

# A novel indication for a method in the treatment of lumbar tuberculosis through minimally invasive extreme lateral interbody fusion (XLIF) in combination with percutaneous pedicle screws fixation in an elderly patient

## A case report

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### Abstract

**Rationale:** To describe a novel indication for a method through minimally invasive extreme lateral interbody fusion (XLIF) in combination with percutaneous pedicle screws fixation in the treatment of lumbar tuberculosis (TB) in an elderly patient, and its clinical efficacy and feasibility. Lumbar TB is a destructive form of TB. Antituberculous treatment should be started as early as possible. In some circumstances, however, surgical debridement with or without stabilization of the spine appears to be beneficial and may be recommended. Surgeries through the approach of anterior or posterior are still challenging and often involve some complications.

**Patient concerns:** The case is a 68-year-old female who was misdiagnosed as simple vertebral compression fracture and underwent L1 and L2 percutaneous vertebroplasty in another hospital 7 years ago. He complained of lumbosacral pain for 1 month this time. Magnetic resonance imaging (MRI) and computed tomography (CT) showed intervertebral space in L1/2 was seriously damaged like TB.

**Diagnoses:** Lumbar tuberculosis

**Interventions:** Antitubercular drugs, mini-invasive debridement with XLIF in combination with percutaneous pedicle screws fixation was performed. This patient was followed up for 12 months.

**Outcomes:** No obvious complication occurred during the operation and the wound healed well. Oswestry Disability Index (ODI: 56 vs 22) and visual analog scale (VAS: 4 vs 0) score significantly decreased at final follow-up of 12 months. Obvious recovery of kyphosis angle was found postoperatively (post: 14.8° vs pre: 33.5°). No recurrent infection occurred at the last follow-up.

**Lessons:** Mini-invasive surgery by debridement through XLIF and percutaneous pedicle screws fixation may be an effective and innovative treatment method for lumbar TB in the elderly.

**Abbreviations:** CRP = C-reactive protein, CT = computed tomography, ESR = erythrocyte sedimentation rate, HIV = human immunodeficiency virus, MRI = magnetic resonance imaging, ODI = Oswestry Disability Index, TB = tuberculosis, VAS = visual analog scale, WHO = World Health Organization, XLIF = extreme lateral interbody fusion.

**Keywords:** elderly patient, extreme lateral approach, lumbar tuberculosis, minimally invasive

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## 1. Introduction

Lumbar infection disease, including tuberculosis (TB) or Pott disease, suppurative spondylitis and other infectious disease, has increased rapidly in both developing and developed countries.<sup>[1]</sup> All about these diseases are commonly occurred in immunocompromised people, especially in the elderly patients. In current, the options of treatment in lumbar infection disease are drug therapy or surgical treatment. Many researches have confirmed the effectiveness of surgical treatment for lumbar infection diseases through the methods of anterior or posterior internal fixation with debridement and interbody fusion.<sup>[2,3]</sup> However, these surgical methods tend to cause a series of problems, such as excessive blood loss, longtime exposure, and so on. It is obviously not suitable for elderly patients with these methods.

Here we described the case of a 68-year-old female with lumbar TB who underwent conservative drug therapy about 2 weeks,

and a novel surgical treatment of minimally invasive debridement and fusion through extreme lateral interbody fusion (XLIF) in combination with percutaneous pedicle screws fixation was retrospectively described and evaluated.

## 2. Case report

This study was approved by the ethical committee of The Third Affiliated Hospital of Sun Yat-sen University, Guangzhou.

### 2.1. Present history and physical examination

A 68-year-old female visited our clinic complaining of lumbosacral pain for 1 month, accompanying with fever more than 10 days. No obvious symptom of night sweating and tidal fever in the afternoon was found. The patient reported the weight loss of 10 pounds in a month. Physical examination showed slight kyphosis and bending deformity on the left side. No obvious tenderness and percussion in low back was seen. Sensation and muscle strength were normal in both lower limbs.

### 2.2. Past history

L1 and L2 was misdiagnosed as simple vertebral compression fracture in another hospital 7 years ago. And percutaneous vertebroplasty was performed at that time.

### 2.3. Radiographic findings

X-ray showed mutual fusion of L1 and L2 and obvious bone cement leakage around vertebral body (Fig. 1A and B). Computed tomography (CT) further confirmed the fused

vertebral in L1 and L2, accompanied by slight kyphosis (Fig. 1C). Magnetic resonance imaging (MRI) in lumbar showed intervertebral space in L1/2 was seriously damaged (Fig. 1D and E). Simultaneously, massive psoas abscess was seen on the left side in coronal view (Fig. 1F).

### 2.4. Laboratory examination

After regular antituberculosis therapy for 2 weeks, C-reactive protein (CRP) decreased to 7.30 mg/L and erythrocyte sedimentation rate (ESR) declined to 26.00 mm/h simultaneously.

### 2.5. Clinical diagnosis

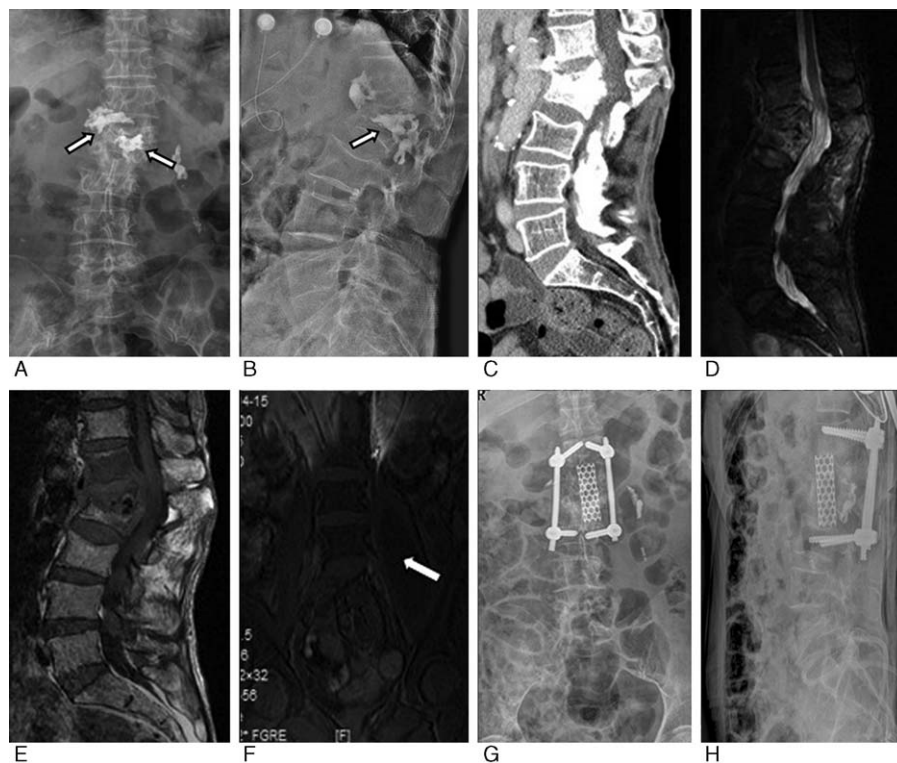
According to the clinical symptoms (weight loss, low grade fever, fatigue, and so on), radiographic assessment (MRI and CT), laboratory finding (ESR and CRP) and pathology result, the diagnosis of this patient was lumbar TB.

### 2.6. Surgical indication

Instability with damage and kyphosis in 2 vertebral bodies.

### 2.7. Hospital course

The patient firstly was treated with 4 first-line antitubercular drugs (streptomycin 75 mg/day im, rifampicin 450 mg/day po, isoniazid 300 mg/day po, and pyrazinamide 750 mg/day po) for 2 weeks and underwent an evacuation of the psoas abscess through the lateral approach of abdominal rectus muscle. The pathology report showed obvious chronic suppurative inflammation in psoas abscess. Next, posterior mini-invasive debridement and



**Figure 1.** Preoperative imaging. X-ray (A and B) showed mutual fusion of L1 and L2 and obvious bone cement leakage around vertebral body (white arrow); preoperative CT (C) and MRI (D–F) showed damage and kyphosis in vertebral L1–L2, and massive psoas abscess (white arrow); postoperative X-ray showed the internal fixation (G and H).

fusion with autologous bone graft in titanium mesh through XLIF in combination with percutaneous pedicle screw fixation were performed. We cleaned up most of lesion and bone cement during operation. Pathologic report after operation showed fibrous cartilage, broken trabecular bone, and many mature granulocytes. The patient was confined to bed rest for 8 weeks and got up out of bed using lumbar orthosis as external fixed support. This patient was followed up for 12 months. Postoperative X-ray film showed internal fixation and fusion between T12 and L2 (Fig. 1G and H). Patient continued oral HREZ (isoniazid 300 mg/day, rifampicin 450 mg/day, ethambutol 750 mg/day, and pyrazinamide 750 mg/day) chemotherapy after operation. Pyrazinamide was discontinued at 6 months, and HRE chemotherapy was continued for 12 months until the indicators of ESR and CRP were normal.

### 2.8. Surgical technique in operative procedure

There are 4 critical steps in this surgical technique.

#### (1) Surgical position

After successful intratracheal intubation anesthesia, patient was positioned in lateral decubitus view with left side up. In order to relax psoas and increase the distance between thorax and iliac crest, we flexed the hip-joint in the left lower limb

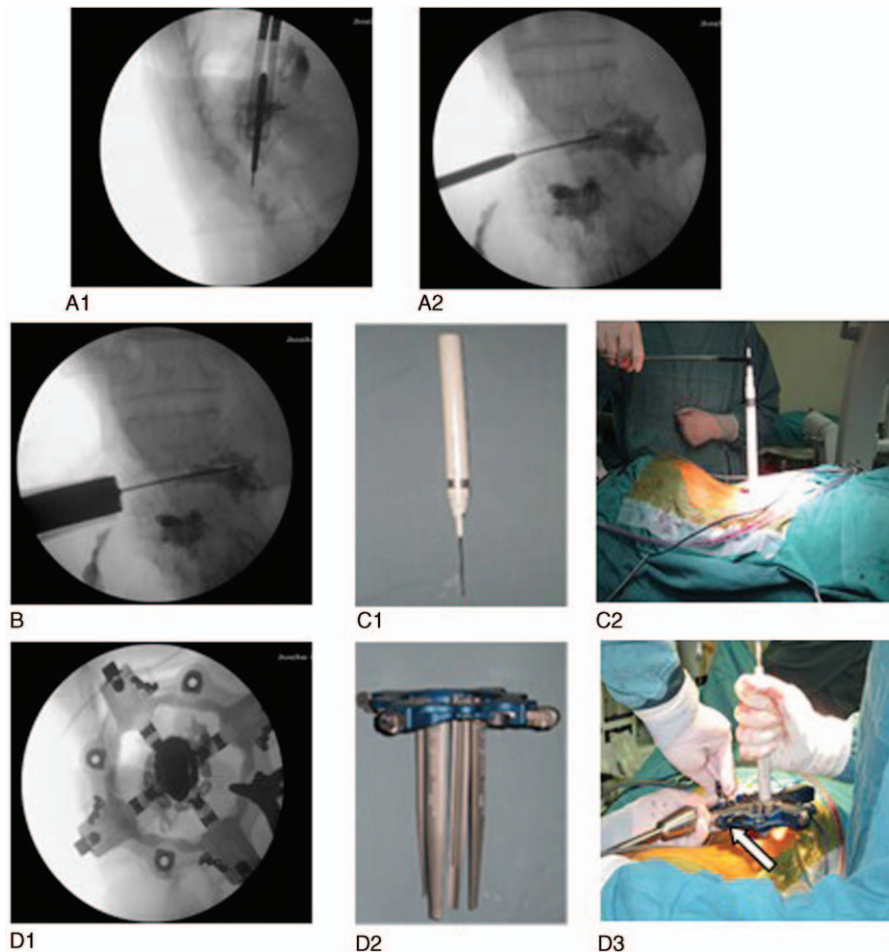
and adjusted the head and tailstock of operating bed respectively. Adhesive tapes were used to fix the trunk and lower limbs simultaneously. Before routine disinfection we used cross K-wires to locate the anteroposterior and lateral view of major segment or intervertebral space under the fluoroscopy.

#### (2) Establishment of surgical channel through the lateral approach

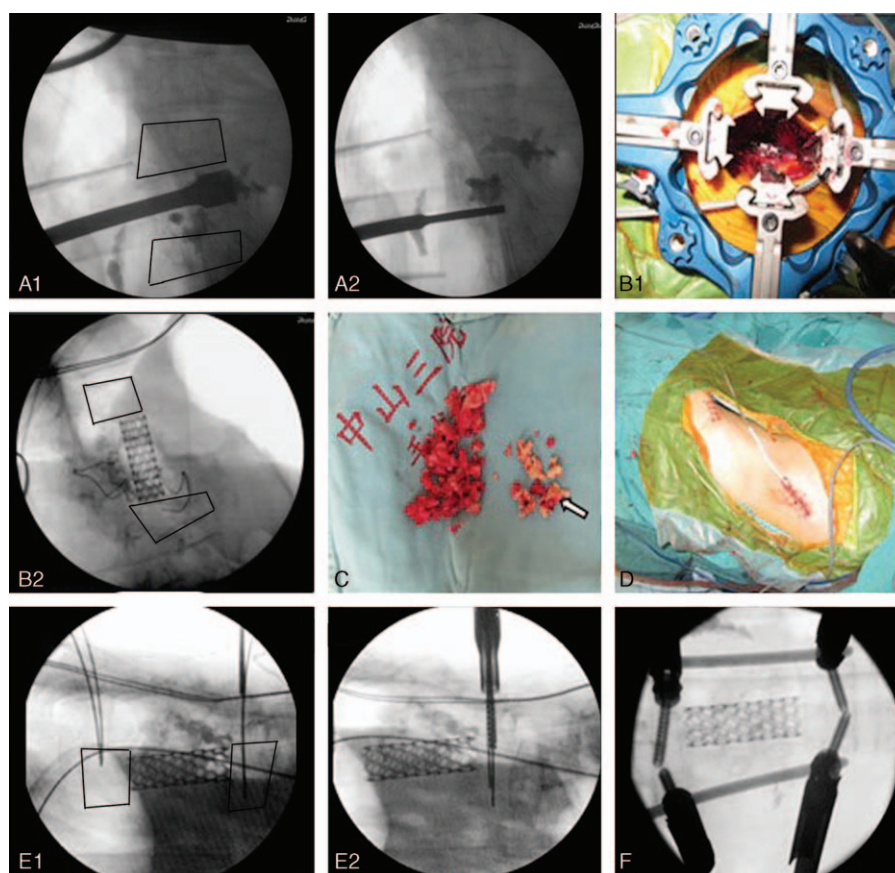
When the lateral approach and dilator was established, intraoperative wake-up test was used in order to avoid the nerve root injury. Firstly the skin incision (about 2–3 cm in length) was paralleled to the vertical K-wires as mentioned before and aimed to the middle of upper and lower end plate. Then we used primary dilator to separate the psoas (Fig. 2A1 and A2) and guiding pin was placed to the lateral of intervertebral disc through primary dilator under X-ray fluoroscopy (Fig. 2B). Then we continued to use expansion tube of different diameters (Fig. 2C1 and C2), the final dilator (surgical channel) was hooked up to the free arm and fixed beside the operating bed (Fig. 2D1–D3). Meanwhile, a light source was installed to the dilator (white arrow in Fig. 2D3).

#### (3) Debridement and fusion in the intervertebral space

We used the sharp blade to cut the annulus of the object intervertebral disc through this surgical channel under the direct vision. Necrotic tissues (including nucleus pulposus,



**Figure 2.** Establishment of surgical channel through the lateral approach. Using primary dilator to separate the psoas (A1 and A2); guiding pin was placed to the lateral of intervertebral disc through primary dilator under X-ray fluoroscopy (B); using expansion tube of different diameters (C1 and C2); the final dilator (surgical channel) was hooked up to the free arm and fixed beside the operating bed (D1–D3).



**Figure 3.** Clearance of necrotic tissues (A1, A2, and C) and intervertebral fusion (B1 and B2), routine drainage tube (D); mini-invasive percutaneous pedicle screws fixation (E1, E2, and F).

adjacent end plate and vertebra, abscess) were removed by different type of curettes and rongeurs followed by washing with a large number of physiological saline (Fig. 3A1 and A2). After clearance of lesion (Fig. 3C), intervertebral fusion (titanium mesh and autologous iliac crest) was positioned between the 2 vertebral bodies according to the size of molding (Fig. 3B1 and B2). Finally, routine drainage tube was placed after surgery (Fig. 3D).

#### (4) Minimally invasive percutaneous pedicle screws fixation

The patient was changed to the prone position. The entry point of percutaneous pedicle screws was confirmed under the AP X-ray. After accurate position, four 6.5 mm × 45 mm titanium screws (VIPER IITM, Depuy Spine, Johnson & Johnson, Boston, MA, USA) were placed at objective vertebra followed the 4 K-wires (Fig. 3E1 and E2). Finally, pedicle rods were passed the relevant trajectory of pedicle screws under the VIPER II system (Fig. 3F).

### 3. Result

No obvious complication (vessel injury or spinal nerve injury) occurred during the operation and the wound healed well. Operative time, estimated blood loss, and hospital stay after surgery were 220 minutes, 500 mL, and 8 days, respectively. Pathologic report after operation showed fibrous cartilage, broken trabecular bone, and many mature granulocytes.

In clinical assessment, Frankle classification was Grade E before operation. Oswestry Disability Index (ODI) and VAS score were decreased at final follow-up, compared with

preoperative values (ODI scores: 56 vs 22; VAS scores: 4 vs 0). At final follow-up, this patient returned to normal life.

In the assessment of radiological changes, no fixation loosening or breakage was found, and complete spinal interbody fusion was obtained. Obvious recovery of kyphosis angle was found postoperatively (post: 14.8° vs pre: 33.5°), and there was no change at the 3 months follow-up. And a degree of correction loss (3°) occurred at last follow-up (17.8°). No recurrent infection occurred. The inflammatory factors of CRP (7.50 mg/L) and ESR (4.00 mm/h) were normal at last follow-up.

### 4. Discussion

TB is still one of the leading cause of death from an infectious disease worldwide, only second to the human immunodeficiency virus (HIV). The World Health Organization (WHO) estimated that 1.3 million people died from TB and there were an estimated 8.6 million new cases in 2012.<sup>[4]</sup> Skeletal TB, as the most common form of nonpulmonary TB, accounts for 10% to 35% of cases in nonpulmonary TB. Approximately 50% of all cases of skeletal TB are spinal TB, which remains a major health challenge in low-income countries.<sup>[4]</sup>

Surgical intervention is necessary for management of spinal TB if the cases lack of response to anti-TB drugs, and if there are developing neurological deficit, bony involvement, abscess formation, or severe progressive kyphosis. Surgical procedures to treat the lesions involve debridement and reconstruction of the normal sagittal spinal balance.<sup>[5]</sup> Anterior approach has traditionally been considered as the “gold standard” procedure

for debridement and decompression of spinal TB, but anterior and posterior approach for fusion and instrumentation has been controversial.<sup>[6-8]</sup>

Fusion surgery, which was originally developed to correct spinal deformities caused by TB, has been in use to address other spinal conditions since the early 1900s. New advances in minimally invasive fusion surgery techniques allow ideal instrumentation without the trauma of traditional spinal surgery. The XLIF is an approach for spinal fusion in which the surgeon could access the lesions and fuse the spine using a lateral surgical approach rather than via anterior or posterior approach. XLIF procedure can be used to treat many spinal conditions, such as low-grade spondylolisthesis, degenerative scoliosis,<sup>[9,10]</sup> lumbar disc herniation, and so on.<sup>[11,12]</sup> To our knowledge, no previous studies evaluate the outcomes and complications of a lateral XLIF approach utilized to address spinal TB.

We believe this is the first reported case of lumbar TB that was treated with XLIF to eradicate the infection and correct spinal deformities. The advantage of XLIF approach is truly minimally invasive compared with other methods and can be performed without extensive disruption of tissues resulting in decreased blood loss, less postoperative complications, and a shorter recovery time. In this case, postoperative ODI and VAS scores decreased in comparison to preoperative levels, which suggested that overall quality of life was improved for this older patient. Recent study had demonstrated that the operative time, estimated blood loss, and length of hospital stays for patients treated by XLIF are significantly less than traditional open surgery.<sup>[13]</sup> Karikari<sup>[14]</sup> further confirmed that elderly people also had less major complications after undergoing XLIF surgery. In this case, no neurological injury or other obvious complications were found during the follow-up period.

Debridement with XLIF approach and percutaneous pedicle screws instrumentation are also effective in correcting and stabilizing kyphotic deformity caused by spinal TB. Although the Cobb angle still existed at last follow up, a kyphosis correction of 49.6% revealed that the stability and balance of the spine was reconstructed.

Another important issue is the rate of bone fusion after surgery. Many studies had demonstrated that spinal fusion using XLIF approach has achieved mechanical stability with a high rate of bone fusion.<sup>[15]</sup> Similarly, a high bone fusion rate and solid fusion was observed at the last follow-up.

Although with many advantages, only if the lesions involved only 1 segment without large abscess might this new technique be suitable, and implants could be placed properly between adjacent vertebrae through this approach.

In conclusion, debridement with XLIF approach and percutaneous pedicle screws instrumentation can be able to obtain satisfying results in correcting spinal deformity, eradicating infection, achieving spinal decompression and obtaining functional improvement in the treatment of lumbar TB if proper surgical indications are correctly followed.

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