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Transthoracic lateral retropleural minimally invasive microdiscectomy for T9-T10 disc herniation

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Keywords Thoracic disc herniation · Microdiscectomy · Transthoracic · Retropleural · Minimally invasive · Extreme lateral interbody fusion XLIF

Learning targets

1. To understand how to safely perform a transthoracic retropleural minimally invasive approach to the lower thoracic spine.
2. To understand how to perform a thoracic microdiscectomy through a lateral transthoracic, retropleural approach.

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Introduction

Thoracic disc herniation (TDH) is a rare pathology, its prevalence estimated in 1:1.000.000 [2]. Its etiology remains unclear; symptoms are variable, ranging from mild back pain to moderate sensorial or motor deficits to severe paraparesis and bladder disfunction [1, 2, 9, 10]. Diagnosis is confirmed by MR of the thoracic spine; CT scan is helpful to better identify disc calcifications or osteophytes, which are frequent and pose significant additional difficulties during surgical excision [3].

Surgery is the treatment of choice in cases of severely symptomatic TDH [1, 2]. Different surgical approaches have been proposed in the past: posterior laminectomy associated or not to costo-transversectomy, has been almost completely abandoned because of poor results related to insufficient decompression and high rate of complications-including spinal cord injuries, dural tears and death [2]; transthoracic thoracotomic approaches were then postulated [7]; video-assisted thoracoscopic surgery allowed for significative reduction of thoracic exposure and consequently reduced postoperative pain related to thoracotomy [6]; disadvantages of the thoracoscopic approach are the need for selective intubation with lung collapse on the side of the access, the additional technical difficulty related to the specific skills that thoracoscopic surgery requires, which can hardly be kept trained with a low case load, as typically in TDH [8]. Lateral access, minimally invasive transthoracic retropleural discectomy and spinal cord decompression with the assistance of operative microscope is an excellent less invasive alternative to transthoracic open and thoracoscopic techniques in the treatment of symptomatic TDH [4, 5, 9].

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Case description, imaging

The case of a 56 year-old lady suffering from long lasting thoracic back pain and progressive onset of lower left limb weakness and dumbness with gait impairment is reported. Her symptoms were lasting for 2 years; the patient performed neurological investigations demonstrating a T9-T10 disc herniation but because of cardiovascular comorbidity that made necessary the implantation of a pacemaker spinal surgery had to be delayed. Upon admittance she presented with walking ataxia, moderate distal bilateral epicritical hypoesthesia in the lower limbs and proximal, ileopsoas and quadriceps, motor weakness on the left side. Significant back pain was present. Oswestry disability Index (ODI) scored 66/100 and pain, both in the legs and in the back scored on a numeric rating scale (NRS) 9/10. Recent imaging (CT, MRI) showed bony T9-T10 central disc herniation, determining compression and dislocation of the spinal cord; no clear radiological signs of altered signal of the spinal cord were found.

The patient was positioned in right lateral decubitus. Prophylactic parenteral antibiotics were given. Due to the presence of a pacemaker, evoked motor and somatosensorial potentials (MEP and SSEP) could not be used, as dictated by the institution's protocol. When no counterindication for the use of evoked potentials is present, the authors use the automated, surgeon driven Neurovision M5^{TM} (Nuvasive Inc, San Diego, CA, USA) device, because of its ability of simultaneously recording 8 motor channels (usually 2 in the upper and 6 in the lower limbs). Such a configuration has proved [11] to be more sensitive than 4-channel MEP plus 4-channel SSEP monitoring, which is the current accepted standard in many centers. General anesthesia was performed. Though lung exclusion is not strictly necessary to perform this MIS procedure, the authors prefer to have the patient under selective lung intubation. This allows, in case of transpleural procedure, to partially deflate the lung on the side of the access for a short time in order to more safely insert the retractor. Preoperatively, the level was identified with C-arm and the skin was accordingly marked, after strict lateral decubitus placement with the target disc in orthogonal position was confirmed by radioscopy. As one of the potential causes of surgical failure is wrong level surgery, obtaining preoperatively a CT or MRI scan that unequivocally shows both the target level and a clear anatomical landmark (usually the sacrum or the C2 vertebra) is mandatory. Other visible anatomical references can be useful in the identification of the level. In some cases, preoperatively marking of the lesion level by tattooing the skin under CT guidance can be necessary. In this case, an MRI containing both the sacrum and the target level was available; additionally, the presence of a large, recognizable osteophyte just one level above the herniated disc helped to identify the correct disc space (T9–T10). A 5 cm skin incision was made in the left thoracic intercostal space that better matched the position of the target disc, as seen in fluoroscopy (VIIth and VIIIth) through which the site of herniation is vertically approachable. A 5-cm segment of the VIIth rib is then partially resected to gain better exposition. Through gentle finger dissection the parietal pleura is mobilized starting from the posterior rib osteotomy site and progressing dorsally without collapsing the lung until the lateral aspect of the thoracic spine is exposed. The exposed surgical field is centred on the T9-T10 disc space (C-arm check for correct level). Resection of the head rib is performed to expose the T10 left pedicle. The operative microscope is introduced. A partial resection of the posterior corner of the T10 superior endplate (including a portion of the superior aspect of the pedicle left pedicle of T10) and T9 inferior endplate is performed. The posterior endplate resection creates a cavity anterior to the calcified herniation where the lesion can be pulled, avoiding spinal cord compression during resection of the herniation. The spinal canal is identified under the left T10 pedicle. Once inside the canal, the dura mater covering the spinal cord is identified, above and below the calcified herniation. Gentle dissection is made in order to safely dissect the herniation from the dura, in the area of the spinal cord compression. Partial resection of the caudal posterior wall of T9 and of the rostral posterior wall of T10 allows to mobilize the calcified herniation into the vertebral body cavity anteriorly. Dural re-expansion following decompression can be noticed. Careful endplate preparation for interbody fusion device implant is performed; in this case, due to the narrowing of the disc space, it is not possible to proceed with the implantation of a cage. Thus, bone chips are inserted into the disc space and a lateral plate is implanted between T9 and T10. Final canal exploration, bipolar hemostasis and thorough irrigation is performed. The retractor system is gently removed, checking carefully the integrity on the pleural surface. The fascia and subcutaneous tissue are closed with simple stitches and the skin with resorbable intradermal suture. After watertight suture, ventilation of the patient with positive pressure and positioning of a drain temporarily under a water seal allows for the retropleural cavity to be emptied of air. Once the cavity has been emptied, the drain is removed (or left in place with a standard closed system if bleeding is anticipated) and its tract is sealed.

Postoperative information and images

Postoperatively, the patient was observed in intensive care for 18 h (mainly due to preoperative severe lung restriction). The clinical course was good, with improvement of back pain, motor weakness and walking. The patient was allowed to stand up two days after surgery, without any brace. A CT scan and a full spine X-ray were performed 3 days after surgery, demonstrating complete decompression of the spinal cord and good positioning of the plate. Postoperative pain was well controlled with NSAID drugs. Passive, active and gait rehabilitation was started on day 2 after surgery. Patient was discharged on day 9 after surgery with a normal gait (waiting for ODI and VAS at 3 months).

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References

1. Uribe JS, Smith WD, Pimenta L, Härtl R, Dakwar E, Modhia UM, Pollock GA, Nagineni V, Smith R, Christian G, Oliveira L, Marchi L, Deviren V (2012) Minimally invasive lateral approach for symptomatic thoracic disc herniation: initial multicenter clinical experience. J Neurosurg Spine 16(3):264–279
2. Albrand OW, Corkill G (1979) Thoracic disc herniation. Treatment and prognosis. Spine 4(1):41–46
3. Williams MP, Cherryman GR, Husband JE (1989) Significance of thoracic disc herniation demonstrated by MR imaging. J Comput Assist Tomogr 13:211–214
4. Uribe JS, Dakwar E, Le TV, Christian G, Serrano S, Smith WD (2010) Minimally invasive surgery treatment for thoracic spine tumor removal: a mini-open, lateral approach. Spine (Phila Pa 1976) 35(26 Suppl):S347–S354
5. Uribe JS, Dakwar E, Cardona RF, Vale FL (2011) Minimally invasive lateral retropleural thoracolumbar approach: cadaveric feasibility study and report of 4 clinical cases. Neurosurgery 68(1 Suppl Operative):32–39
6. Rosenthal D, Dickman CA (1998) Thoracoscopic microsurgical excision of herniated thoracic discs. J Neurosurg 89(2):224–235
7. McCormick PC (1995) Retropleural approach to the thoracic and thoracolumbar spine. Neurosurgery 37:908–914
8. McAfee PC, Regan JR, Zdeblick T, Zuckerman J, Picetti GD III, Heim S et al (1995) The incidence of complications in endoscopic anterior thoracolumbar spinal reconstructive surgery. A prospective multicenter study comprising the first 100 consecutive cases. Spine (Phila Pa 1976) 20(14):1624–1632
9. Khoo LT, Smith ZA, Asgarzadie F, Barlas Y, Armin SS, Tashjian V et al (2011) Minimally invasive extracavitary approach for thoracic discectomy and interbody fusion: 1-year clinical and radiographic outcomes in 13 patients compared with a cohort of traditional anterior transthoracic approaches. Clinical article. J Neurosurg Spine 14:250–260
10. Ayhan S, Nelson C, Gok B, Petteys RJ, Wolinsky JP, Witham TF et al (2010) Transthoracic surgical treatment for centrally located thoracic disc herniations presenting with myelopathy: a 5-year institutional experience. J Spinal Disord Tech 23:79–88
11. Langeloo DD, Lelivelt A, Louis Journée H, Slappendel R, De Kleuver M (2003) Transcranial electrical motor-evoked potential monitoring during surgery for spinal deformity: a study of 145 patients. Spine 28(10):1043–1050