



Case report

Novel minimally invasive management of lumbar osteomyelitis: A case report

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ABSTRACT

Introduction and importance: Vertebral osteomyelitis is a rare disease that might lead to significant clinical problems. Initially, conservative therapy is considered to be sufficient for most patients. However, it is not uncommon that the infectious process may become fulminant and severe complications could arise. Recent studies have shown that percutaneous endoscopic debridement provides a favorable outcome in managing lumbar infections without severe neurological symptoms.

Case presentation: We presented a case report of a female, 49 years old, with pyogenic vertebral osteomyelitis of the 4th - 5th lumbar spine without neurologic deficit. X-ray examination showed a resemblance of the lytic lesion over the anterior aspect of the L4. We then planned a minimally invasive endoscopic procedure for the patient. We made the 1st portal to aspirate the abscess product and for the endoscopy instrument to debride the remaining debris material. We also developed the second portal using kyphoplasty needle towards the pedicle to gain access to the vertebral body. The debriding process was achieved by positive irrigation pressure from one portal to another using physiologic NaCl saline and gentamicin solution.

Clinical discussion: Combined with the access created by the kyphoplasty needle, more thorough irrigation was made possible as the intravertebral body was approachable. Compared to open surgery, this approach can reduce surgical damage. Clinically, patient experienced an almost instant relief of pain.

Conclusion: Percutaneous endoscopic debridement technique in addition of kyphoplasty needle allows wider area for adequate debridement and better result, while maintaining minimally invasive setting with minimum complications.

1. Introduction and importance

Vertebral osteomyelitis is a rare disease that might lead to significant clinical problems, including spinal deformity and segmental instability that affect the patient's quality of life [1]. This infectious process is usually found in the lumbar spine, which can be categorized into pyogenic (the most frequent), non-specific, and specific (such as tuberculosis) types [2]. Several predisposing factors, such as smoking, malnutrition, a compromised immune system, determine the role in the profundity of an infectious process and the development of its complications [3]. Commonly found clinical signs and symptoms of lumbar osteomyelitis, whether pyogenic or tuberculous, is severe back pain accompanied with or without paralysis [1]. During physical examination, midline tenderness over the L4-L5 spine could also be seen.

Conservative therapy, conventional open surgery, and minimally invasive surgery are some of the many treatment approaches for lumbar osteomyelitis.

Conservative therapy combines appropriate antibiotics regimes with bed rest, which was originally believed to be sufficient for most patients [4]. This approach typically consists of large doses of antibiotics given up to two weeks after all clinical symptoms have disappeared and erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) have returned to baseline [5]. The principle of conservative therapy is to allow natural bone fusion to progress into the vertebrae and attain pain relief by avoiding activities that may worsen the gap on site. However, this process may not take a short amount of time as it often takes more than three months at the very least, which imaginably is not going to be the easiest period of time for patients and their families [6,7]. Moreover,

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even while on antibiotics, it is not uncommon that the infectious process may become fulminant and severe complications develop. These complications range from mechanical deformities caused by bone destruction to disastrous neurological deficits elicited by epidural abscess formation. Not to mention the issues that entail prolonged bed rest as well.

Conventional open surgery can be done through anterior or posterior debridement and bone grafting, with or without supplemental instrumentation. Unfortunately, this approach may give rise to postoperative complications [8]. The complications associated with open surgery are damaged spinal cord and nerve roots, disrupted spinal stability, and, more importantly, the added trauma on the already-suffering patients.

Evidently, early assessment of an infectious process in the lumbar spine and prompt suitable treatment plays a major determining role in successful management of spinal infection and prevention of its appalling complications.

Percutaneous endoscopic discectomy was initially used in the treatment of uncomplicated herniated discs. Recently, this technique has shown favorable results in spinal stenosis cases [9]. Recent studies have also reported beneficial outcomes from performing percutaneous endoscopic discectomy in treating lumbar infections without causing neurological symptoms [10–12]. While performing performed bilateral portal percutaneous endoscopic debridement, Yang et al. used a dilute povidone-iodine solution to lavage which successfully manage pyogenic spondylitis with a paraspinous abscess and recurrent postoperative infection [12,13].

In this study, we attempted to demonstrate a case in which we used a novel modified approach using unilateral percutaneous endoscopic debridement aided by a kyphoplasty needle with gentamicin diluted over physiological saline for irrigation. We modified the PEDD technique using kyphoplasty needle to widen the approached area.

This case report is presented and written in line with the SCARE2020 criteria [14]. The procedure was done by single orthopedic surgeon who sub-specialized in spine, in a medical-educational center.

2. Case presentation

We presented a case report of a female, 49 years old, with pyogenic vertebral osteomyelitis of the 4th–5th lumbar spine and specific infection without neurologic deficit. From the history of the patient, one year before being admitted to the hospital, the patient started to feel localized pain at the lower back (VAS 5) and left groin. The pain was described as dull, arising intermittently, and especially when sneezing or coughing. The pain was usually relieved when bending backward, going as far as to prefer sleeping with a pillow slipped on his back area. At that time, the patient only sought over-the-counter medications.

Four months later, the pain progressed to VAS 7. The patient had difficulty mobilizing and needed walking aid. This time around, the pain was described as numb and burning pain around the groin, left knee, and left foot. The patient had neither micturition nor defecation problems. She then went for a Neurologist consultation, from which she was prescribed analgesics but felt only slight improvement.

There was no history of trauma, loss of weight, chronic cough, fever, Mycobacterium Tuberculous infection, or other metabolic conditions. History of drug abuse was also absent.

On her visit to our center, we found the patient's general condition was decent and slightly underweight at a glance. From our spine physical examination, we found that there were no obvious visible signs of inflammation and deformity. However, on palpation, there was midline tenderness over the L4–L5 spine (Fig. 1).

The neurologic function, assessed with the American Spinal Injury Association (ASIA) Impairment Scale, showed no signs of deficit. Autonomic dysfunction was also in the clear. The obtained laboratory results were all within normal limit with the exception for positive Interferon Gamma Release Assays (IGRA). The laboratory findings were increased level of CRP (54 mg/L) and ESR (43 mm/h). Other markers namely AFP,



Fig. 1. Pre-operative physical examination of the spine.

Ca 15–3, Ca 125, Ca 19–9 is also found increasing.

X-ray examination showed a resemblance of the lytic lesion over the anterior aspect of the L4 vertebral body, with no sign of translation for instability and as shown in figure below (Fig. 2).

Further MRI examination was done for a detailed soft tissue perspective. Here, the imaging revealed a hyperdense lesion resembling spondylitis over the L4–L5 vertebral body with a paravertebral abscess at the anterior aspect. There was also a posterior intervertebral disc bulge of the same level, which caused minor canal stenosis with preserved intrathecal substance as shown in figure below (Fig. 3).

Since the diagnosis was unable to be established yet, we then planned a minimally invasive endoscopic procedure for the patient as the affected area is relatively small and accessible and no neurological deficits were found.

This transforaminal approach procedure was started by leveling the guide needle trajectory directed by fluoroscopy. Then, the insertion point was anesthetized with 10 milliliter of 0.5% Lidocaine. Spinocaine (18G) needle was next inserted from the left side at the L4 level, 14 cm from the midline, angled at about 45° on the axial plane until the final position of the spinocaine tip rested on the paravertebral region pocket of psoas abscess (Fig. 4).

The abscess was aspirated using a 20 cm³ syringe; the 1st aspiration confirmed 20 cm³ of pus and the 2nd one acquired another 20 cm³ of bloody pus (Fig. 5).

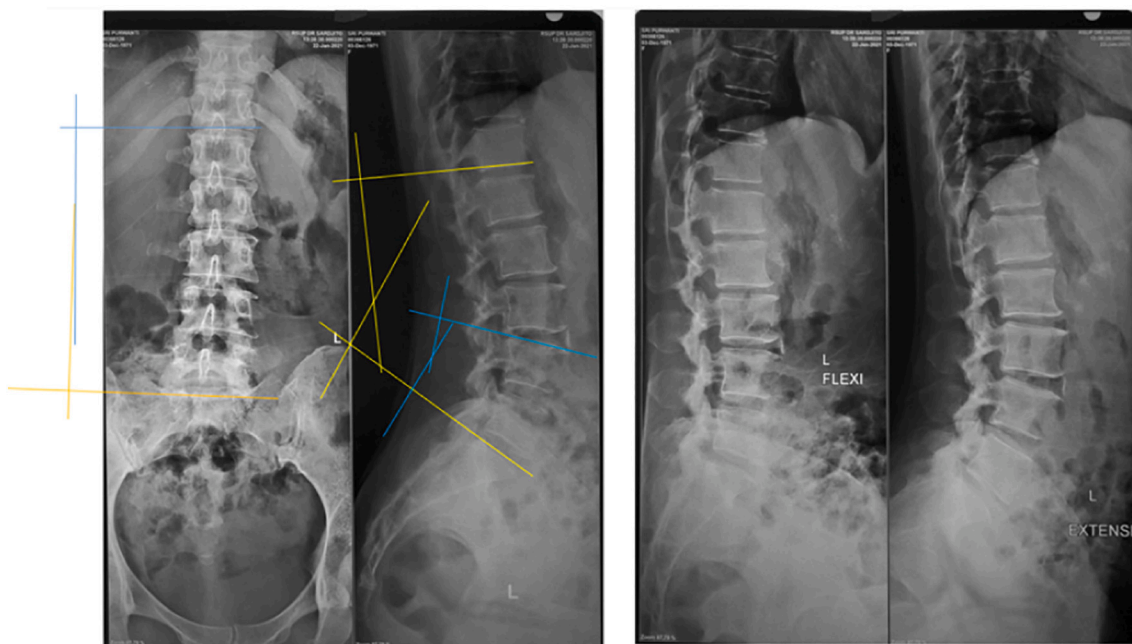


Fig. 2. Pre-operative X-ray examination.

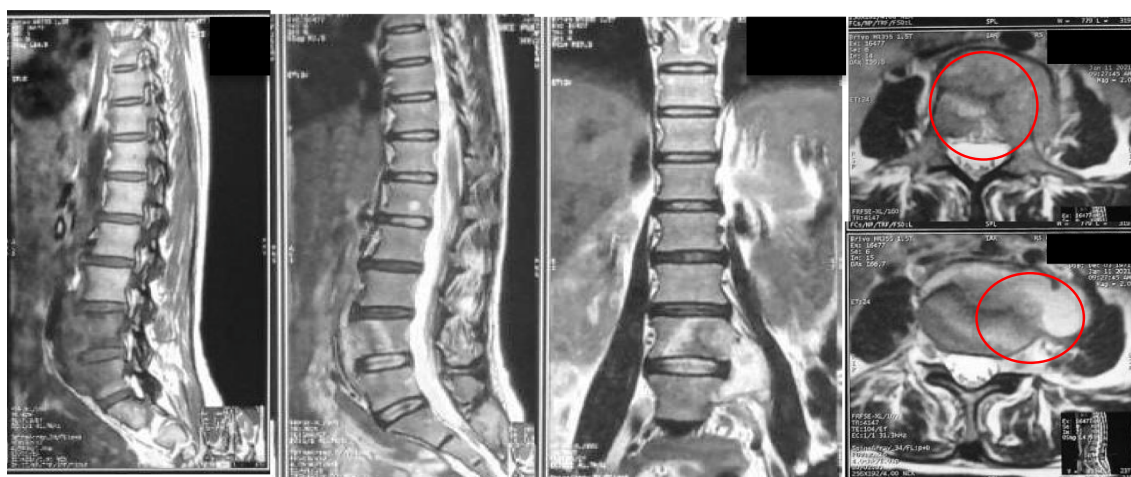


Fig. 3. Pre-operative MRI examination.

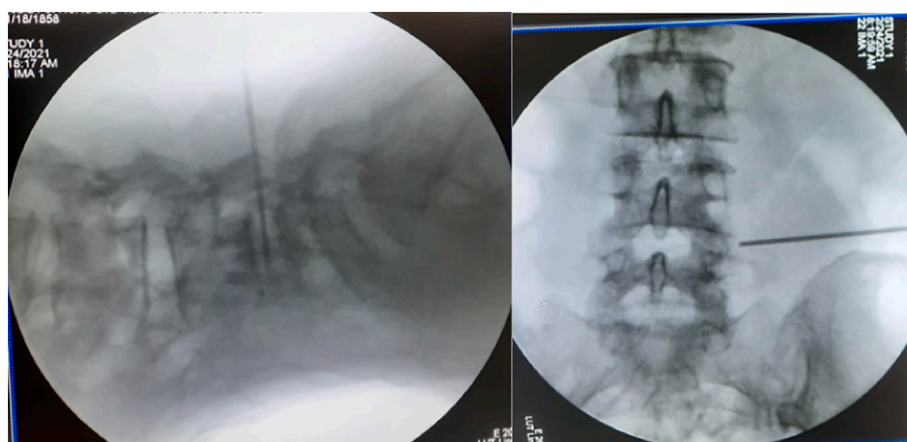


Fig. 4. Final needle confirmation at the paravertebral abscess.



Fig. 5. Intra operative aspiration product from abscess site.

Next, we inserted a guidewire through the spinocaine and retracted the spinocaine from that point so that the guidewire was in place. We then made a 7 mm incision around that site as a portal of endoscopy instrument. We inserted the dilators from the smallest to the largest diameter and confirmed the final position by fluoroscopy. Afterward, we introduced the trocar, through which we proceeded to the endoscopy system.

Much to our delight, the abscess and debris material was immediately identified right from the start. Those structures were thereafter removed thoroughly and collected for biopsy and culture sampling (Fig. 6).

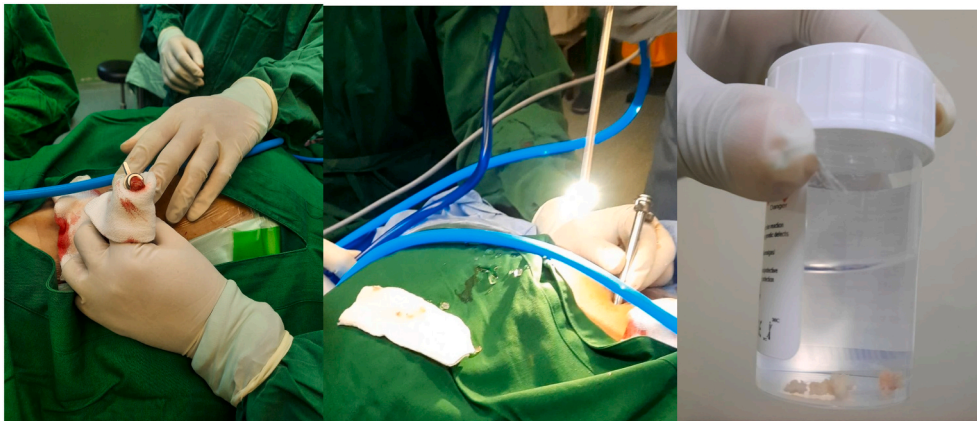


Fig. 6. Intraoperative Percutaneous endoscopic debridement, culture sampling and biopsy.

On the surface, we had the second portal prepared, a set of vertebroplasty needles. It is chosen to gain access of vertebral body while maintaining minimally invasive setting. The needle was inserted under fluoroscopic guidance towards the pedicle. The final fluoroscopy confirmation is shown in the figure below (Fig. 7).

The debriding process was achieved by positive irrigation pressure was administered through this portal. We used a solution of 80 mg Gentamicin per liter of normal saline as our irrigation agent. The solution then was run through the second portal, all the way along the abscess area, and eventually exited through the first portal. After 3 liter of flow, we finally observed a complete turn of the stream from pus/bloody pus to downright clear saline. The procedure was finally finished (Fig. 8).

The patient was awake and responsive throughout the procedure, providing real-time feedback in case of nerve irritation from instrument pressure or retraction. Intra-operative monitoring showed no sign of nerve irritation throughout the procedure.

Surprisingly, the patient experienced an almost instant relief of pain (VAS 1) and was able to conduct daily activities on the next day with an ODI score of 98% at one-week post-operative. WBC, ESR, CRP values were consistently low for the remaining follow-up with one-month total duration of follow-up. MRI evaluation was not obtained. Patient was discharged from hospital on day one post-operative procedure. Prescribed anti-mycobacterium therapy as discharge drugs.

Culture result didn't show any microorganism. Pathological examination results shown a connective tissue fragment with necrotic area and myxoid area that densely consist of lymphocyte, histiocyte, foamed macrophages and also multi nucleated giant cell with multiple nucleus in distribution resembling Langhans pattern without any neoplastic appearance.

3. Clinical discussion

Pyogenic vertebral osteomyelitis commonly results from a primary infection that occurs elsewhere in the body, whether from the genitourinary tract, prostate, or respiratory tract, that spreads through the bloodstream [15]. Generally, immunocompromised and diabetic patients have a higher risk for this bacteremia, as prolonged use of intravenous line and urine catheter would [16,17].

The most common target for this spread is towards the lumbar and lower thoracic spine areas [18,19]. The pathogen is thought to spread through the veins of Batson's plexus, which drain the vertebral bodies and pelvis [20]. The common connection of genitourinary tract infections and vertebral osteomyelitis is due to retrograde hematogenous migration of organisms from the pelvis to the spine via Batson's plexus. However, another suggestion was brought up by Wiley and Trueta that the spread is through vertebral branches of the posterior spinal arteries

earlier studies.

This leads to our belief that as long as there are no signs of spinal instability and no neurological symptoms, the less invasive method should be considered. These single-segment lumbar infections, even with the presence of a paravertebral or epidural abscess, are thought to be the best indication for this novel technique.

4. Conclusion

The percutaneous endoscopic debridement technique allows for a less invasive approach that has the benefits of reduced blood loss, less pain resulting in early post-operative mobilization, and shorter hospital stay and recovery time. At the same time, adding access to the intra-vertebral body by means of a kyphoplasty needle makes sure that the debridement process stays extensive in such a minimally invasive environment. In another perspective, percutaneous endoscopic techniques are not widely used by all surgeons. This novel technique could serve as an attractive option for the treatment of spinal infection without instability problems.

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Ethical approval

The informed consent form declared that information gained is used for educational and research purpose only. Our institutional review board also didn't provide an ethical approval in the form of case report.

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

Author contributor

Yudha Mathan Sakti conceived the study. Ahmad Ramdoni Chusnanto, Alan Philips Resubun, Aristida Cahyono Putro, Caesarean Rayhan Cein, Akbar Mafaza, Yunus Oksikimbawan Tampubolon, and Ardanariswara Wikantayasa, drafted the manuscript and critically revised the manuscript by Rahadyan Magetsari for important intellectual content. Ahmad Ramdoni Chusnanto, Alan Philips Resubun, Aristida Cahyono Putro, Caesarean Rayhan Cein, Akbar Mafaza, Yunus Oksikimbawan Tampubolon, and Ardanariswara Wikantayasa facilitated all project-related tasks.

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Declaration of competing interest

No potential conflict of interest relevant to this article was reported.

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