

Case Report

PERCUTANEOUS ENDOSCOPIC DECOMPRESSION FOR THORACIC TUBERCULOSIS FOLLOWING POSTERIOR INSTRUMENTATION: A CASE REPORT

Cheng-Yue Zhu, MS, Qing-Feng Hu, MD, Gao-Yong Jia, MS, and Hao Pan, MD

Thoracic involvement in spinal tuberculosis has long been recognized as a common manifestation of this entity (1). Osteoligamentous destruction may lead to evolving kyphosis and neurological deficits, which need surgical intervention (2). However, the operative strategy remains controversial (3) and poses particular difficulties for the elderly (4). This case highlights the percutaneous surgical treatment of thoracic tuberculosis associated with severe back pain and paraplegia in an elderly high-risk for surgery patient.

CASE REPORT

An 80-year-old male patient, weighing 39 kg, was noted to have progressive back pain and muscle weakness in both lower limbs for the past 5 months. He was referred to our department because of intolerable back pain, acute uroschesis, and a bedsore (Grade II) on the left hip. Clinical examination revealed weakness of the hip flexors (muscular strength grade III) and numbness in the lower limbs, while hyperreflexia and hypermyotonia were not found. Laboratory examination showed hypoproteinemia (30.7 g/L), a high level of C reactive protein (CRP, 24.3 mg/L) and erythrocyte sedimentation rate (ESR, 70 mm/h), and a positive tuberculous infection of T cells spot test (T-SPOT experiment). Computed tomography (CT) (Fig. 1A) and magnetic resonance imaging (MRI) (Fig. 1B) scans of the

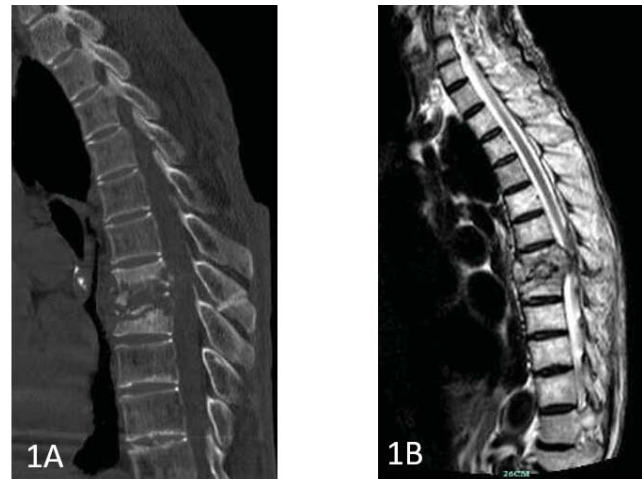


Fig. 1. (A) Sagittal CT scan showed vertebral bone and disc destruction at the level of T7-8. (B) The spinal cord was compressed on MRI.

thoracic spine gave evidence of bone and disc destruction and spinal cord compression at T7-8. Thoracic spine tuberculosis (TSTB) was confirmed combined with his pulmonary tuberculosis history; however, the patient was not a major surgical candidate, given potentially significant morbidity.

Posterior transpedicular screw fixation (PSF) has been proven effective to abate pain caused by an unstable spine and local inflammation (5-6). Therefore, the patient was sent to the operating room and placed in a prone

From : Department of Orthopaedics, the Affiliated Guang-Xing Hospital of Zhejiang Traditional Chinese Medicine University, Hangzhou, China

Author for correspondence: Qing-Feng Hu, MD

Address: Department of Orthopaedics, the Affiliated Guang-Xing

Hospital of Zhejiang Traditional Chinese Medicine University Tiychang Road NO. 453 Hangzhou 310007, China

E-mail: huqingfeng2018@126.com

position under general anesthesia. Under the guidance of G-arm fluoroscopy, percutaneous pedicle screws were placed 2 levels above and below the diseased segments bilaterally and connected by 2 rods on both sides; at this time a moderate distraction between T7 and T8 was also done (Fig. 2A). Afterwards, biopsy forceps were used to take some lesions through the T8 left pedicle for an Xpert test (7), and a drainage tube was placed (Fig. 2B). The procedure was done in about 80 minutes. His back pain was immediately relieved after the surgery, while the spinal cord injury remained Frankel Grade C. The Xpert test revealed a positive *Mycobacterium tuberculosis* infection and its high sensitivity to the rifampicin.

The spinal cord impingement was the worst at the level of the T7 pedicle. Two weeks later, a percutaneous endoscopic focus clearance on the right side was performed under local anesthesia via a costotransverse and pedicle-complex approach. Then we had to increase the abduction angle of the puncture channel due to obstruction of the rod, and the skin entry point was 4 to 5 cm from the midline (Fig. 3A). A 1.8-mm-diameter needle and a 4.3-mm-diameter cannula, which worked as a dilator (Medicom, South Korea) for percutaneous kyphoplasty, were placed stepwise under intermittent G-arm guidance (Fig. 3B). Then a 7.6-mm-diameter trephine (SPINENDOS GmbH, Germany) was inserted along the needle toward the foci and maneuvered through the pedicle (Fig. 3C). The 7.5-mm-diameter working cannula (SPINENDOS GmbH, Germany) was then placed over the guidance bar into the spinal canal (Fig. 3D). Intraoperative fluoroscopy showed the direction of the working cannula to be from the superolateral margin of the transverse process to the inferomedial margin of the pedicle (Fig. 4). Forceps went through the middle line of T7 (Fig.

5A) and compressive factors such as sequestered bone and granulation tissues were removed until dural sac pulsation was observed. Four days later, the catheter was pulled out accidentally, and surprisingly his urinal function had returned to normal.

Half a month later, a third procedure on the left side of T7 was carried out in a manner identical to the second one. The space on the right side of the posterior part of the vertebral body after the second surgery was interlocking (Fig. 5B) with its counterpart on the left side, where the clearing of the nidus by forceps went across the middle line (Fig. 5C). MRI after the final operation confirmed the complete decompression of the cord (Fig. 5D). Standard antitubercular chemotherapy and a dirigation program in bed were conducted in the pre- and postoperative periods. The ESR decreased to 20 mm/h and the CRP to 0.5 mg/L, muscle strength improved gradually from grade III to grade IV, hemoglobin remained around 110 g/L post operation as in preoperation, the bedsore was healed, and he could walk by himself with the support of a brace and walking aid about 10 days after the third operation (Fig. 5E).

DISCUSSION

This report represents the case of an elderly poor general health patient in poor general health, suffering from deteriorative TSTB and treated with

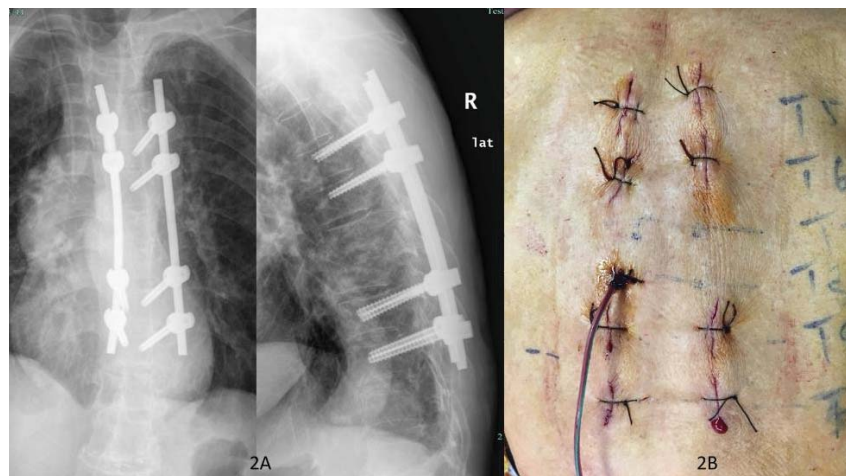


Fig. 2. First operation was percutaneous pedicle screw fixation to reestablish the spinal stability. (A) Posteroanterior and lateral thoracic radiograph demonstrated the satisfactory screws and rods emplacement respectively. (B) A drainage tube was placed after biopsy on the left side of T8.

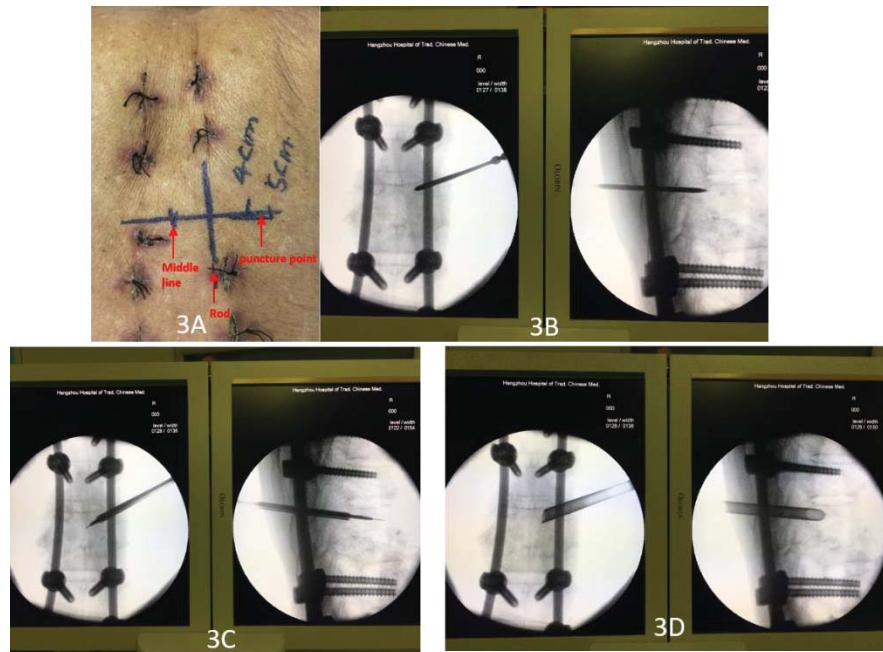


Fig. 3. (A) Considering the obstruction of the rod, the skin entry point is 4–5 cm from the midline. (B) A 1.8-mm-diameter needle and a 4.3-mm-diameter cannula and (Medicom, South Korea) for percutaneous kyphoplasty were placed stepwise under intermittent G-arm guidance. (C) A 7.6-mm diameter trephine (SPINENDOS GmbH, Germany) was inserted along the needle to broaden working passage. (D) The 7.5-mm-diameter working cannula (SPINENDOS GmbH, Germany) was able to be placed under the guidance of the bar into the spinal canal.

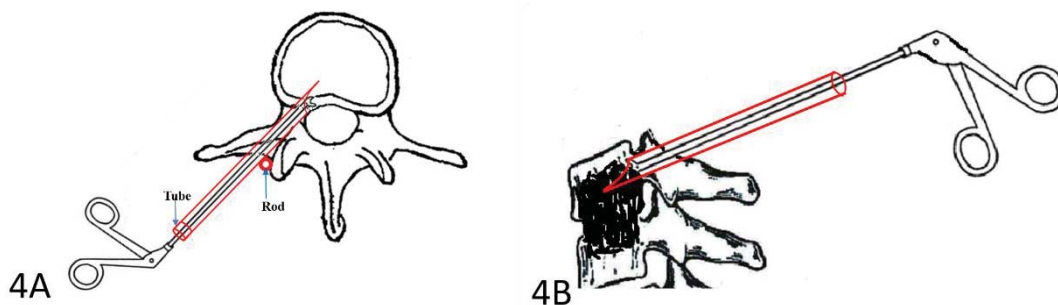


Fig. 4. The position of working tube was slightly downward inclination from the superolateral margin of transverse process to the inferomedial margin of the T7 pedicle, biopsy forceps was able to remove the compressions through the working tube.

staged minimally invasive surgeries (MIS). By means of percutaneous posterior instrumentation and spinal endoscopic surgeries, successful healing of TSTB with reestablishment of spinal stability and decompression of the spinal cord were achieved without complications.

Geriatric TSTB patients are common in developing countries, and most of them decide on a consultation only when they suffer severe symptoms, such as nervous lesions and unbearable physical pain, because of financial problems and inconvenient transportation (8). Other factors such as hypertension and diabetes make them vulnerable to a major surgery (9).

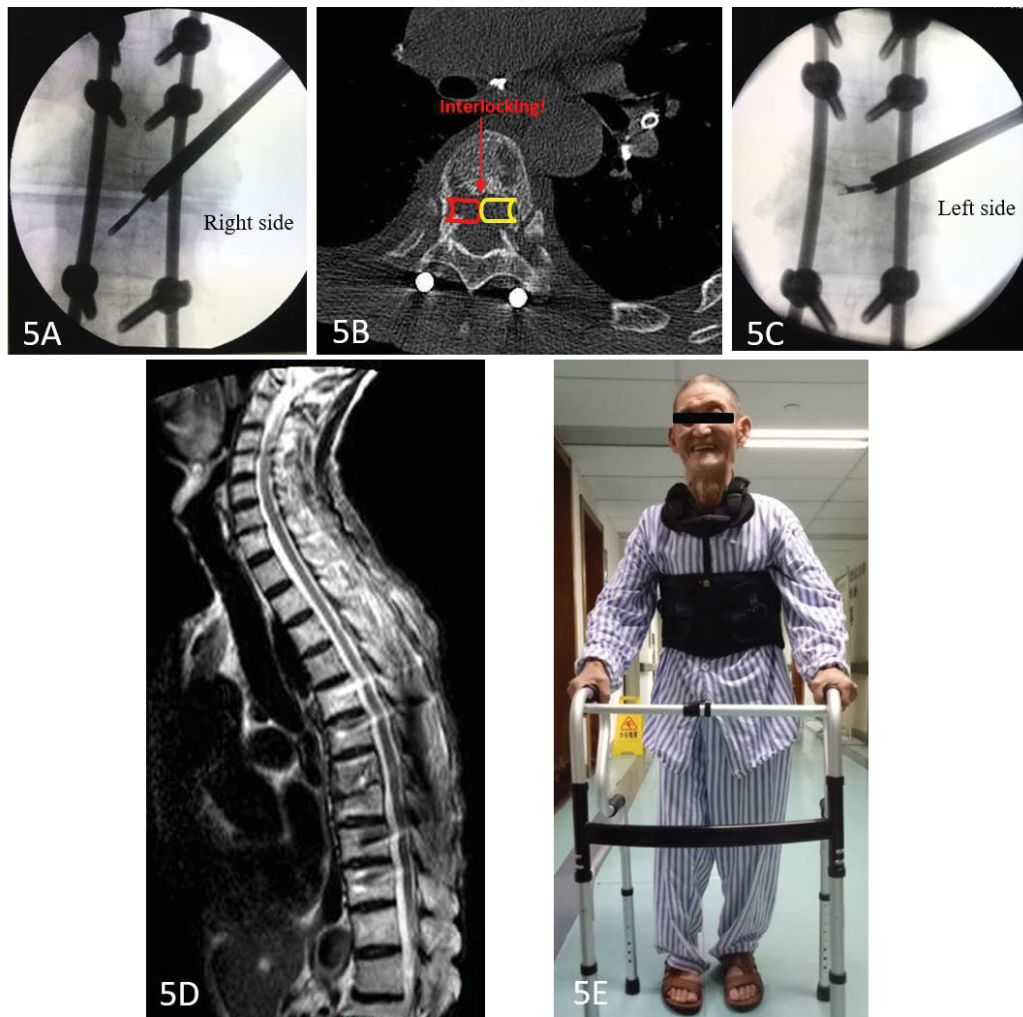


Fig. 5. Intra-operative fluoroscopy showed forceps crossed over the midline of vertebrae on both sides (5A, 5C), postoperative imaging examination also demonstrated the interlocking phenomenon (5B) and total decompression (5D), the patient could walk on his own with the support of brace and walking aid ten days after the final surgery (5E, with permission).

With rapid progress in medical science and a deeper understanding of TBTS, anterior debridement with anterior/posterior instrumentation has not been the preferable surgical choice in recent years (10). For the sake of lessening the surgical trauma and complications that accompany anterior surgery, video-assisted thoracoscopic surgery has been applied but has not shown advantages (11). The anterior approach is not suitable for patients in poor condition because of the longer surgical procedure, greater surgical trauma, and loss of correction on follow-up (12-13). One-stage transpedicular decompression/debridement with pos-

terior spinal fusion showed similar clinical outcomes in patients with moderate neurological involvement, but without the anterior approach-related drawbacks (4,12,14-16). Zhang (17) demonstrated that a double-lumen tube placed under CT-guidance with the use of local antituberculosis chemotherapy was effective in the treatment of lumbar and lumbosacral spinal tuberculosis without instrumentation and debridement. He also advocated that patients with low back pain should take strict bed rest during a long lavage period; nevertheless, long-term bed rest may lead to weakening of the skeletal, neuromuscular, and cardio-

vascular systems, as well as urinary and pulmonary infections in elderly patients (18).

Taking into account the elderly patient's intractable pain, worsening neurological deficits, and poor health situation, we modified the surgical techniques. The staged percutaneous internal fixation and foci debridement decreased iatrogenic injuries and anesthetic risks, which meant less blood loss, lower risk of infection, a shorter hospital stay, and faster recovery from the spinal operation.

Assessment of the endoscopy trajectory on preoperative imaging is the most important factor in a successful operation. Additionally, the size of the working cannula is assessed in preoperative imaging. In this case, a 7.5-mm-diameter cannula was chosen to maximize the operative field while minimizing the risk of pedicle fracture and canal encroachment. In order to keep the patient in a prone position during endoscopic surgery under local anaesthesia, we chose PSFas the first procedure, which relieved the pain. Generally, the endoscopic decompression is conducted on the more severe side first; in this

case, operating on the right side presented lower aorta-injuring risks.

There are many advanced-stage Pott's spine patients in the developing countries, and increasingly, among immigrant populations in developed countries (19). We think that this method is simple, safe, and effective, and that it could potentially be the first choice for patients who can't tolerate traditional open surgery, physically or financially. Patients who are resistant to antitubercular chemotherapy are not recommended for this process due to their risk of infection spreading along the working passage. The theoretical complications include fractures of the transverse process and pedicle, pleura penetration, cerebrospinal fluid leakage, nerve damage, aorta and azygos injury, sinus tract formation, etc. Overall, percutaneous surgical techniques for thoracic tuberculosis were successfully utilized in this case to reestablish spinal stability and decompress the cord. This strategy is significantly superior to traditional open approaches, due to its minimal risks especially for patients who are in poor health condition.

REFERENCES

1. Turgut M. Spinal tuberculosis (Pott's disease): Its clinical presentation, surgical management, and outcome. A survey study on 694 patients. *Neurosurg Rev* 2001; 24:8-13.
2. Sell P. Expert's comment concerning Grand Rounds case entitled "Posterior listhesis of a lumbar vertebra in spinal tuberculosis" (by Matthew A. Kirkman and Krishnamurthy Sridhar). *Eur Spine J* 2011; 20: 6-8.
3. Fisahn C, Alonso F, Hasan GA, Tubbs RS, Dettori JR, Schildhauer TA, Rustagi T. Trends in spinal surgery for Pott's disease (2000-2016): An overview and bibliometric study. *Global Spine J* 2017; 7:821-828.
4. Zhang HQ, Li JS, Zhao SS, Shao YX, Liu SH, Gao Q, Lin MZ, Liu JY, Wu JH, Chen J. Surgical management for thoracic spinal tuberculosis in the elderly: Posterior only versus combined posterior and anterior approaches. *Arch Orthop Trauma Surg* 2012;1717-1723.
5. Nussbaum ES, Rockswold GL, Bergman TA, Erickson DL, Seljeskog EL. Spinal TB: A diagnostic and management challenge. *J Neurosurg* 1995; 83:243-247.
6. Fukuta S, Miyamoto K, Masuda T, Hosoe H, Kodama H, Nishimoto H, Sakaeda H, Shimizu K. Two-stage (posterior and anterior) surgical treatment using posterior spinal instrumentation for pyogenic and tuberculous spondylitis. *Spine (Phila Pa 1976)* 2003; 28:302-308.
7. Denkinger CM, Schumacher SG, Boehme CC, Dendukuri N, Pai M, Steingart KR. Xpert MTB/RIF assay for the diagnosis of extrapulmonary tuberculosis: A systematic review and meta-analysis. *Eur Respir J* 2014; 44:435-446.
8. Arora S, Sabat D, Maini L, Sural S, Kumar V, Gautam VK, Gupta A, Dhal A. The results of nonoperative treatment of craniovertebral junction tuberculosis: A review of twenty-six cases. *J Bone Joint Surg Am* 2011; 93:540-547.
9. He B, Hu Z, Hao J, Liu B. Posterior transpedicular debridement, decompression and instrumentation for thoracic tuberculosis in patients over the age of 60. *Arch Orthop Trauma Surg* 2012; 132:1407-1414.
10. Basu S, Kondety SKC. Transpedicular decompression/debridement and posterior spinal fusion with instrumentation for single-level thoracic spinal tuberculosis with myelopathy – Is anterior column reconstruction necessary? *Spine Deformity* 2018; 6:282-289.
11. Zhong W, Xiong G, Wang B, Lu C, Dai Z, Lv G. Surgical management for thoracic spinal tuberculosis posterior only versus anterior video-assisted thoracoscopic surgery. *PLoS One* 2015; 10:e0119759.
12. Liu P, Sun M, Li S, Wang Z, Ding G. A retrospective controlled study of three different operative approaches for the treatment of thoracic and lumbar spinal tuberculosis: Three years of follow-up. *Clin Neurol Neurosurg* 2015; 128:25-34.
13. Rajasekaran S, Soundarapandian S. Progression of kyphosis in tuberculous spine treated by anterior arthrodesis. *J Bone Joint Surg Am* 1989; 71:1314-1323.
14. Qian J, Rijiepu A, Zhu B, Tian D, Chen L, Jing J. Outcomes of radical debridement versus no debridement for the treatment of thoracic and lumbar spinal tuberculosis. *Int Orthop* 2016; 40:2081-2088.
15. D'souza AR, Mohapatra B, Bansal ML, Das K. Role of posterior stabilization and transpedicular decompression in the treatment of thoracic and thoracolumbar TB: A retrospective evaluation. *Clin Spine Surg* 2017; 30:E1426-E1433.
16. Jain A, Jain RK, Kiyawat V. Evaluation of outcome of transpedicular decompression and instrumented fusion in thoracic and thoracolumbar tuberculosis. *Asian Spine J* 2017; 11:31-36.
17. Zhang XF, Wang Y, Xiao SH, Liu ZS, Zhang YG, Liu BW, Xia ZM. Treatment of lumbar and lumbosacral spinal tuberculosis with minimally invasive surgery. *Orthop Surg* 2010; 2:64-70.
18. Convertino VA, Bloomfield SA, Greenleaf JE. An overview of the issues: Physiological effects of bed rest and restricted physical activity. *Med Sci Sports Exerc* 1997; 29:187-190.
19. Dunn RN, Ben Husien M. Spinal tuberculosis: Review of current management. *Bone Joint J* 2018; 100:425-431.