



Case series

Closed system paravertebral abscess evacuation on spinal infection: A case series

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ABSTRACT

Introduction: Paravertebral abscess is a common complication of spondylitis tuberculosis which has high prevalence in Indonesia. Surgical intervention such as open surgery or endoscopic debridement is needed to remove and drainage the abscess in addition to chemotherapy. However, this surgeries have several complications such as soft tissue damage and abscess contamination to the healthy tissue. We reported closed system strategy to evacuate the paravertebral abscess on spinal infection.

Methods: The technique is performed by orthopaedic team under guidance of the C-Arm and ultrasound sonography (USG) in March–June 2022. The needle which connected to 20 cc syringe is inserted into the lesion to aspirate the abscess. After evacuation of the abscess, 2-g broad spectrum antibiotic is injected through the needle to eradicate the bacteria locally.

Results: We performed the closed system paravertebral abscess evacuation in three patients, a 30-year-old male, 43-year-old male, and 22-year-old female. All the patients had back pain and limitation spine movement due to pain and were diagnosed with spondylitis and paravertebral abscess based on the plain radiography and magnetic resonance imaging (MRI). It reported that up to 2000 cc abscess can be evacuated with this micro invasive technique.

Conclusion: The closed system is a micro-invasive procedure result in minimal soft tissue injury and faster recovery. It successfully remove paravertebral abscess followed by direct antibiotic eradication on spinal infection.

1. Introduction

Tuberculosis causes 1.8 million deaths and 10.4 million new cases every year. The World Health Organization (WHO) reports that multidrug-resistant tuberculosis, which has recently arisen, as well as tuberculosis co-infected with HIV, are currently the main causes of death worldwide. According to reports, Indonesia now has the second highest tuberculosis prevalence rate in the world and around 10 % of extrapulmonary tuberculosis is musculoskeletal tuberculosis [1]. Spondylitis tuberculosis or tuberculosis of the spine accounts for half of all musculoskeletal tuberculosis cases. It was first identified in the European population by Percival Pott in 1779 [2]. Spondylitis tuberculosis is characterized by bone destruction, fracture, abscess, kyphosis deformity, and has predilection in thoracic and lumbar region, but not limited to other spinal levels [3].

Paravertebral abscess is a common complication of spondylitis tuberculosis. The formation of abscess is due to the spread of infection from the vertebral bodies to the disc spaces and paravertebral soft tissues [4]. Anti-tuberculosis chemotherapy is used effectively as the main therapy for paravertebral tuberculosis abscess. If the condition is not treated, major side effects such as discitis, epidural abscess, fistulization of adjacent organs, and fatal outcome may develop. In some cases such as drug-resistant tuberculosis, serious neurological impairment, spinal instability, complex abscess formation, and discitis, surgical procedures are indicated [5]. The benefits of surgical treatment include proper sample for histological diagnosis confirmation, promotes healing by removing the disease focus, correction and prevent spinal deformity, and decreased recurrence rates [6].

The goal of treatment for paravertebral abscess is complete drainage of the abscess and regular anti-tuberculosis chemotherapy. Currently,

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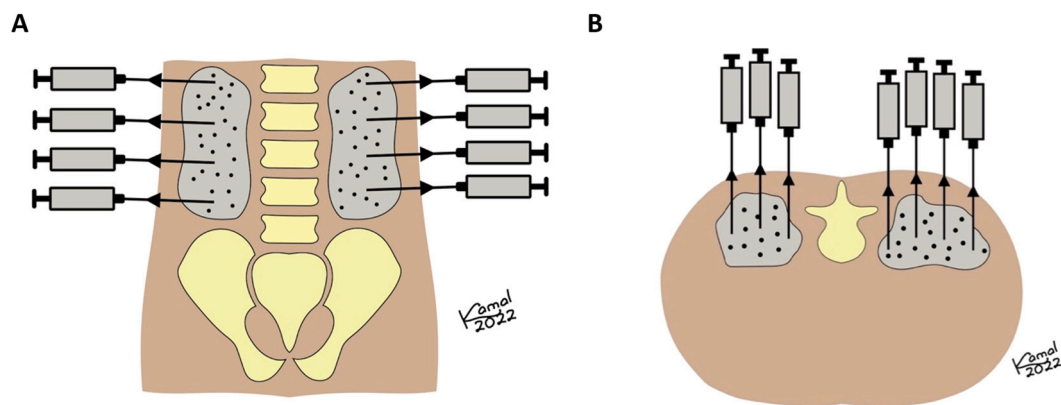


Fig. 1. Illustration of closed system paravertebral abscess evacuation. A. Anteroposterior view B. Axial view. The technique can be done through several needles' insertion based on the abscess location.

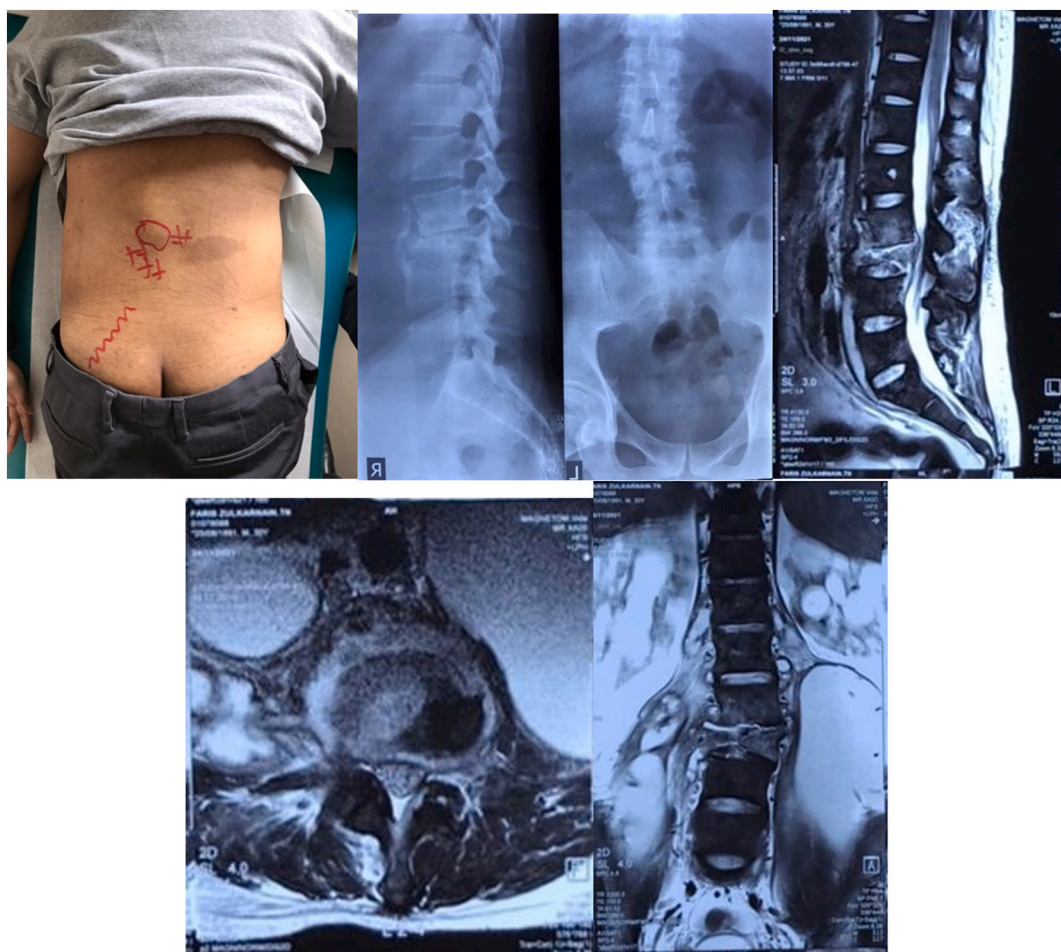


Fig. 2. The clinical picture, X-Ray, and MRI of 30-year-old man with spondylitis tuberculosis at L2-L3 with paravertebral abscess.

open surgery is used to evacuate large cold abscesses, relieve pressure on the spinal cord and neural tissues, prevent instability, and cure or prevent deformities. However, for patients with no serious neurological impairment or unstable kyphotic deformity, minimally invasive procedure approach should be conducted as the management strategy [7]. We have obtained micro invasive technique that involves closed-system evacuation to remove the paravertebral abscess. Several spine needles are used in this procedure, which may also include suction devices, and are attached to sterile closed storage [8]. We reported several cases of paravertebral abscess that were treated with closed system

paravertebral abscess evacuation.

2. Method

The design of this study is a prospective study reported according to the Preferred Reporting of Case Series in Surgery (PROCESS) 2020 criteria [9]. The cases were carried out on March–June 2022 at Cipto Mangunkusumo General Hospital, Jakarta, Indonesia. The diagnosis of paravertebral abscess was confirmed by magnetic resonance imaging (MRI) of lumbosacral. The technique of closed system was performed by



Fig. 3. The closed system abscess evacuation procedure: marking and leveling using C-arm; and closed system pus evacuation. Up to 100 ml of seropurulent abscesses were evacuated.

orthopaedic team with the patient being in prone position under general anesthesia. After skin disinfection, marks were made on the skin to indicate the targeted level and area of the abscess under the supervision of the C-Arm and ultrasound sonography (USG) guidance. After identification of the targeted location, several disposable spine needles size 18G were inserted into the paravertebral abscess under the monitoring of the needle position by C-Arm as needed. A 20 cc syringe was attached to each needle in order to aspirate the abscess (Fig. 1). After complete evacuation of the abscess, 2-g broad spectrum antibiotic was injected into the lesion through the spine needle to eradicate the bacteria locally.

3. Case presentation

3.1. Case 1

A 30-year-old male presented with lower back pain (VAS 6) since five months before arrival at the hospital. He also complained of pain and numbness in the bilateral thigh and cannot move normally. The pain developed progressively followed by muscle tenderness in the lower back. There was a history of cough, intermittent fever, and weight loss in last six months. The patient had no comorbidities, drug history, or allergies.

On the physical examination, there were no deformity on the back and no sign of inflammation on the skin (Fig. 2). On palpation, there was tenderness at the paravertebral levels of L2-L3. The distal sensory impression was normal. The range of movement (ROM) of the spine and hip was limited due to pain.

The laboratory investigations showed normal leukocytes, increased erythrocyte sedimentation rate (ESR), and increased C-reactive protein (CRP). The X-Ray examination of the anteroposterior and lateral thoracolumbar revealed destruction of the third lumbar spine. The magnetic resonance imaging (MRI) concluded that there was a destruction of the vertebral body with a massive psoas abscess along the bilateral psoas

muscle region (Fig. 1).

Based on clinical and supporting investigations, the patient was diagnosed with spondylitis tuberculosis at the second and third lumbar levels with paravertebral abscesses and mild neurological deficit. A seropurulent liquid of up to 100 ml was removed during closed system paravertebral abscess evacuation by the attending spine orthopaedic physician and team (Fig. 3).

Following the abscess evacuation procedure, the patient was able to mobilize, sit and walk without any difficulty, and his lower back pain and thigh numbness had improved. The patient was treated with WHO category 1 oral anti-tuberculosis chemotherapy drugs (Isoniazid, Rifampicin, Pyrazinamide, and Ethambutol) for nine months.

Seven days later, the patient came back to the hospital to do a scheduled evaluation. On the examination, He said that the complaint of pain on the lower back had appeared again and patient could not move normally. The team decided to perform the closed system paravertebral abscess for the second time. As much as 1854 ml seropurulent abscess that were on the right side and 372 ml on the left side (a total of 2226 ml seropurulent abscess) were obtained (Fig. 4). After the procedure, the patient showed significant improvement of the symptoms.

3.2. Case 2

A 43-year-old male with presenting symptoms of back pain 6 months prior to being admitted to the hospital. Two months prior, the patient also reported having upper abdominal pain. There was no numbness and tingling sensation, and he could walk without aid. There was a history of coughing, and 6 kg of body weight had been lost over the previous 4 months. For the past five years, the patient has smoked one pack a day. From the physical examination, there were no deformities, wounds, gibbous, or scars (Fig. 5). There was tenderness in the midline at levels L2-L3. Due to discomfort, the spine's range of motion is restricted.

A decrease in vertebral body height of the T12-L1 and a narrowing of

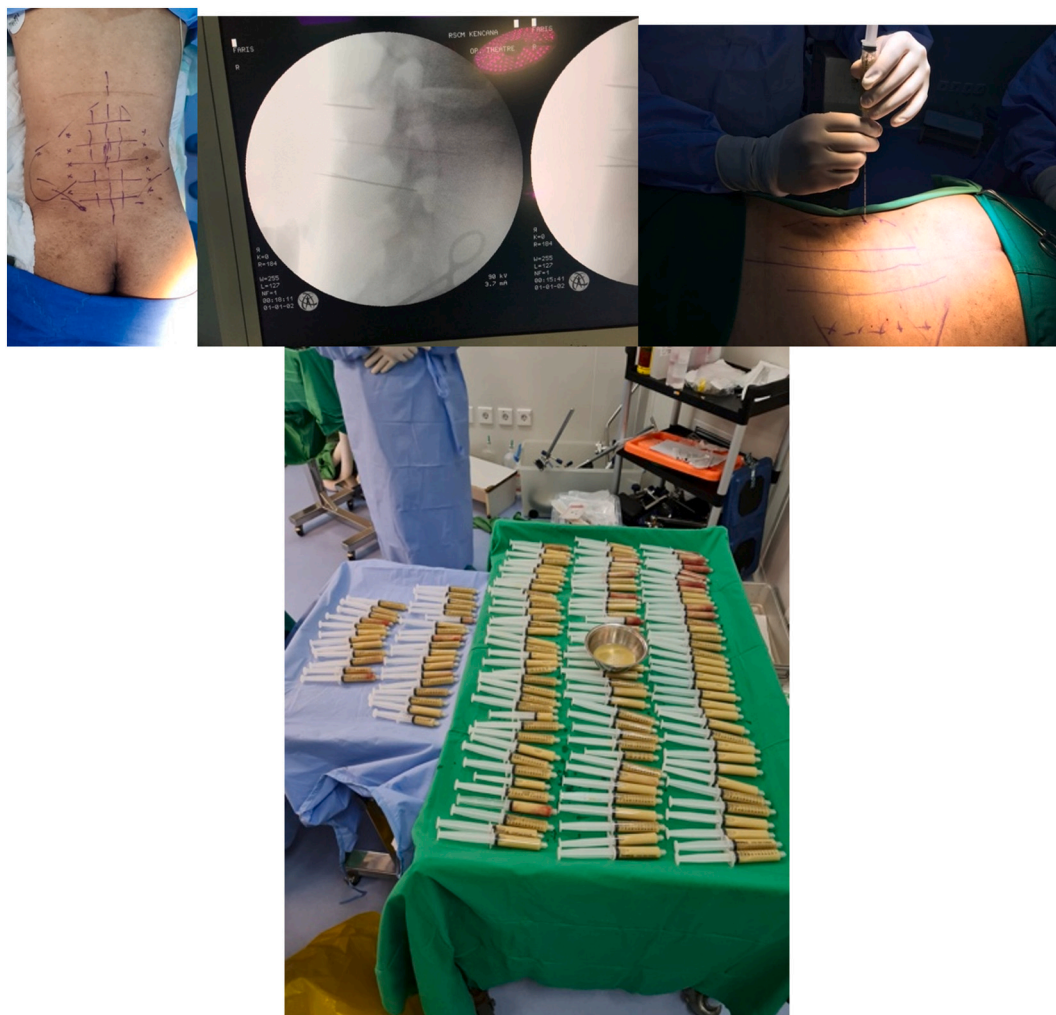


Fig. 4. The second closed system abscess evacuation procedure with 2226 ml pus were evacuated.



Fig. 5. The clinical presentation and plain radiography results of a 43-year-old male with iliopsoas abscess due to tuberculosis infection.

the L1-L2 disc space were seen on thoracic plain radiography. Lumbar plain radiography suggests spondylitis tuberculosis due to soft tissue swelling, mild compression of the vertebral body in T12 and L2, and moderate compression in L1 and L3. The results of the MRI revealed bilateral psoas abscesses from T12 to S4 (Fig. 6). The patient was diagnosed with iliopsoas abscess due to tuberculosis infection and was scheduled for abscess drainage and evacuation as well as deep specimen culture and biopsy.

The intraoperative procedure (Fig. 7) was initiated with draping and leveling of the patient with the help of the C-arm. Then, needles were inserted in the marked location and some pus was aspirated. Finally, using closed system evacuation, 600 ml of pus from the right side and 350 ml from the left side were removed. Following the surgeries, the patient's clinical presentation has improved.

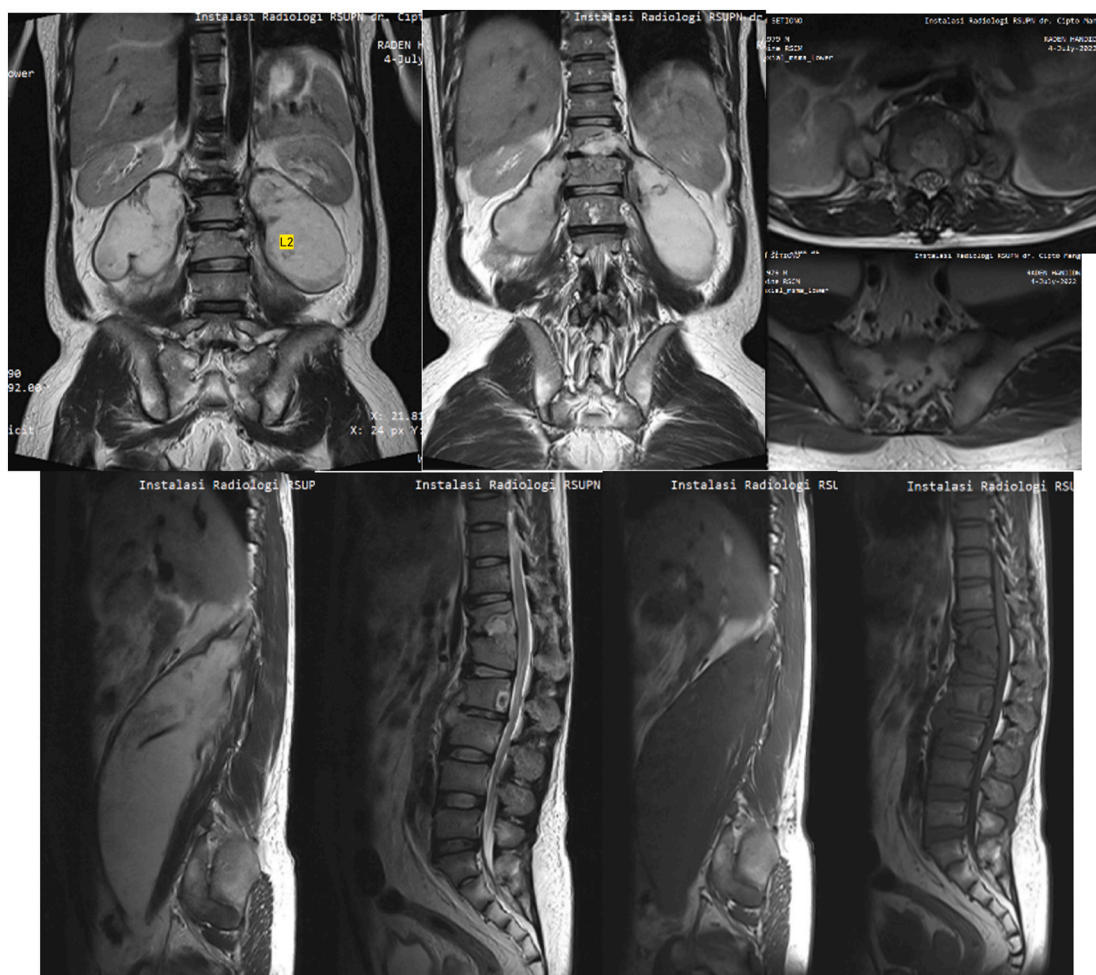


Fig. 6. The results of the MRI revealed bilateral psoas abscesses from T12 to S4.

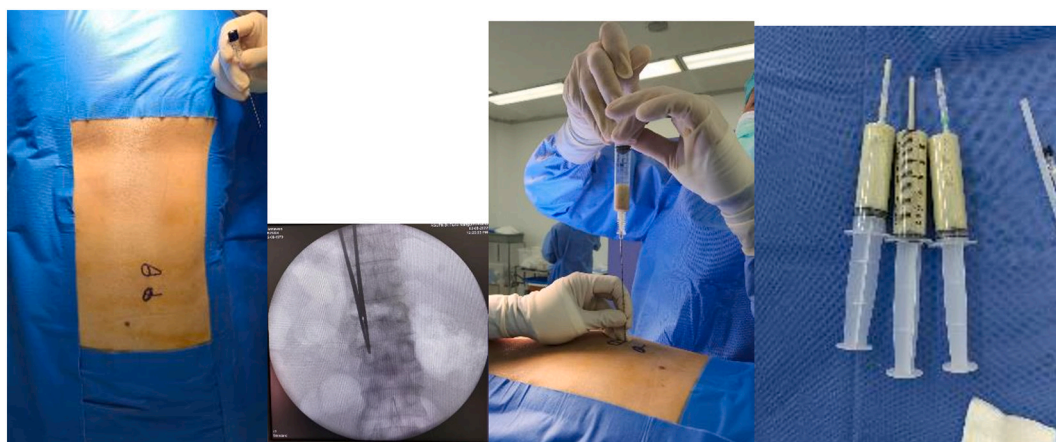


Fig. 7. The intraoperative procedures: marking and leveling using C-arm; and closed system pus evacuation.

3.3. Case 3

A 22-year-old female came to the hospital with a chief complaint of back pain with no radiating pain, numbness, or tingling sensation since 4 months prior. In 4 months, the patient had lost 10 kg body weight. Trauma, chronic cough, fever, or night sweats had not previously occurred. Due to pulmonary tuberculosis, the patient had previously been using anti-tuberculous drugs for one month, but stopped due to

toxicity and was given a different regimen for the last three weeks. A 78 cm-in-circumference lump on the lower back was discovered during the physical examination, with tenderness (VAS 3) on the level of L4 as shown in Fig. 8. There was a limited range of motion of the back due to pain.

The patient's lumbosacral radiography revealed narrowing of disc spaces in L3-L4 and L4-L5, destruction of the anterior body of L4 and L5, lytic lesions in L3, and lumbar lordosis (45,5°). This could represent

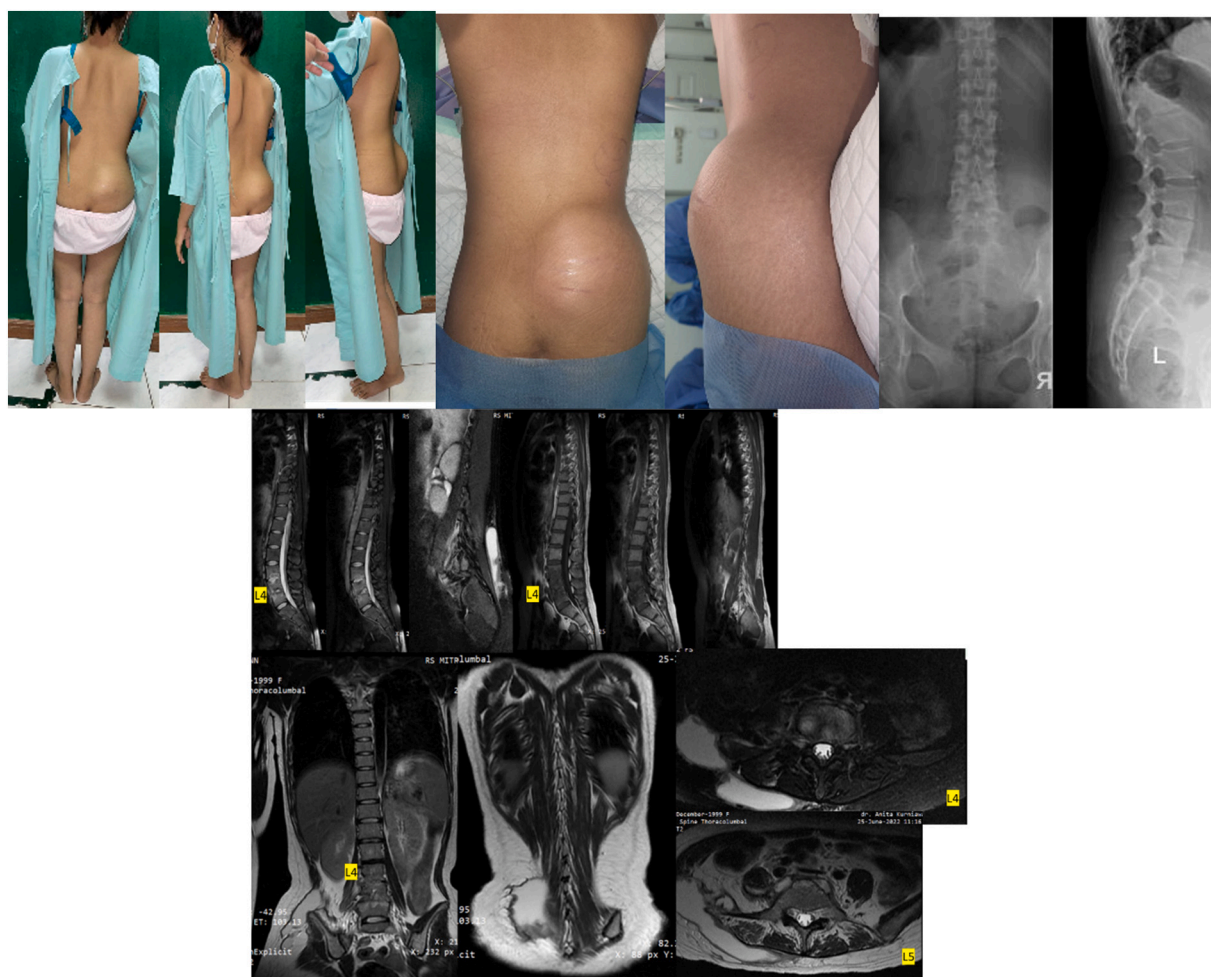


Fig. 8. The clinical picture, X-Ray, and MRI of 22-year-old female with spondylitis tuberculosis at L4-L5 with paravertebral abscess.

spondylodiscitis. According to the MRI findings, there were abscesses in the paravertebral region and the right gluteal subcutaneous region. The patient was diagnosed with tuberculous spondylodiscitis of L4-L5 with paravertebral and right gluteal abscesses. Abscess evacuation and specimen culture were performed on this patient. Syringe aspiration was used to drain the right gluteal abscess, and then an antibiotic injection was administered. The amount of pus removed was about 600 ml (Fig. 9). Following the operations, the patient showed pain improvement.

4. Discussion

According to WHO, there are around 10.4 million new cases of tuberculosis and 1.8 million mortalities each year. The South East Asian region accounted for 46.5 % of the global tuberculosis burden, and Indonesia currently has the second highest tuberculosis prevalence rate in the world [11]. Tuberculosis is an infectious bacterial disease caused by *Mycobacterium tuberculosis*, which is an aerobic, fastidious, and slow-growing bacillus [10]. Any viscera, including the lungs, mesentery, gastrointestinal tract, genitourinary system, and lymph nodes of the mediastinum, can serve as the tuberculosis infection's primary location. Spinal infections are always secondary and are brought on by the bacillus spreading through the blood from a primary focus [11]. Inflammation caused by tuberculosis is granulomatous, with lymphocytic and epithelioid cells infiltration. These cells may combine to create the classic Langhans-type giant cells, which lead to caseating necrosis of the affected tissues and the formation of cold abscesses [12].

One of extrapulmonary tuberculosis that is still an issue in Indonesia is spondylitis tuberculosis that accounts in 50 % of musculoskeletal tuberculosis. The development of spondylitis tuberculosis is typically insidious, and the disease normally advances slowly. The severity and duration of the illness, the location of the illness, and the existence of sequelae such as abscess, sinusitis, deformity, and neurological deficiency all affect the clinical presentation. The most frequent symptom is back pain [6]. In our cases, all of the patients had back pain when they were hospitalized and also displayed general symptoms including weight loss.

In the early diagnosis of spondylitis tuberculosis, plain radiographs are insufficient. Disc space narrowing can be seen as the condition worsens. Further damage that causes kyphosis and instability can be observed in plain radiographs in the late stages. Due to its ability to identify the earliest alterations, MRI has become the imaging technique of choice. MRI is the most effective tool for determining the degree of soft tissue involved, abscess spread, and neural compression [13].

Anti-tuberculous chemotherapy (such as combined treatment with isoniazid, rifampicin, pyrazinamide, and ethambutol), conventional surgical procedures (anterior radical debridement with graft fusion or posterior debridement with fusion and fixation), and minimally invasive methods are therapeutic options for spondylitis tuberculosis. The gold standard treatment of spondylitis tuberculosis is anti-tuberculous chemotherapy [14]. Indications for subsequent intervention include failure of anti-tuberculous treatment, vertebral instability, advancing deformity, severe neurological impairment, or extensive abscess. The recommended procedure for extensive paravertebral abscesses was

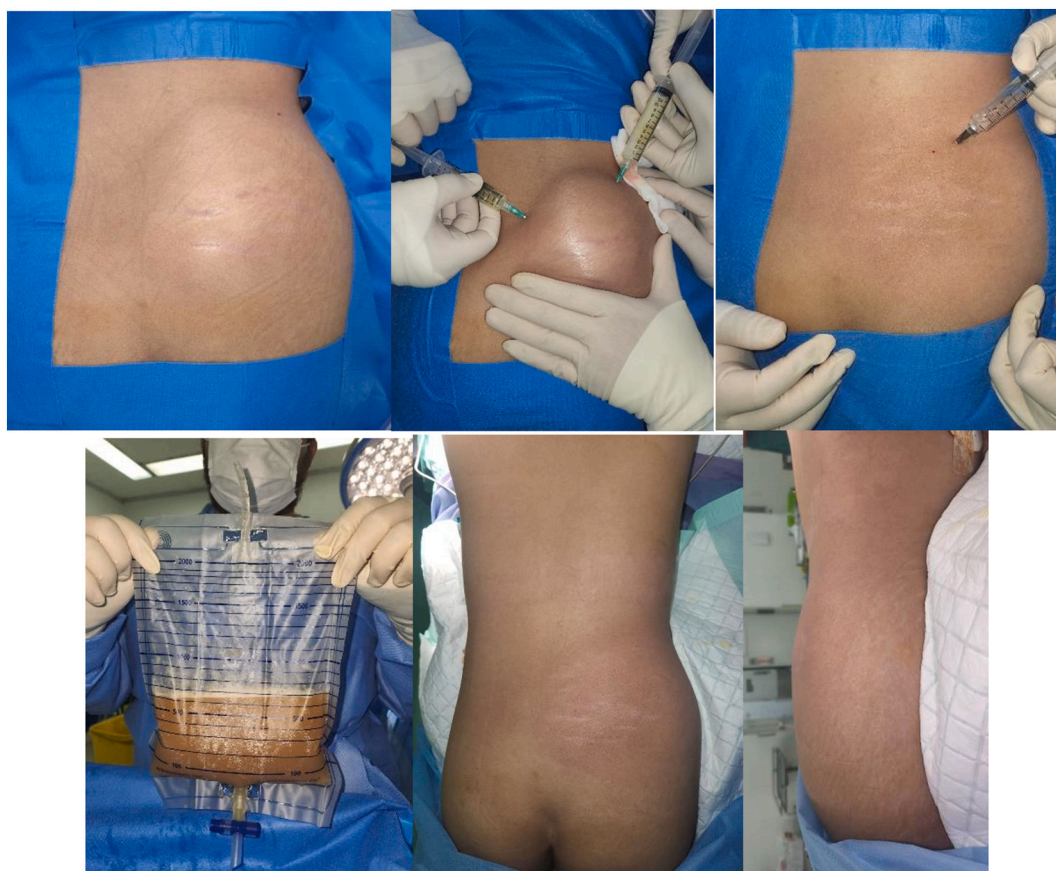


Fig. 9. The evacuation of right gluteal abscess using syringe, antibiotic injection, and the post abscess evacuation documentation.

percutaneous drainage and retroperitoneoscopic drainage [7]. Extensive abscesses were discovered in all of our cases, indicating the need for further treatment.

We employed micro invasive approaches with closed system evacuation to evacuate the abscesses in our patients. The indications of this technique include abscess of the paravertebral or psoas region affecting T8 to L5 vertebrae without significant damage to the vertebral body or serious symptoms of nerve or spinal cord compression [7]. When the vertebral body has suffered severe injury or when there are serious signs of spinal cord compression, conventional open surgery is the recommended treatment. Patients who are not good candidates for open surgery can instead choose closed system method. This approach is percutaneous and does not contaminate healthy tissue compared to conventional surgery which is more invasive and results in significant blood loss [12].

All three of our patients received immediate relief from their local symptoms, and there were no intraoperative complications. The amount of abscess that was collected ranged from 600 to 2000 ml. One patient needed a second evacuation because of a recurring abscess (a 30-year-old male). This outcome is comparable to that of Pombo F et al., who performed CT-guided catheter drainage and chemotherapy to treat patients with psoas or iliopsoas abscess. In their study, clinical improvements were shown right away following the treatment, and most patients' conditions returned to normal between three and nine months later [15]. Compared to Pombo F et al., our technique are less invasive and less tissue damage thereby speeding recovery and reducing patient's length of stay. Moreover, our closed system method involved bacteria eradication by direct broad spectrum antibiotic implantation through the inserted needles.

This case report aimed to demonstrate how closed system evacuation can be used as a micro invasive approach in the treatment of patients

with paravertebral abscess. However, due to the small sample size, we were unable to evaluate the results with accuracy and validity. Another drawback was that clinical outcomes were not consistently evaluated, which made it difficult for us to get precise data. We were unable to compare the surgical results directly because of the different abscess locations, which was another limitation of this study.

5. Conclusion

This case series reported three cases of closed system evacuation in patients with paravertebral abscesses caused by spondylitis tuberculosis. This micro invasive method successfully removed the abscess from the infected location and promptly lessened the patients' clinical complaints. Early treatment of paravertebral abscesses is essential for minimizing complications. However, several shortcomings were discovered. Therefore, additional research using a better methodology and larger sample size is required.

Consent

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 the review by the Editor-in-Chief of this journal on request.

Ethical approval

Ethical approval was provided/waived by the authors institution.

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Not applicable.

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Guarantor

Ahmad Jabir Rahyussalim

CRedit authorship contribution statement

Ahmad Jabir Rahyussalim: supervising, making the concept and design of the treatment.

Andi Rama Sulaiman: collecting the data, analyzing the data, interpretation, writing the paper.

Aryo Winartomo: collecting the data, analyzing the data, interpretation, writing the paper.

Muslich Isdris Al Mashur: collecting the data, analyzing the data, writing the paper.

Mochammad Kamal Nasser: collecting the data, analyzing the data, writing the paper.

Trie Kurniawati: collecting the data, editing the paper.

Declaration of competing interest

The authors do not have any conflict of interest.

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