



Total *en bloc* spondylectomy in the treatment of postoperative chronic osteomyelitis: a case report

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Background: Infection of the spine after surgical procedures is one of the most dreaded complications of spinal fusion surgery. Treatment goals are to eradicate the necrotic and infected tissue and to obtain a correct spinal profile. Traditionally many authors have recommended the posterolateral or double approach, anterior and posterior. Total *en bloc* spondylectomy is a surgical procedure traditionally used to treat primary and metastatic tumors. The use of this surgical procedure in treatment of chronic vertebral osteomyelitis is not clearly defined in literature.

Case Description: This case involved a 66-year-old female patient with a history of T9-S1 instrumentation after several surgeries, who developed chronic osteomyelitis of T8-T9 with extensive destruction of the vertebral body and severe thoracic kyphosis. After targeted antibiotic therapy, total *en bloc* spondylectomy of T8-T9 was performed according to the Tomita technique. Necrotic and infected tissues were removed proceeding as if it were chronic osteomyelitis of long bones and performing *en bloc* resection with clear margins, that is, applying the criteria of oncological surgery to this chronic infection. After resection, the sagittal plane is reconstructed in the affected segment, restoring the normal distance between the two healthy vertebrae and the mechanical stability of the spine.

Conclusions: Total *en bloc* spondylectomy in the treatment of extensive infectious lesions with a mechanical component allows performing *en bloc* resection of infected and necrotic tissue along with biological and mechanical reconstruction. In our case, the complete resection of the infected bone and soft tissues achieved good outcome without complications. We propose total *en bloc* spondylectomy as a reasonable treatment option in complicated spondylodiscitis progressing to extensive chronic osteomyelitis and compromising spinal stability due to a significant loss of bone material.

Keywords: Spondylodiscitis; chronic vertebral osteomyelitis; total *en bloc* spondylectomy; Tomita technique; case report

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Introduction

Infection of the spine can appear after surgical procedures or *de novo* and this is an increasing problem (1) compromising the life of the patient, the stability of the spine, as well as the neurological function. Postoperative infection is one of the most dreaded complications of spinal fusion surgery. The incidence ranges from 1% to 4% in the lumbar area (2) and the number of cases to be treated is increasing, due to the higher number of surgeries performed. It poses a significant burden in terms of patient morbidity, so it is advisable to know the treatment options available (3).

According to the literature, early infection occurs in the first 30 postoperative days and usually presents with local signs (erythema, increased temperature, wound exudate, etc.). Late infection can occur up to years after surgery and typically presents with chronic pain, implant failure or no fusion, and bone loss. Both differ in clinical presentation and treatment strategy (3).

In early infections, the treatment of choice includes early surgical lavage and debridement, along with intense antibiotic therapy. Instrumentation and grafting should be maintained as segment stability promotes healing (2).

Late infections are usually caused by biofilm-producing pathogens, so the usual treatment of choice is debridement and removal of osteosynthesis material (2), also considering the extent of the lesion, the quality of fixation, patient comorbidities, and the pathogen involved (3). The anterior column is most commonly involved since the posterior elements are only affected in 5% of cases (4). In some patients, bone destruction caused by infection destroys the anterior support of the spine. Subsequently, an important kyphotic deformity can be developed causing pain and seriously compromising the neurological function. The reconstruction of this problem must reach two goals: to eradicate the necrotic and infected tissue and to obtain a correct spinal profile which is stable and with a good biological field that permits to obtain a solid fusion mass.

For this reason, many authors have recommended the posterolateral or double approach, anterior and posterior, to remove the infected and necrotic tissue, replacing it with implants and biological interfaces (5-9) but destruction by chronic infection affects the whole vertebral body and it is impossible to make a complete resection unless by an intralaminar approach.

We present the case of a female patient who underwent T9-S1 instrumentation and developed chronic osteomyelitis secondary to spinal spondylodiscitis of T8-T9 with residual

segmental kyphosis due to extensive anterior destruction. Treatment was performed by total *en bloc* spondylectomy of the affected segments following the Tomita technique (10). We present the following case in accordance with the CARE reporting checklist (available at <https://jss.amegroups.com/article/view/10.21037/jss-22-14/rc>).

Case presentation

Statement of informed consent

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

Case

The patient is a 66-year-old woman, with no medical history of interest, who underwent multiple spinal procedures at another center, detailed below. In 2006, a primary L3-L4 fusion was performed due to spinal stenosis, extended in several surgical procedures to the T11-S1 segment by repeated failures at adjacent levels. The pain was poorly managed, so a medullary neurostimulation device was implanted. Finally, the T9-T11 segment was fixed after verifying instability.

Six months after the last surgery the patient had daily fever and pain. The blood count showed leukocytosis with 81% polymorphonuclear cells and elevated C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR). Plain radiographs showed angular thoracic kyphosis in T8-T9 secondary to disc destruction and mirror-image bone loss pattern of adjacent vertebrae (*Figure 1A,1B*).

Magnetic resonance imaging (MRI) and computerized axial tomography (CT) showed bone destruction and paravertebral involvement, diagnosed as osteomyelitis.

Blood cultures were positive for methicillin-resistant *staphylococcus hominis* and *staphylococcus epidermidis*. No intralaminar samples were taken for culture. The preantibiotic sample blood test shown 7,300 leukocytes with an 81% of polymorphonuclear, CRP 21,25 (reference value <5) and an ESR of 32. Antibiotic treatment was performed for 3 months according to blood culture results.

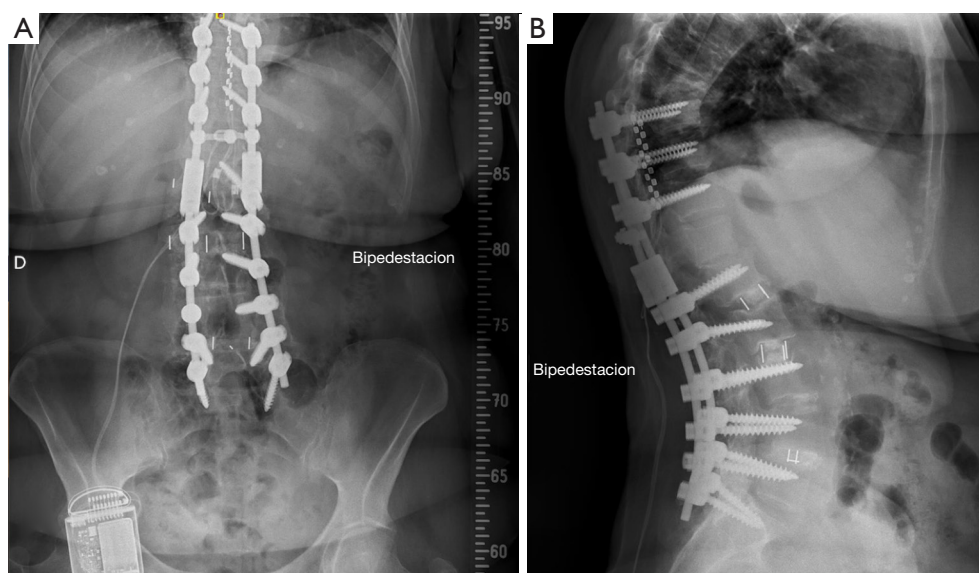


Figure 1 Pre-operative plain films showing the previous instrumentation and the upper kyphosis due to bone destruction. (A) An anteroposterior radiograph; (B) a lateral radiograph, and the upper kyphosis due to bone destruction.

Blood analytical results returned to normal (CRP 6 and ESR 19), but the patient mentioned disabling chest pain not irradiated to the lower limbs and was referred to our center for evaluation. The preoperative visual analog scale (VAS) was 7/10.

Physical examination

Severe thoracic kyphosis was evident on inspection. The appearance of the surgical wound was good, with no signs of infection. Neurological examination was normal.

Complementary tests

New imaging tests, MRI and CT scans, were performed and compared with previous studies. There was evidence of progression of spondylodiscitis at the T8-T9 level with extensive bone destruction in the anteroinferior portion of the T8 body, along with T9 screw displacement with osteolysis and collapse of the T8-T9 disc, without bone fusion (*Figure 2*). There was no epidural involvement.

Diagnosis

Chronic osteomyelitis secondary to spinal spondylodiscitis at the T8-T9 level and residual segmental kyphosis in a patient with T9-S1 instrumentation.

Surgical technique

Total *en bloc* spondylectomy of the affected segments T8-T9 was performed according to the Tomita technique (10).

In the prone position, through a posterior approach, caudal instrumentation was connected with in-line connectors for 5.5–6.35 up to two levels proximal to the vertebral resection.

Two-level *en bloc* spondylectomy was performed according to the Tomita technique (*Figure 3*) with bilateral preganglionic section of the T8-T9 roots. Complete discectomy of T7-8 and T9-10 was performed until obtaining a bleeding bed in the lower plate of T7 and upper plate of T10, last, implanting a titanium mesh with cancellous allograft. The final rods were placed and attached to previous instrumentation (*Figure 4*). During the procedure, the neurostimulator was not removed to avoid possible injury due to dural adhesions. The posterior cranial and caudal structures were scraped, and a cortico-cancellous bone allograft was placed over the posterior elements.

To finish the instrumentation in a favorable area in the sagittal plane, the spondylectomy area was reinforced with double-rod and finished with less rigid instrumentation in T4 using 5.5-mm titanium rods. The procedure was performed under neurophysiological control with no events, recording 600 cc of intraoperative bleeding that required the administration of two red blood cell concentrates in the postoperative period.

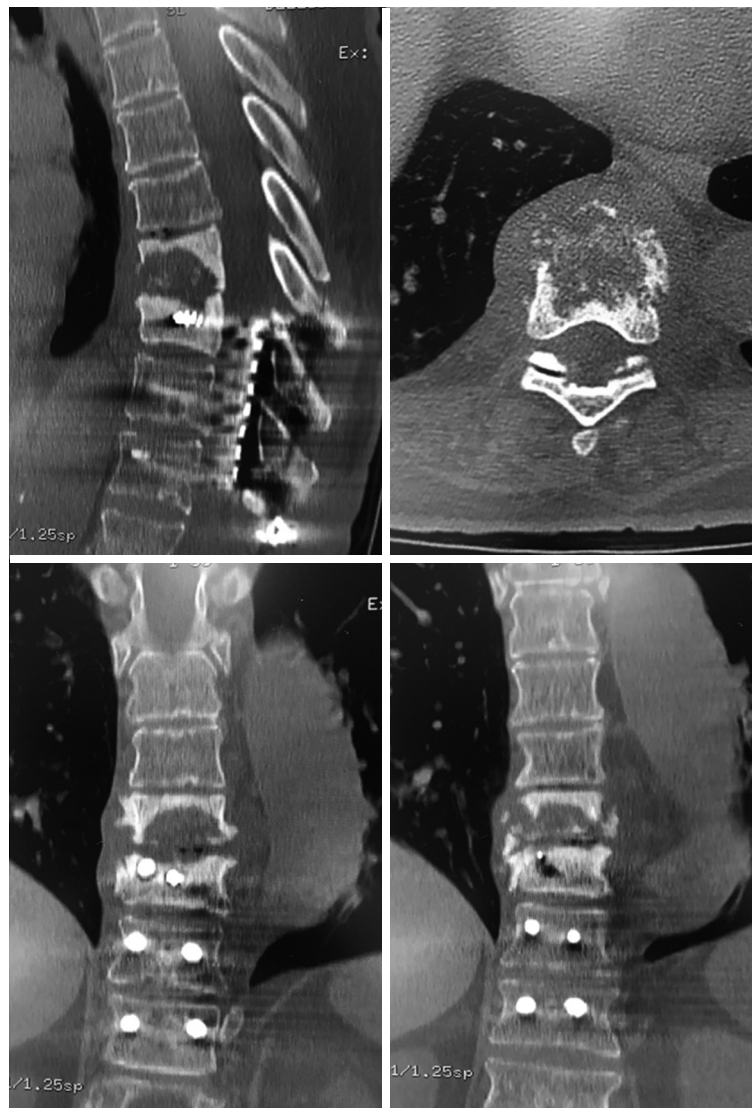


Figure 2 Computed tomography scan showing vertebral osteomyelitis and destruction of the T8 vertebral body.

Postoperative evolution

After a 25-month follow-up, patient evolution has been favorable. The VAS score shows a 3/10 value. There were no complications in the postoperative period and radiographic control was satisfactory (*Figure 5A, 5B*).

The microbiological study of the surgical specimen was negative for bacteria, fungi, and mycobacteria. Pathology revealed fibrosis, necrosis, and chronic inflammation compatible with chronic osteomyelitis, with no evidence of malignancy. With these results we opted for no antibiotic treatment.

No external orthosis was used in the postoperative

period.

Currently, neurological examination and analytical results are normal, and the patient reports favorable pain control with analgesics from the first level of the World Health Organization.

Discussion

Traditionally, spinal infection has been treated using one or two surgical approaches aimed at removing the infectious focus and necrotic material, along with mechanical reconstruction of the area (5-9). The disadvantages of

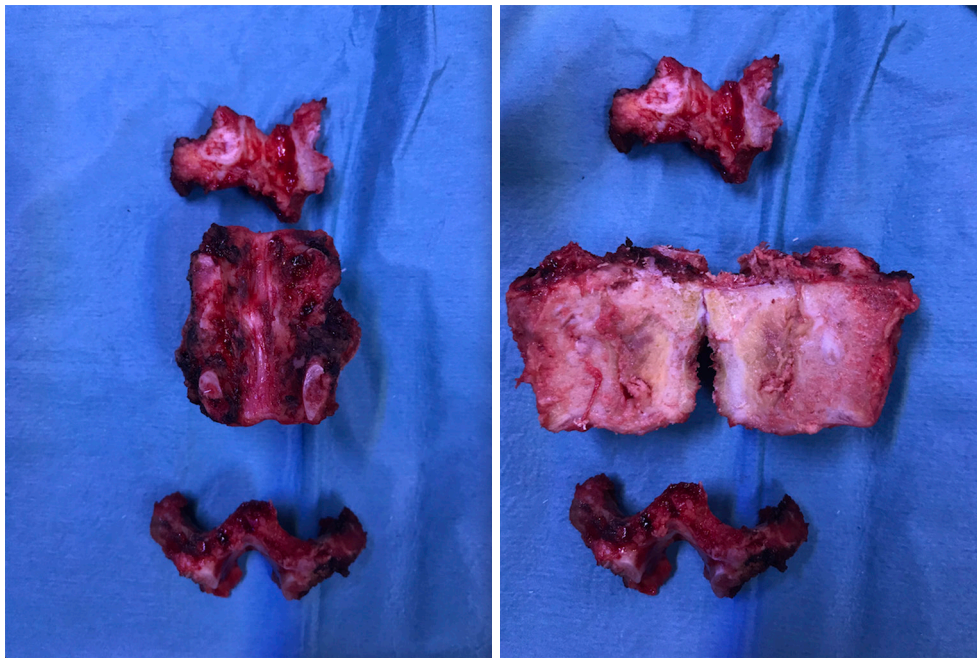


Figure 3 Total *en bloc* spondylectomy of the T8-T9 vertebral bodies. Surgical specimen.



Figure 4 Definitive instrumentation. Intraoperative image.

this procedure include using two surgical approaches and removing infected and necrotic tissue from the interior of the lesion, which is sometimes insufficient and causes surrounding contamination. Other authors (11) proposed to do it by a posterolateral approach with a radical debridement the ability to make an anterior and posterior reconstruction and a quicker recovery. The difference with the technique we propose is that the *en bloc* spondylectomy permits a radical resection of the whole affected area without violating the necrotic and infected tissue. This provides a safe and radical excision of the infected area (11-13). In patients with an acute infection, the ability to perform a surgery surrounding the infected tissue is lower and we have doubts using it in those kinds of patients.

In our patient, to avoid these adverse effects, necrotic and infected tissues were removed proceeding as if it were chronic osteomyelitis of long bones and performing *en bloc* resection with clear margins (14), that is, applying the criteria of oncological surgery to this chronic infection. This approach allows the complete and safe removal of



Figure 5 Post-operative plain films demonstrating the reconstructed sagittal plane. (A) An anteroposterior radiograph; (B) a lateral radiograph.

infected and necrotic tissue, until reaching biologically viable healthy tissue in the vertebrae immediately cranial and caudal to the two healthy discs without entering the affected area. This technique has been reported as high-risk technique and with a high rate of complications (15). We have a very low rate of complications in oncologic patients avoiding a double approach and allowing the removal of all the necrotic or infected tissue.

After resection, the sagittal plane is reconstructed in the affected segment, restoring the normal distance between the two healthy vertebrae and the mechanical stability of the spine.

Total *en bloc* spondylectomy is a technically complex surgery, traditionally used to treat primary and metastatic vertebral tumors and not without major risks such as

spinal injury or bleeding (10). In addition, multilevel vertebrectomy increases the risk of instability and is associated with a greater number of complications related to instrumentation, especially in the thoracic segment (16,17).

Despite the few studies on its use in cases of chronic vertebral osteomyelitis (17), it is an extensively described and well-known technique proven beneficial in our patient, allowing the treatment of infection and correction of angular thoracic kyphosis, reconstructing the sagittal plane, and providing the mechanical stability necessary to control infection and manage pain.

In our case, we consider infection has been controlled since all necrotic tissue has been removed and culture of the surgical specimen has been negative. We propose total *en bloc* spondylectomy as a reasonable treatment option

in complicated spondylodiscitis progressing to extensive chronic osteomyelitis and compromising spinal stability due to a significant loss of bone material. To apply this oncologic designed technique to the infected spine permits experienced surgeons to reach the whole infected specimen while minimizing the possibility of contaminating the surrounding tissues doing suboptimal resections.

According to the available literature, adequate debridement of necrotic bone is of paramount importance for eradication of infection in chronic vertebral osteomyelitis. However, the role of total *en bloc* spondylectomy as treatment is yet to be defined. In our case, we achieved mechanical stability and the infection was eradicated. This may help to improve treatment outcome in patients in the future.

However, further studies may be required to develop a treatment algorithm for chronic vertebral osteomyelitis with use of this surgical technique.

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Footnote

Reporting Checklist: The authors have completed the CARE reporting checklist. Available at <https://jss.amegroups.com/article/view/10.21037/jss-22-14/rc>

Peer Review File: Available at <https://jss.amegroups.com/article/view/10.21037/jss-22-14/prf>

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://jss.amegroups.com/article/view/10.21037/jss-22-14/coif>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

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