Case Report

Emphysematous osteomyelitis of lumbar spine: a rare case report and review of literature

Abstract

Rationale: There are very few cases of emphysematous osteomyelitis documented in the literature, and it is one of the rare diseases brought on by gas-forming bacteria.

Patient concerns: A 63-year-old male was admitted to the orthopaedics ward with the chief complaints of fever and low back pain for one week and shortness of breath for three days. He was a known case of old pulmonary tuberculosis with chronic obstructive pulmonary disease (COPD) and pulmonary artery hypertension (PAH).

Diagnoses and interventions: On CT scan, multiple air pockets were noted in L4 & L5 vertebrae. After a CT scan, a probable diagnosis of emphysematous osteomyelitis was made and empirically, antibiotics were started. Fine needle aspiration under CT-guided cytology was done, and *Klebsiella pneumoniae* was identified based on culture and sensitivity. After confirmation, specific antibiotics were started, and he improved gradually. The patient had a significant improvement in back pain after the treatment.

Keywords: computed tomography, emphysematous osteomyelitis, *Klebsiella pneumoniae*, spine

Volume 17 Issue 2 - 2025

Dr Joydeep Das,[1] Dr Hitesh Garg,[1] Dr Ravisha Bhardwaj,[2] Dr Bhimana Sujit Ravi Teja[3]

[1]Senior Resident, VMMC and Safdarjung Hospital New Delhi, India
[2]Assistant Professor, Currently on Deputation as Senior Medical Officer at CGHS /Sports injury centre, Vardhman Mahavir Medical College and Safdarjung Hospital, India
[3]Assistant Professor, Department Of Orthopaedics, Siddhartha Medical College, India

Correspondence: Dr. Joydeep Das, MS Ortho, Senior Resident, Sports Injury Centre, VMMC and Safdarjung Hospital, Tel 8860855795, Postal Address: Flat No 149, 1st Floor, Pocket D6, Rohini Sec 6, New Delhi 110085

Received: February 28, 2025 | **Published:** March 28, 2025

Introduction

Emphysematous osteomyelitis (EO) is an uncommon condition marked by the development of intraosseous gas due to a fast-progressing and potentially lethal variety of osteomyelitis caused by bacteria which produces gas. The index case of EO was published in 1981 and included the appendicular skeleton. The characteristic radiographic feature was the presence of gas with no history of piercing injuries, open fractures, or biopsies.[1–4]

Only 45 cases have been documented up to this point. The pelvis, femur, tibia, and thoracolumbar vertebrae are common sites. It is a potentially lethal illness, so an early diagnosis is necessary. This illness is predisposed by a number of comorbidities, including cancer, diabetes mellitus, alcoholism, Crohn's disease, and other immunosuppressive aetiologies.[5] This first spine-related phenomena was described by Bielecki et al. in 1986 as a condition that differs clinically from other well-known infections of the spine, like granulomatous osteomyelitis and pyogenic vertebral osteomyelitis. Although the infection can be monomicrobial or polymicrobial, the causative organisms are usually anaerobes or members of the Enterobacteriaceae family.[6–9] We are presenting a case of a 63-year-old man who developed EO of the lumbar spine as a result of Klebsiella pneumonia infection.

Case report

A 63-year-old male was admitted with the chief complaints of fever and lower back pain for one week with difficulty of breathing for 3 days. He had history of pulmonary tuberculosis and he was also a known case of chronic obstructive pulmonary disease (COPD) with pulmonary artery hypertension (PAH). He was a chronic alcoholic & smoker for the last 30 years.

Clinical examination

On examination, he was febrile with tachycardia & dyspnoea. On routine neurological examination power and deep tendon reflexes were with in normal but on lower back examination mild to moderate tenderness over the lumbar region was present.

Laboratory examination

Hb: 9.6 gm/dl	CRP: Positive
WBC: 25000/cumm	LFT: Normal
Plt: 1.5 lakh/cumm	RBS: 105 gm/dl
ESR: 45 mm/hr	
Uric Acid: 7.2 mg/dl	Creatinine: 1.8 mg/dl

Radiological examination

He got a plain radiograph of the thoracolumbar spine and was within normal limit. On CT scan (Figure 1), multiple air pockets were noted in L4 & L5 vertebrae.

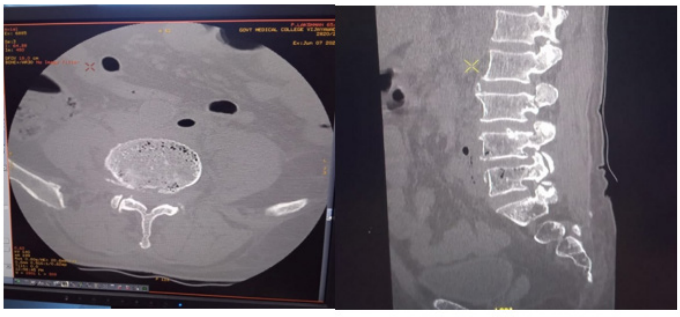

Figure 1 CT scan of lumbar vertebrae

Management

Ceftriaxone, piperacillin-tazobactam, and oxygen inhalation and nebulisation were administered to him empirically. He underwent a small needle aspiration under CT-guided imaging because emphysematous osteomyelitis was a possibility. The specimen was also sent for sensitivity and culture testing.

Gram stain showed gram-negative rod-shaped bacteria. On culture and sensitivity *Klebsiella Pneumoniae* was detected which

was sensitive to imipenem, meropenem, piperacillin, amikacin, and ciprofloxacin. He was put on meropenem, piperacillin-tazobactam and other symptomatic treatment. Intravenous antibiotics were given for 21 days, followed by oral antibiotics for another 3 weeks. He responded to antibiotic therapy. No complications were noted on regular follow-ups till 6 months.

Discussion

Patient had risk factor of alcohol consumption and COPD. *Alcohol* misuse can weaken immune system and may cause serious *infections*, on the other hand in COPD use of glucocorticoids can supress immune system which may leads to infections.

EO of the spine is diagnosed and verified by CT scan, which detects minimal amount of intraosseous gas in the vertebrae that are not detectable on x-rays.[2-4] Furthermore, CT scans can effectively diagnose EO to prevent postponing surgical care when necessary, in contrast to MRI for spondylodiscitis and spinal epidural abscesses.[2–4,10] Intraosseous gas in the spine, in contrast to the appendicular skeleton, can be a secondary symptom of a variety of conditions, such as neoplasms, osteonecrosis, and degenerative illnesses.[6,11,12] When using CT scan to identify EO of the spine, maximum cases (86.22%; n=25) that were reported involved the lumbosacral spine, with or without pelvic and thoracic bone involvement. The thoracic spine accounted for just 10.3% (n=3) of the total involvement.[6,11,12] The L4 and L5 vertebral bodies were involved in this patient. The radiologic characteristics of EO that differentiate it apart from other non-infectious conditions were detailed by Small et al. He pointed out that at least three irregularly irregular millimetric (2–5 mm) foci of gas on CT scans, known as the "pumice stone" pattern of intramedullary gas are present in 96% of recorded cases of EO.[13] The **pumice stone sign** describes the distinctive imaging appearance of emphysematous osteomyelitis on CT described as clusters of greater than 3 distinct foci of intramedullary gas with irregularly irregular sizes ranging between 2 and 5 mm with resemblance to surface appearance of pumice stone.[14] This is in contrast to benign, degenerative pneumatocysts or subchondral cysts, which are comparatively large or same in size, have thin sclerotic edges, and have few discrete locules.[13] This is because, in contrast to the destructive gas-producing diseases that causes the trabeculae to be rapidly destroyed and multiple foci of various sizes and shapes to appear, the regularly spaced bone trabeculae are preserved.[13] Furthermore, emphysematous osteomyelitis may be suspected if fluid accumulations or abscess formations are observed in the surrounding tissue.[13,15] Even if CT scans confirm the diagnosis, a multifactorial approach is required for an efficient work-up in the proper clinical setting and the subsequent development of a management.

PET-CT scans, like MRI scans, can show areas of enhanced focal uptake, which suggests a continuous, active inflammatory process. PET-CT scans, however, are not frequently used to diagnose EO. Instead, as MRI can show regions of inflammation and CT scan may best show cortical damage/intraosseous gas, these two tests are still the gold standard for detecting EO. Guidelines for infectious diseases state that image-guided biopsies should only be performed in cases where blood, urine, or other serologic testing are unable to identify a microbe.

Actually, other results in the previous studies point to image-guided biopsy, which has a poor chance of detecting particular microorganisms.[16] In general, cases with non-identifiable organism or nonresponsive to antibiotics therapy, the Infectious Disease Society of America (IDSA) advises image-guided biopsy and/or open biopsy.[17] However, image-guided aspiration or open biopsy can successfully offer information for targeted antibiotic therapy in situations where an organism cannot be detected despite worsening symptoms.

Treatment

Medical therapy

Proper diagnosis and prompt beginning of antibiotic therapy are critical in the management of EO spine. Even though targeted therapy is preferable, empirical antibiotic therapy was started in the majority of described cases. IV antibiotic therapy was started in every instance that was reported, with the exception of those that contained no details about the antibiotic regimen.

Penicillins, IV clindamycin,[3,11] cephalosporins,[4,18,19] were among the commonly reported antibiotics.[5,20,21]

Surgical intervention

Similar to pyogenic vertebral OM, the EO of the spine has criteria for surgical intervention. Surgery is typically done for three reasons: (I) diagnostics, in the event that no microorganism is found. (II) stability when a deformity develops; and (III) source control when a patient doesn't react as well to appropriate medical treatment.

Emergency surgical decompression of the spine is indicated in progressing signs of cauda equina syndrome or cord compression for EO and pyogenic vertebral OM/spondylodiscitis.

However, it's crucial to carefully weigh the benefits and drawbacks of surgical intervention in addition to patient-specific factors including surgical optimisation and prognosis.37.9% (n=11) of patients with EO of the spine underwent surgery of some type, including decompression, debridement, or decompression with fusion instrumentation.[3,6,10,15,17,22–25] In several of the cases reported, surgical intervention was not carried out because of the patient's haemodynamic state.[2,4,26–28] In 2 of the 3 cases where multi-level laminectomies were done, posterior instrumentation was carried out.[10,14,24] On the other hand, anterior procedures[6] and single-level laminectomy procedures[17] did not require posterior instrumentation.

For example, in a database analysis of 2,662 individuals who had spinal infections treated surgically, Dietz et al. reported better outcomes in a number of factors when fusion and decompression are carried out in comparison to only decompression.[29] In comparison to the non-fused cohort, the fused cohort experienced shorter lengths of stay (6 vs. 4 days), lower rates of revision surgery (12.7% vs. 8.16%) and new infection (11.25% vs. 3.99%), and overall fewer problems during index hospitalisation (34.95% vs. 23.96%).[28] Nevertheless, the research material on the best ways to treat EO of the spine is very less.

Conclusion

Therefore, our results imply that the potentially deadly consequences of emphysematous osteomyelitis may only be avoided by early diagnosis and prompt treatment with appropriate antibiotics and surgery where necessary.

Acknowledgements

None.

Conflicts of interest

The authors declare that there are no conflicts of interest.

Citation: Das J, Garg H, Bhardwaj R, et al. Emphysematous osteomyelitis of lumbar spine: a rare case report and review of literature. *MOJ Orthop Rheumatol.* 2025;17(2):25–27. DOI: 10.15406/mojor.2025.17.00694

References

1. Ram PC, Martinez S, Korobkin M, et al. CT detection of intraosseous gas: a new sign of osteomyelitis. *AJR Am J Roentgenol*. 1981;137(4):721–723.
2. Ono R, Uehara K, Kitagawa I. Emphysematous osteomyelitis of the spine: a case report and literature review. *Intern Med*. 2018;57(14):2081–2087.
3. Luey C, Tooley D, Briggs S. Emphysematous osteomyelitis: a case report and review of the literature. *Int J Infect Dis*. 2012;16(3):e216–220.
4. Tatakis FP, Kyriazis I, Panagiotopoulou IE, et al. Simultaneous diagnosis of emphysematous osteomyelitis and emphysematous pyelonephritis in a diabetic patient. *Am J Case Rep*. 2019;20:1793–1796.
5. Khanduri S, Singh M, Goyal A, et al. Emphysematous osteomyelitis: report of two cases and review of literature. *Indian J Radiol Imaging.* 2018;28(1):78–80.
6. Bielecki DK, Sartoris D, Resnick D, et al. Intraosseous and intradiscal gas in association with spinal infection: report of three cases. *AJR Am J Roentgenol*. 1986;147(1):83–86.
7. Beit Ner E, Chechik Y, Lambert LA, et al. Gas forming infection of the spine: a systematic and narrative review. *Eur Spine J.* 2021;30(6):1708–1720.
8. Kwon JW, Hyun SJ, Han SH, et al. Pyogenic vertebral osteomyelitis: clinical features, diagnosis, and treatment. *Korean J Spine*. 2017;14(2):27–34.
9. Murray MR, Schroeder GD, Hsu WK. Granulomatous vertebral osteomyelitis: an update. *J Am Acad Orthop Surg*. 2015;23(9):529–538.
10. Smorgick Y, Beit Ner E, Granek T, et al. Gas forming infection of the spine: a case report. *SN Compr Clin Med*. 2020;2:1008–1011.
11. Le Moal G, Juhel L, Grollier G, et al. Vertebral osteomyelitis due to Fusobacterium species: report of three cases and review of the literature. *J Infect.* 2005;51(2):E5–E9.
12. Park SS, Lee SE, Min CK. Emphysematous osteomyelitis due to Escherichia coli in multiple myeloma. *Blood Res.* 2016;51:224.
13. Small JE, Chea P, Shah N, et al. Diagnostic features of emphysematous osteomyelitis. *Curr Probl Diagn Radiol*. 2022;51(4):666–672.
14. Sarangi P, Gaillard F, Sharma R, et al. Pumice stone sign. Reference article, Radiopaedia.
15. Sung S, Lee BH, Kim JH, et al. Emphysematous osteomyelitis of the spine: A rare case report. *Medicine (Baltimore*). 2020;99:e21113.
16. Garg V, Kosmas C, Young PC, et al. Computed tomography-guided percutaneous biopsy for vertebral osteomyelitis: a department's experience. *Neurosurg Focus.* 2014;37(2):E10.
17. Berbari EF, Kanj SS, Kowalski TJ, et al. 2015 Infectious diseases society of america (idsa) clinical practice guidelines for the diagnosis and treatment of native vertebral osteomyelitis in adults. *Clin Infect Dis*. 2015;61(6):e26–46.
18. Al-Wakeel J, Al-Ballaa SR, Sergani H, et al. Non-clostridial gas-forming infections in diabetic patients. *Ann Saudi Med*. 1995;15:71–73.
19. Aiyappan SK, Ranga U, Veeraiyan S. Spontaneous emphysematous osteomyelitis of spine detected by computed tomography: Report of two cases. *J Craniovertebr Junction Spine*. 2014;5(2):90–92.
20. Philippe J, Sheybani E, Hirschel B, et al. Air in the bones: multifocal anaerobic osteomyelitis associated with oat cell carcinoma. *Br Med J (Clin Res Ed*). 1985;290(6473):969.
21. Velickovic M, Hockertz T. Sacral emphysematous osteomyelitis caused by *Escherichia coli* after arthroscopy of the knee. *Case Rep Orthop*. 2016;2016:1961287.
22. Merine D, Fishman EK, Magid D. CT detection of sacral osteomyelitis associated with pelvic abscesses. *J Comput Assist Tomogr*. 1988;12:118–121.
23. Chen JL, Huang YS. Emphysematous osteomyelitis of the spine. *QJM*. 2016;109(6):427–428.
24. Mahesh BH, Upendra BN, Vijay S, et al. Emphysematous osteomyelitis - a rare cause of gas in the spine - a case report. *J Spine*. 2016;5:4.
25. Ko IK, Hong JH. Emphysematous osteomyelitis of the spine. *Br J Neurosurg*. 2023;37(3):292–293.
26. Larsen J, Mühlbauer J, Wigger T, et al. Emphysematous osteomyelitis. *Lancet Infect Dis*. 2015;15(4):486.
27. Kim YK, Jo KM, Jang JH, et al. Rapidly fatal emphysematous osteomyelitis with multiple septic emboli and liver abscess caused by K*lebsiella pneumoniae*. *Infect Chemother*. 2018;50(3):268–273.
28. Famularo G, Savignano S, Parisi G, et al. Of rods, gas and spine. *Presse Med*. 2016;45:274–275.
29. Dietz N, Sharma M, Alhourani A, et al. Outcomes of decompression and fusion for treatment of spinal infection. *Neurosurg Focus*. 2019;46(1):E7.

Citation: Das J, Garg H, Bhardwaj R, et al. Emphysematous osteomyelitis of lumbar spine: a rare case report and review of literature. *MOJ Orthop Rheumatol.* 2025;17(2):25–27. DOI: 10.15406/mojor.2025.17.00694