

# Extreme lateral interbody fusion and percutaneous pedicle screw fixation in the minimally invasive treatment of thoracic tuberculosis

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## Abstract

**Objective:** As a minimally invasive intervertebral fusion technique popularized in recent years, extreme lateral interbody fusion (XLIF) has various advantages. In this study, we describe the application and efficacy of XLIF for the treatment of thoracic tuberculosis (TB), as this may be an emerging treatment option for thoracic TB in the future.

**Methods:** We present the case of a 75-year-old man who had suffered from chest and back pain for 1 month. Imaging studies showed destruction of the T12 and L1 vertebral bodies and the T12–L1 intervertebral disc, accompanied by formation of a paravertebral abscess. After 2 weeks of standard anti-TB treatment, the patient underwent debridement of the lesions, XLIF, and percutaneous pedicle screw fixation.

**Results:** The patient's chest and back pain were significantly alleviated after the operation. The patient recovered well, and as of the most recent follow-up had no obvious limitation in thoracolumbar spine function.

**Conclusions:** XLIF combined with percutaneous pedicle screw fixation for the treatment of thoracic TB can allow for TB lesion debridement, discectomy, and interbody fusion under direct visualization, and can effectively improve patient prognosis.

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**Keywords**

Extreme lateral interbody fusion, tuberculosis, thoracic tuberculosis, paravertebral abscess, percutaneous pedicle screw fixation, minimally invasive

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**Background**

Tuberculosis (TB) more commonly affects the thoracic spine than other portions of the spine. When the TB lesions threaten the stability of the spine, surgical treatment should be undertaken.<sup>1</sup> Conventional approaches include the anterior, posterior, and combined anterior and posterior approaches, with each having certain drawbacks.<sup>2</sup> Extreme lateral interbody fusion (XLIF) is a minimally invasive intervertebral fusion technique used in recent years that can allow direct visualization to perform procedures such as TB lesion removal, discectomy, and interbody fusion. It is associated with the advantages of less trauma, high fusion rate, short hospital stay, and rapid rehabilitation.<sup>3</sup> In this case report, we describe an innovative application of XLIF and evaluate its efficacy in the treatment of thoracic TB. We determined that this may be an effective future treatment for thoracic TB.

**Case presentation**

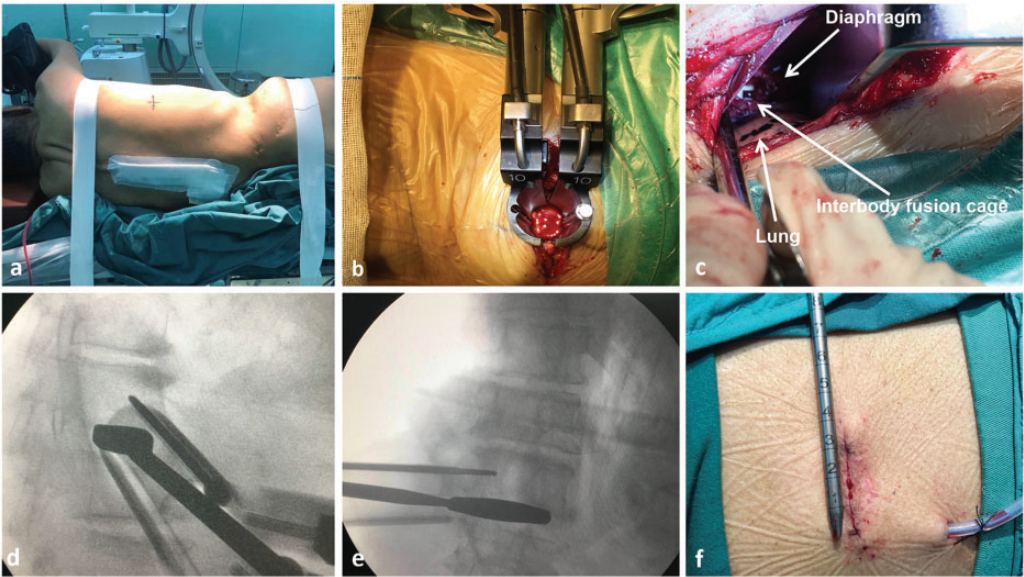
A 75-year-old man initially presented with a 1-month history of chest and back pain, accompanied by low-grade afternoon fevers and repeated night sweats. Before entering our department, he was diagnosed with a lumbar disc herniation in a private clinic, although conservative treatment was ineffective and the symptoms gradually worsened. Physical examination demonstrated percussion pain in the chest and back, and flexion and extension of the thoracolumbar spine were limited. Laboratory studies showed that anti-TB antibody was

negative, and the indexes of C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) were increased significantly. Imaging revealed destruction of the T12 and L1 vertebral bodies and the T12–L1 intervertebral disc, accompanied by formation of a paravertebral abscess (Figure 1). Based on the above findings, he was diagnosed with spinal TB (T12–L1).

After 2 weeks of standard anti-TB treatment, the symptoms of low-grade fever and night sweats were alleviated. To avoid further destruction and collapse of the vertebral bodies and potential spinal cord compression, the patient underwent lesion debridement, XLIF, and percutaneous pedicle screw fixation. Under general anesthesia, the patient was placed in the lateral position and the body was fixed with wide tape. Routine fluoroscopy was performed to determine the center of the T12–L1 intervertebral disc. An oblique 4-cm incision was made at the marked point, and the muscle and pleura were separated with a step-by-step dilator until the diseased intervertebral disc was safely reached, and the expandable working tube was inserted to gradually open the channel. Then, additional debridement of the TB lesions and necrotic tissue of the diseased vertebral body and intervertebral disc were performed, the diseased intervertebral disc was grasped with nucleus pulposus forceps, the vertebral lesion was scraped with a curette, and the TB lesions and dead bones were cleared. Subsequently, the distance between the upper and lower residual vertebrae was measured, the suitable type of interbody fusion cage was selected, and an appropriate amount of



**Figure 1.** Preoperative X-rays and magnetic resonance imaging (MRI) examination results.



**Figure 2.** The specific operative procedure for the extreme lateral interbody fusion (XLIF) combined with percutaneous pedicle screw fixation.

autogenous iliac bone was filled into the interbody fusion cage for implantation into the intervertebral disc. The prone position was employed, the pedicle screws were percutaneously inserted, and the internal fixation position and spinal sequence were determined by C-arm fluoroscopy. A drainage tube was placed next to the incision,

and the incision was sutured closed in a layered fashion (Figure 2).

The symptoms of chest and back pain were significantly alleviated after the operation. Thus far, the patient has recovered well, and there is no obvious limitation of the function of the thoracolumbar spine. Postoperative imaging showed that the

interbody fusion cage was fixed in place and the pedicle screws were fixed reliably (Figure 3).

### Ethics

This study was conducted in accordance with the declaration of Helsinki and with approval from the Ethics Committee of Jiangxi Provincial People's Hospital Affiliated with Nanchang University. Written informed consent was obtained from the patient.

### Discussion

With the rapid development of advanced imaging techniques and anti-TB drugs in recent years, conservative treatment is effective for most TB patients. However, when the TB lesion destroys the vertebral body and forms an abscess in the surrounding tissue, this can result in spinal collapse, which can lead to neurological dysfunction. Because of the pressure on the spinal cord and thoracic kyphosis, urgent surgical treatment is needed.<sup>4</sup> The purpose of the operation is to remove the lesions completely, relieve the compression of the spinal cord, restore neurological function, correct the thoracic kyphosis, and maintain the stability of the spine.<sup>5</sup> Although the

conventional anterior or posterior approaches for lesion debridement and internal fixation can obtain ideal outcomes, there are still certain shortcomings, such as a large incision, more bleeding, infection, dural tear, spread of the lesions in the spinal canal, and a high incidence of sinus formation.<sup>6</sup>

As an emerging minimally invasive interbody fusion technology in recent years, XLIF was first reported by Ozgur et al.<sup>7</sup> in 2006 for the treatment of degenerative diseases such as lumbar degenerative instability and scoliosis. Previous clinical studies showed that the operation was safe and effective. Moreover, the indications for XLIF reported in the current literature mainly include degenerative scoliosis, segmental spinal instability, recurrent disc herniation, intervertebral foramen stenosis, anterior revision of pseudarthrosis after posterior surgery, degenerative disc disease, infection, trauma, tumor, and revision artificial disc replacement.<sup>8</sup>

Ha et al.<sup>9</sup> first reported the application of XLIF combined with percutaneous pedicle screw fixation for the treatment of 16 patients with lumbar suppurative spondylitis, of which 15 patients obtained a good fusion and symptomatic relief after the operation. Only one patient developed pseudoarthrosis and failure of the internal



**Figure 3.** Postoperative X-rays and computed tomography (CT) scans.

fixation hardware. Moreover, Wang et al.<sup>10</sup> reported that 22 patients with lumbar TB were treated with XLIF combined with percutaneous pedicle screw fixation in the first stage. The laboratory indexes of CRP and ESR were significantly reduced after surgery, and the visual analogue scale (VAS) and Oswestry Disability Index (ODI) scores for low back pain were also significantly ameliorated. The correction of the kyphotic deformity was correct and the interbody fusion was optimal at the final follow-up, and no patients had serious complications or TB recurrence. Thus, after a series of previous clinical studies, many spine surgeons concluded that XLIF can completely retain the anterior and posterior longitudinal ligament, and the spinal sequence can be restored well by the tension of the anterior and posterior longitudinal ligaments during the operation. Moreover, by removing the intervertebral lesions to restore the height of the intervertebral disc, the ligamentum flavum and annulus fibrosis can be stretched and the intervertebral foramen can be restored to achieve the aim of indirect decompression.<sup>11</sup> This provides a solid basis for the treatment of TCB with XLIF combined with percutaneous pedicle screw fixation.

## Conclusion

XLIF combined with percutaneous pedicle screw fixation can be used for the treatment of thoracic TB to perform the debridement of TB lesions with discectomy and interbody fusion under direct visualization. This treatment effectively improved the prognosis for our patient, and is appealing because of the developing trend of minimally invasive surgical treatments.

## Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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## References

1. Zhang H, Huang S, Guo H, et al. A clinical study of internal fixation, debridement and interbody thoracic fusion to treat thoracic tuberculosis via posterior approach only. *Int Orthop* 2012; 36: 293–298.
2. Wang LJ, Zhang HQ, Tang MX, et al. Comparison of three surgical approaches for thoracic spinal tuberculosis in adult: minimum 5-year follow up. *Spine (Phila Pa 1976)* 2017; 42: 808–817.
3. Pereira EA, Farwana M and Lam KS. Extreme lateral interbody fusion relieves symptoms of spinal stenosis and low-grade spondylolisthesis by indirect decompression in complex patients. *J Clin Neurosci* 2017; 35: 56–61.
4. Wu P, Wang XY, Li XG, et al. One-stage posterior procedure in treating active thoracic spinal tuberculosis: a retrospective study. *Eur J Trauma Emerg Surg* 2015; 41: 189–197.
5. Li M, Du J, Meng H, et al. One-stage surgical management for thoracic tuberculosis by anterior debridement, decompression and autogenous rib grafts, and instrumentation. *Spine J* 2011; 11: 726–733.
6. He M, Xu H, Zhao J, et al. Anterior debridement, decompression, bone grafting, and instrumentation for lower cervical spine tuberculosis. *Spine J* 2014; 14: 619–627.
7. Ozgur BM, Aryan HE, Pimenta L, et al. Extreme Lateral Interbody Fusion (XLIF): a novel surgical technique for anterior lumbar interbody fusion. *Spine J* 2006; 6: 435–443.

8. Formica M, Zanirato A, Cavagnaro L, et al. Extreme lateral interbody fusion in spinal revision surgery: clinical results and complications. *Eur Spine J* 2017; 26: 464–470.
9. Ha KY, Kim YH, Seo JY, et al. Percutaneous posterior instrumentation followed by direct lateral interbody fusion for lumbar infectious spondylitis. *J Spinal Disord Tech* 2013; 26: E95–E100.
10. Wang QY, Huang MG, Ou DQ, et al. One-stage extreme lateral interbody fusion and percutaneous pedicle screw fixation in lumbar spine tuberculosis. *J Musculoskelet Neuronal Interact* 2017; 17: 450–455.
11. Lang G, Perrech M, Navarro-Ramirez R, et al. Potential and limitations of neural decompression in extreme lateral interbody fusion-a systematic review. *World Neurosurg* 2017; 101: 99–113.