



Minimally Invasive Surgical Approach for the Management of Lumbosacral Tuberculosis with Huge Presacral Abscess: A Case Report

Min Ouyang^{1#}, Shilang Xiong^{2#}, Peng Qiu², Linghua Din³, Zhisheng Long⁴, Jianhua Zeng⁵, Xiaodong Cai⁶ and Long Xiong^{1*}

¹Department of Orthopedics, Second Affiliated Hospital of Nanchang University, China

²Department of Orthopedics, The First Affiliated Hospital of Nanchang University, China

³Department of Orthopedics, Jinhua Peoples Hospital, China

⁴Department of Orthopedics, People's Hospital Affiliated to Nanchang University, China

⁵Department of Spine Surgery, Shanghai East Hospital, School of Medicine, Tongji University, China

⁶Department of Orthopedics, Xingang Central Hospital, China

#These authors contributed equally to this work

Abstract

The surgical management of lumbosacral tuberculosis with presacral abscess is challenging. Here, we described a case of lumbosacral tuberculosis with a huge abscess in the anterior sacral margin complicated with radicular nerve symptoms treated by minimally invasive procedures. Firstly, the lumbar intervertebral disc was removed by using a spinal endoscope *via* the posterolateral approach, the nerve decompression was performed, and a drainage tube was inserted. In the second stage procedure, the tuberculosis lesion was removed by using the spinal endoscope *via* the presacral approach, with the further placement of a drainage tube in the presacral abscess cavity. In the presence of both the front and rear drainage tubes, irrigation and drainage of the infected cavity could be performed regularly. With anti-tuberculosis treatment onboard, the patient recovered well eventually. Our minimally invasive strategy *via* the anterior presacral space approach combined with a lateral approach minimally invasive surgical approach for the management of complex lumbosacral tuberculosis with huge presacral abscess show cases an alternative but effective treatment for an otherwise challenging disorder to treat surgically.

Keywords: Lumbosacral tuberculosis; Surgical approach; Minimally invasive; Spinal tuberculosis

Introduction

Lumbosacral Tuberculosis (LT) (from L3 and below) accounts for approximately 2% to 3% of all spinal tuberculosis [1]. Patients with LT usually present with persistent low back pain accompanied by neurological deficits. On radiological imaging, common features of LT include presacral abscess and paravertebral abscess, bone destruction, vertebral collapse and loss, and kyphotic deformity [2]. Conservative anti-tuberculosis medical therapy is not effective in treating LT due to poor lumbosacral blood supply and hardened bones. Therefore, early surgical intervention has been advocated to remove the infection to prevent complications such as nerve compression, spinal deformity, and Instability [3]. Conventionally, the surgical approach for LT includes the anterior approach, posterior approach, and combined anterior and posterior approach, which enables open debridement of infective tissues, bone graft for spine fusion, and internal fixation. However, these surgical approaches are technically challenging, demand long operative time and require stripping of soft tissues that often result in great trauma. Also, open surgery is associated with a significant risk of heavy bleeding and damage to nerves, intestines, major blood vessels, sexual dysfunction, and slow recovery [4-7].

In recent years, the advancement of minimally invasive concepts and endoscopes has allowed minimally invasive surgery in the management of LT. In this regard, two main methods of minimally invasive surgery have been described: CT-guided approach and endoscopic approach for the removal of tuberculosis spinal infection and catheter insertion [8,9]. In these methods, drug

OPEN ACCESS

*Correspondence:

Long Xiong, Department of Orthopedics, Second Affiliated Hospital of Nanchang University, Jiangxi, Nanchang, 330006, China, E-mail: ncxionglong2@126.com

Received Date: 14 Mar 2022

Accepted Date: 26 Apr 2022

Published Date: 02 May 2022

Citation:

Ouyang M, Xiong S, Qiu P, Din L, Long Z, Zeng J, et al. Minimally Invasive Surgical Approach for the Management of Lumbosacral Tuberculosis with Huge Presacral Abscess: A Case Report. *World J Surg Surgical Res.* 2022; 5: 1382.

Copyright © 2022 Long Xiong. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.



Figure 1: X-ray (A, B) the radiograph of the pelvis and lumbosacral revealed L4-S1 vertebral body bone destruction and haziness at the psoas. The CT (C-E) images showed L4-S3 vertebral body destruction with the paravertebral, psoas, and presacral abscess. The MRI (F, G) demonstrated significant compression to the lumbar spinal cord, L4-S3 vertebral body and intervertebral space destruction, and a huge pre-sacral abscess.

delivery, wound lavage and drainage will be carried out through the catheter placement. The advantages of minimally invasive surgery are apparent, including fewer traumas and bleeding, faster recovery after surgery, and reduced risk of damage to surrounding anatomical structures. Moreover, a high concentration of the drug can be delivered directly into the infective area through the catheter, which can be more effective against tubercle bacillus.

Conventionally, the minimally invasive approach has been performed *via* the foramen behind the lumbar to gain access to the abscess cavity. However, a presacral abscess is often developed in patients with lumbosacral tuberculosis, which cannot be accessed *via* the transforaminal approach. Therefore, to apply minimally invasive techniques in the treatment of LT, we have adopted the presacral minimally invasive approach that is performed for L5-S1 fusion and internal fixation. This presacral approach has been shown to be safe and effective in patients with degenerative spines [7,10]. Here, we described a case of LT management by performing a presacral approach operation using a spine endoscope. In addition, we combined the posterior approach with the anterior sacral space approach, which not only effectively reduced the nerve pressure but also allowed drainage of the abscess. For spinal nodes and patients, especially for special spinal segments. The delivery of local high concentrations of anti-tuberculosis drugs ensured effective treatment of any residue infection. The placement of 2 drainage tubes facilitated continuous irrigation of the infective area, which was conducive to healing and recovery.

Case Presentation

A 51-year-old male farmer presented to our hospital with 2-month symptoms of low back pain that radiated to the lower extremities, accompanied by leg weakness, numbness and paraesthesia. The pain was severe and rated as 8 by the Visual Analog Scale (VAS). On further inquiry, he reported a history of lung tuberculosis a year previously and was treated with isoniazid, rifampicin, pyrazinamide, ethambutol. However, he admitted to not complying with the treatment.

On physical examination, there was lumbar spinal tenderness

and limited lumbar movement. The straight leg raising test was positive bilaterally. The blood investigation revealed raised infection ((white cell count = 12.60×10^9 L, normal range = $4\sim 10 \times 10^9$ L) and inflammatory markers (C-Reactive Protein [CRP] = 64 mg/L, normal range = 0.8~8 mg/L; Erythrocyte Sedimentation Rate [ESR] = 74.8 mm/h, normal range = < 15 mm/h (male) or < 20 mm/h (female)). The T-spot test was positive. The radiograph of the pelvis and lumbosacral revealed L4-S1 vertebral body bone destruction and psoas haziness (Figure 1A, 1B). To delineate this further, a CT scan was performed, which showed L4-S3 vertebral body destruction with paravertebral, psoas, presacral abscess (Figures 1C-1E). The MRI of the pelvis and lumbar spine demonstrated significant compression to the lumbar spinal cord, L4-S3 vertebral body and intervertebral space destruction, and a huge presacral abscess (Figure 1F, 1G). Given the above findings and previous history, spinal tuberculosis was suspected. Therefore, further investigations were carried out, which revealed negative sputum smear and culture for *Mycobacterium TB*, no obvious abnormality in the lungs on chest X-ray, and negative Purified Protein-Derived (PPD) skin test. However, the result of the Quanti FERON-TB Gold test was positive. Furthermore, purulent fluid was aspirated using a lumbar puncture needle *via* the foraminal approach, and the microscopy examination of the fluid demonstrated Acid-fast bacilli. Finally, the diagnosis of LT was confirmed.

Surgical treatment

This patient was subjected to two operations, of which PELD (Percutaneous Endoscopic Lumbar Discectomy) *via* the foraminal approach was performed first, followed by abscess removal *via* the presacral approach. Before the first surgery, the patient received 4 weeks of anti-tuberculosis drug treatment, which consisted of isoniazid, rifampicin, pyrazinamide, and ethambutol. On the day before surgery, the repeat inflammatory markers showed CRP and ESR of 16 and 25, respectively. To perform PELD under local anesthesia, the patient was placed in a prone position. The needle entry point and trajectory were determined under the C-arm view. An 18-G needle was inserted through the Kambin's triangle to the L5-S1 intervertebral space. Then, the needle was replaced with a working sheath. The abscess surrounding the nerve roots together with most

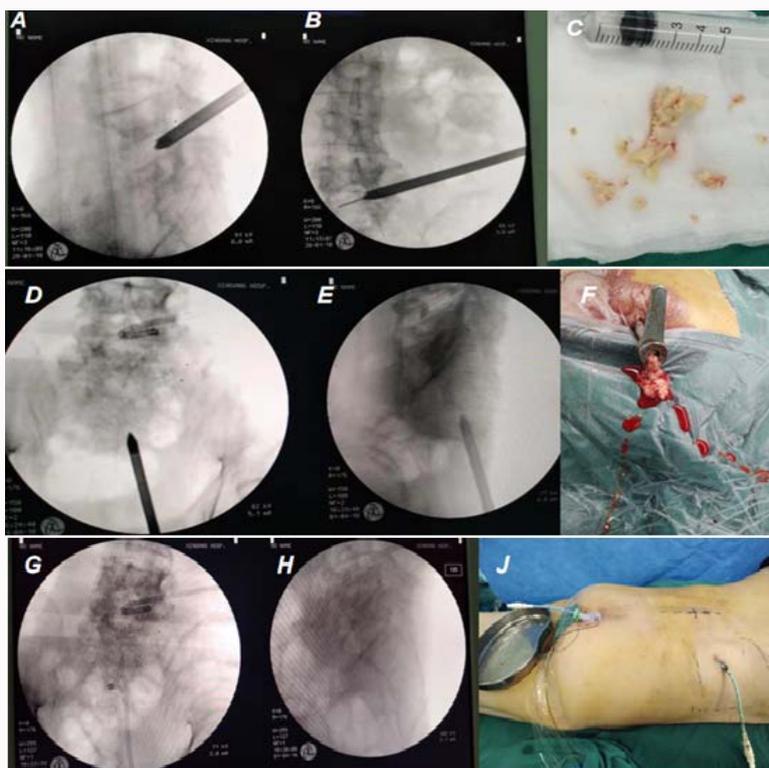


Figure 2: Percutaneous Transforaminal Endoscopic Lateral Discectomy (PELD), neuro-spinal canal exploration and decompression. The antero-posterior (A) and lateral (B) radiological images indicated the position of the endoscope, and lateral discectomy (C) was performed. Through the presacral approach, the anterior (D) and lateral (E) radiological images indicated the position of the inserted spinal endoscopic catheter. When the blunt head separator reached the presacral abscess, the necrotic material ejected from the working channel (F). The plain X-ray showed the position of the drainage tube (G, H), which exited at the patient's coccygeal area (J).

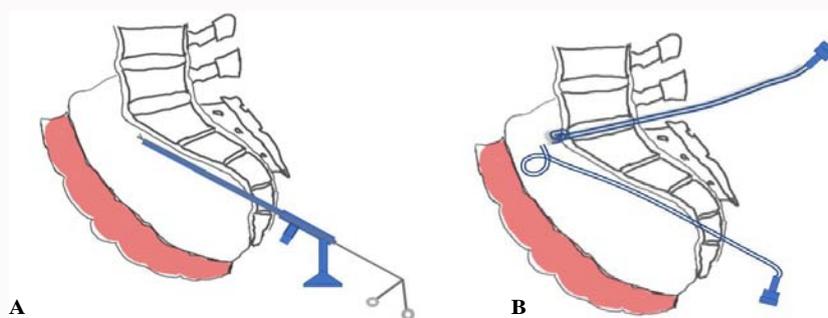


Figure 3: Spine endoscope was advanced to the presacral space via the presacral approach (A). Two drainage tubes were placed into the abscess cavity via the two approaches to allow continuous flushing and draining (B).

of the disc were removed using forceps *via* the endoscope (Figures 2A-2C, 2J). After a thorough lavage, the nerve roots were visualized directly and there was no evidence of compression or injury. Finally, A14 gauge double J tube was inserted to allow for continuous drainage (Figure 3B). Following this procedure, the patient's back pain resolved immediately, while his previous symptoms of leg weakness, numbness, and paraesthesia had improved gradually. The anti-tuberculosis medical treatment was continued until the second operation.

At 14 days later, the CRP and ESR were 13 mm/h and 26 mg/L, respectively. The second operation was performed. After a dose of enema for rectal cleansing, the patient was placed in a prone position and the anus was covered with an occlusive dressing in order to separate it from the para-coccygeal working area, which was more

dorsal. After infiltration with local anesthesia, a 7 mm incision was made on the skin at approximately 20 mm caudal to the right para-coccygeal notch. Blunt dissection with a finger was performed through the skin incision to ensure that the fascia was adequately opened. Then, the 1st grade casing of the spine endoscope was inserted into the incision and slowly and gently advanced along the anterior midline of the sacrum (Figure 1), followed by step-by-step insertion of the other grade casings. Direct tactile feedback was obtained from the stylet, which indicated continuous bone contact with the tip of the introducer. Rhythmic small-amplitude oscillating movements were performed to sweep the presacral fat and anterior contents away from the osseous floor of the pelvis. Upon the entrance of the guide pin introducer to the deep part of the presacral space, (Figures 2D-2F, 3A). The introducer was replaced with a 13 cm working sheath, following



Figure 4: The contrast medium was injected through the drainage tube, which showed that the drainage tube was placed in the abscess cavity of the anterior sacral space. The anteroposterior (A) and lateral (B) X-rays indicated the positions of the drainage tube and contrast agents.



Figure 5: The MRI at one year following surgery showed that the number and size of the presacral abscesses had decreased significantly (A-C). At 3 years follow-up, the patient demonstrated good neuromuscular function (D, E).

which copious amount of abscesses drained out spontaneously from the cannula before it stopped several minutes later despite the patient was asked to increase the abdominal pressure by coughing. Warm normal saline was used to irrigate the abscess cavity thoroughly until the withdrawn fluid became clear. Continuous irrigation using approximately 3 L of fluid was set up and an equal amount of liquid flowing in and out was ensured. There was a blur under the direct view of the spine endoscopy. Then, a 14F drainage tube was inserted. A contrast agent was injected *via* the lumbar drainage tube, which revealed posterior vertebral space and the presacral space, and a drainage path was formed (Figures 2F-2H, 4).

Following the second operation, the patient continued to receive anti-tuberculosis medical treatment. Meanwhile, a daily dose of high concentration of isoniazid 100 mg in 2 ml was injected into the

posterior vertebral space and the presacral space.

Follow-up and outcomes

Upon follow-up at day-60, the low back pain was largely resolved with the VAS of 1. The symptoms of leg weakness, numbness and paraesthesia continued to improve gradually. The incision had healed well with no discharge. The patient had returned to his normal physical activity without any complaint. The anti-tuberculosis drugs were continued for a total of 12 months. The repeat MRI examination at 1 year after surgery showed that the abscess had markedly diminished when compared with the preoperative MRI (Figure 5).

Discussion

For spinal tuberculosis, conservative treatment is often prolonged and the outcome is suboptimal. Therefore, early surgical interventions

should be considered. Due to its anatomical location and not readily accessible surgically, LT is unique and the management is different from other spinal tuberculosis. Conventional orthopedic surgeries for spinal tuberculosis including debridement, bone grafting and internal fixation are often traumatic and associated with numerous complications. The emergence of minimally invasive surgery has allowed more options for the treatment of LT, including a CT-guided or endoscopic approach in removing infection and placement of drainage tubes. Minimally invasive surgery for spinal tuberculosis has the advantages of being less traumatic and less bleeding while permitting adequate exposure and clearing the infective tissue.

In 2004, in view of the particularity of the presacral space anatomy, Cragg et al. [11] proposed for the first time the presacral space approach for lumbosacral Axial Interbody Fusion (ALIF), which avoided the excessive trauma of conventional surgery and truly reflected the concept of minimally invasive surgery. Patients with lumbosacral tuberculosis commonly have nerve compression, which poses a great challenge in surgery to effectively target the area of concern and release the nerve from compressive pressure. Our case represented the first in the literature to describe a novel operative method of the endoscopic lateral approach followed by the presacral space approach for the treatment of presacral abscess with nerve compression. The lateral approach of the lumbar vertebra was performed via the posterior safe triangle (Kambin's triangle) for nerve exploration, spinal canal decompression, and debridement of the focus of infection in the intervertebral disc and intervertebral space. However, this lateral approach did not permit access to the sacroiliac abscess, especially those inferior to L5-S1, which necessitated the presacral approach subsequently. In our case, 2 drainage tubes, anteriorly and posteriorly placed into the abscess cavity allowed irrigation, continuous drainage of infection and delivery of a locally higher concentrated anti-tuberculosis drug.

Both operations were performed under local anesthesia with the patient being conscious and able to communicate throughout. The working passageway used in our case was 6 mm, which is smaller than the working channel of 12 mm used in ALIF operation. Therefore, the approach we adopted is safe, minimally invasive, and can reach the desired anatomy directly. *Via* the presacral approach, also described by Tobing et al. [12] using an arthroscopy sheath to complete the removal of the presacral abscess, we used a spine endoscope instead. This is a novel minimally invasive technique *via* the presacral approach that allows effective drainage of the presacral abscess.

Conclusion

In conclusion, our case has demonstrated successful management of LT by combining the anterior presacral space approach with a

lateral approach using a minimally invasive concept, which showcases an alternative but effective treatment for an otherwise challenging disorder to treat surgically.

References

1. Taylor GM, Murphy E, Hopkin R, Rutland P, Chistov Y. First report of Mycobacterium bovis DNA in human remains from the Iron Age. *Microbiology*. 2007;153(4):1243-9.
2. Jiang T, Zhao J, He M, Wang K, Fowdur M, Wu Y. Outcomes and treatment of lumbosacral spinal tuberculosis: A Retrospective study of 53 patients. *J PLoS One*. 2015;10(6):e0130185.
3. Jin DD, Qu DB, Chen JT, Zhang H. One-stage anterior interbody autografting and instrumentation in primary surgical management of thoracolumbar spinal tuberculosis. *Eur Spine J*. 2004;13(2):114-21.
4. He QY, Xu JZ. Comparison between the antero-posterior and anterior approaches for treating L5-S1 vertebral tuberculosis. *Int Orthop*. 2012;36(2):345-51.
5. Sun L, Song Y, Liu L, Gong Q, Zhou C. One stage posterior surgical treatment for lumbosacral tuberculosis with major vertebral body loss and kyphosis. *Orthopedics*. 2013;36(8):e1082-90.
6. Moon KY, Lee SE, Kim KJ, Hyun SJ, Kim HJ, Jahng TA. Back muscle changes after pedicle based dynamic stabilization. *J Korean Neurosurg Soc*. 2013;53(3):174-9.
7. Hou X, Sun X, Zhang Z, Xie G, Zhang X. Computed tomography-guided percutaneous focal catheter infusion in the treatment of spinal tuberculosis. *J Acta Orthop Belg*. 2014;80(4):501-7.
8. Xifeng Z. Can minimally invasive surgery be the main treatment for active spinal tuberculosis? *J Chinese Spine Spinal Cord*. 2006;16(12):891-2.
9. Shibuya S, Komatsubara S, Yamamoto T, Arima N, Kanda Y, Oka S. Percutaneous discectomy-continuous irrigation and drainage for tuberculous lumbar spondylitis: A report of two cases. *Case Rep Med*. 2009;2009:632981.
10. Jain AK. Tuberculosis of the spine: A fresh look at an old disease. *J Bone Joint Surg Br*. 2010;92(7):905-13.
11. Cragg A, Carl A, Casteneda F, Dickman C, Guterman L, Oliveira C. New percutaneous access method for minimally invasive anterior lumbosacral surgery. *J Spinal Disord Tech*. 2004;17(1):21-8.
12. Tobing SDAL, Kurniawan D. Minimally invasive technique for the abscess drainage in lumbosacral tuberculosis using arthroscopy sheath: A case report. *Int J Surg Case Rep*. 2020;72:271-6.