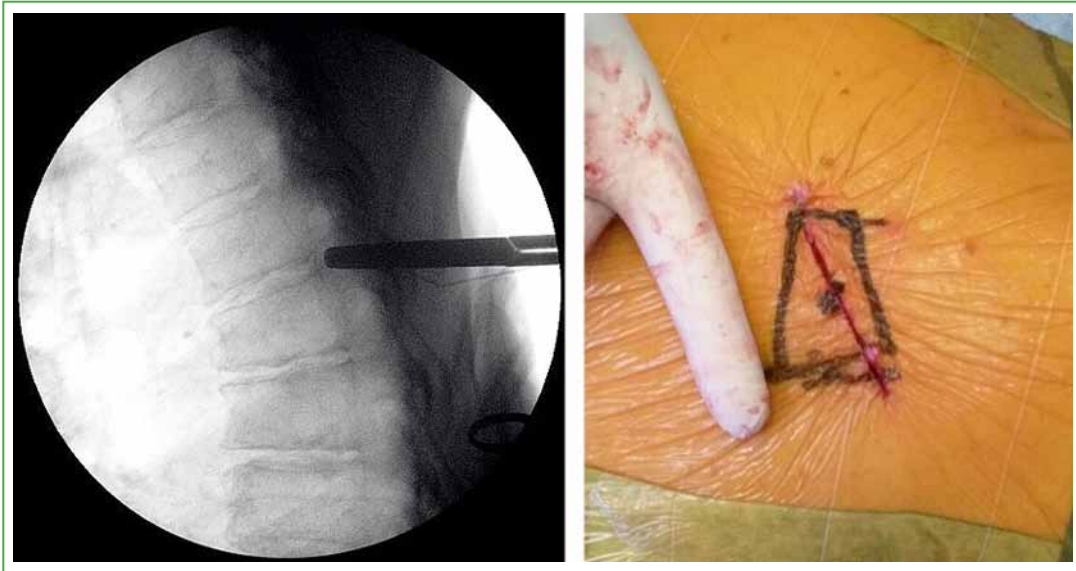
Scans show a central spinal compression secondary to a disc herniation between the fifth and sixth thoracic vertebrae, slightly lateralized to the left, migrated distally to the lower edge of the sixth thoracic vertebra and calcified posteriorly along the entire vertebra, resulting in frank spinal compression (Figure 1).



**Figure 1.** CT scan showing a calcified, migrated central disc herniation, slightly lateralized to the left.

## Surgical approach

The surgery was performed under general anesthesia, with the patient placed in the right lateral decubitus position. There was no need for selective bronchial intubation, and neurological monitoring of somatosensory and motor evoked potentials was ongoing. Correct positioning of AP and lateral projections was monitored under fluoroscopy (Figure 2). A 5 cm-long superficial incision was made along the rib, dissecting and resecting a rib segment. The parietal pleura was also incised, manually dissecting the pleural cavity. Self-retaining tubular retractors specially designed for minimally invasive surgery (MaXcess 3, Nuvasive) were placed. The segmental vascular bundle of T6 was ligated, followed by a partial resection of the costovertebral joint. The T6-T7 foramen was identified, taking it as a posterior reference point, and progressing anteriorly, removing approximately a quarter of the anteroposterior diameter of the disc-to-disc vertebral body. Next, we performed marking and annulotomy of the posterior

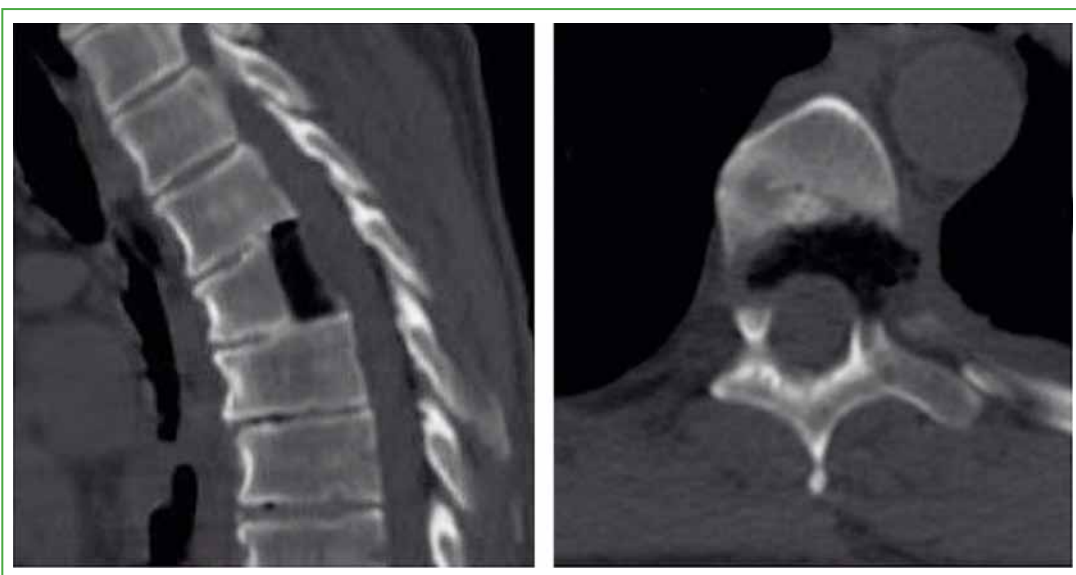


**Figure 2.** On the left, the radioscopic marking can be observed and, on the right, the incision.

quarter of T6-adjacent discs. After correct hemostasis was achieved, the wound was closed, placing an underwater seal drain (K10), and alveolar recruitment manoeuvres were immediately performed before removing the drain and knotting the continuous sutures along the appropriate planes. This way, a pleural drain was unnecessary.

The whole procedure was carried out under microscopic vision and using long instruments designed to work in narrow and deep surgical windows.

Operating time was 180 minutes. Hematocrit was reduced by 1 point. Patient was discharged from hospital three days after surgery. The follow-up CT scan showed wide spinal cord decompression (**Figure 3**). Patient evolved favourably, without progression of neurological symptoms or residual rib pain.



**Figure 3.** Postoperative CT scan showing wide decompression with a partial posterior corpectomy.

## DISCUSSION

The ideal surgical approach should achieve a wide and adequate decompression of nerve structures, maintaining or reconstructing the mechanical and functional anatomy, sparing the adjacent vital structures.

Costotransversectomy and transpedicular approaches proved to be safer than laminectomy, and they allow for an anterior decompression through a posterior incision. However, they limit access to the contralateral portion of the intervertebral disc without retracting the spinal cord, with a limited surgical window. Sometimes, the nerve root of the affected segment must be cutted<sup>3,4</sup>.

Traditional thoracotomy is considered the gold standard for visualization and treatment of thoracic disc herniations<sup>5</sup>; however, it is a highly-complex approach with a significant rate of postoperative morbidity and pain, and, in some cases, resulting in selective intubation, pneumothorax, lung collapse, pleural effusion, hemothorax, and other complications<sup>9</sup>.

Thoracoscopic approaches are successful and decrease morbidity rates, but they are difficult to perform due to the challenge of visualizing three-dimensional conditions in two dimensions, expensive instruments, the need to have highly-trained surgeons with a long learning curve, and the relative difficulty involved in the management of intra-operative complications<sup>6,10,11</sup>.

It has been shown that minimally invasive approaches are successful and have a low morbidity rate, and also avoid the need to use double-lumen endotracheal tubes, dissect the paravertebral muscles or manipulate the spinal cord. Plus, there is an excellent exposure of central or contralateral compressions. They are technically similar to open approaches, but with a lower learning curve than thoracoscopies. Pulmonary complications and rib pain are much lower than with traditional thoracotomies. As a limitation, it can be noted that this approach is useful below T4, since, more proximally, the scapula makes it difficult to perform the procedure, and this bone must be mobilized to access the spine<sup>8,12-14</sup>.

When resection results in additional instability, the decompressed segment must be fused. In 1990, White and Panjabi<sup>15</sup> described a series of criteria for determining thoracolumbar spine instability. According to them, upon sectioning of all the posterior elements, the segment remains stable during flexion, leading to the destruction of the costovertebral joint. Conversely, the anterior ligaments and at least one posterior element must be destroyed to achieve instability during extension. Furthermore, during extension, stability can be maintained only by sparing the anterior longitudinal ligament and, during flexion, by sparing the posterior longitudinal ligament and the rest of the anterior elements.

In our patient, only central elements were partially resected, so arthrodesis of the segments was not required. We use the word “segments”, in the plural, because our procedure involved two discs.

## CONCLUSIONS

Minimally invasive transpleural lateral approaches are valid techniques for the treatment of vertebrae in cases of compressive conditions of the thoracic spine, bearing a low rate of morbidity and mortality, and leading to a rapid postoperative recovery.

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A. E. Martínez ORCID ID: <https://orcid.org/0000-0002-8088-0874>

F. J. Lanari Subiaur ORCID ID: <https://orcid.org/0000-0003-4030-0959>

C. M. Mounier ORCID ID: <https://orcid.org/0000-0001-7075-6231>

J. R. Prina ORCID ID: <https://orcid.org/0000-0003-0632-9870>

R. Gutiérrez ORCID ID: <https://orcid.org/0000-0001-7410-2657>

E. A. Gobbi ORCID ID: <https://orcid.org/0000-0001-7310-6170>

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