Emphysematous osteomyelitis diagnosed on Tc99m MDP SPECT-CT scintigraphy: a case report

Farkhanda Gillani[1*], Muhammad Babar Imran[2], Owais Qadeer Gill[3], Muhammad Shahzad Afzal[4]

European Journal of Medical Case Reports
Volume 5(9):279–282
https://doi.org/10.24911/ejmcr/173-1627883787

ABSTRACT

Background: Emphysematous osteomyelitis is a rare but fatal condition, caused by gas-forming bacteria. We reported a rare case of emphysematous osteomyelitis of left femur in a 27-year-old diabetic male, diagnosed on Tc99m methylene diphosphonate (MDP) single photon emission computed tomography-computed tomography (SPECT-CT) scintigraphy. The pattern of uptake in emphysematous osteomyelitis on Tc99m MDP SPECT-CT scintigraphy was not reported previously.

Case Presentation: A 27-year-old diabetic male patient presented with history of pain in left thigh and fever for 10 days. He was referred to nuclear medicine department for Tc99m MDP bone scan. He had no history of trauma or surgery, and his radiograph of left femur was unremarkable at presentation. Tc99m MDP SPECT-CT scintigraphy showed abnormal uptake in femur with intraosseous air, pathognomic of emphysematous osteomyelitis. Further imaging by magnetic resonant imaging (MRI) showed edematous changes in the musculature of left thigh with marrow replacement changes in left femur favoring the diagnosis of emphysematous osteomyelitis. However, no bacterial growth was detected on blood culture due to prior administration of intravenous antibiotics.

Conclusion: Tc99m MDP SPECT-CT scintigraphy is helpful in diagnosis of such rare conditions like emphysematous osteomyelitis, in addition to common pathologies of bone. Furthermore, this report is helpful for nuclear physicians to know about the pattern of uptake on planner bone scan and SPECT-CT images in such a rare infection of bone, by gas forming bacteria.

Keywords: Emphysematous osteomyelitis, case report, Tc99m MDP bone scan, SPECT-CT scintigraphy.

Received: 2 August 2021 **Accepted:** 29 August 2021 **Type of Article:** CASE REPORT **Specialty:** Nuclear Medicine

Correspondence to: Farkhanda Gillani
*Nuclear Medicine Department, PINUM Cancer Hospital, Faisalabad, Pakistan.
Email: farkhanda.gillani @yahoo.com
Full list of author information is available at the end of the article.

Background

Emphysematous osteomyelitis is a severe infectious disease caused by gas-forming pathogens. It is frequently associated with high morbidity and mortality and should be treated aggressively with antibiotics to prevent possible bone necrosis and bone destruction [1]. Intraosseous air in extra-axial skeleton in the absence of direct contact between air and bone such as trauma or surgery is pathognomonic of intraosseous osteomyelitis. [2,3]. To the best of authors' knowledge, to date, it is the first report, mentioning the pattern of Tc99m methylene diphosphonate (MDP) uptake in such rare infections.

Case Presentation

A 27-year-old male was referred to nuclear medicine department for Tc99m MDP bone scan. He had history of pain in left thigh for 20 days and unable to walk. Pain was associated with high grade fever and intravenous antibiotics were started by the referring physician for last 5 days. He had no history of trauma or any surgical procedure. He was diabetic and taking oral hypoglycemic drugs and insulin.

Three phase Tc99m MDP bone scan was done after injecting 740 MBq of Tc99m MDP. Initial dynamic phase showed increased perfusion with pool activity in the sub-trochanteric region of left femur with relatively reduced uptake in the head region. Delayed phase showed abnormal increased uptake in the sub-trochanteric region and shaft of femur with photon deficient area in the head and trochanteric region of right femur (Figure 1). Correlative single photon emission computed tomography-computed tomography (SPECT-CT) showed air in left femur, pathognomonic of emphysematous osteomyelitis (Figure 2a). No abnormality was detected on the radiograph of left femur (Figure 2b). Magnetic resonant imaging (MRI) of the patient was done, which showed edematous changes in the surrounding musculature of left femur along with marrow replacement changes in left femur favoring the diagnosis of emphysematous osteomyelitis (Figure 3).

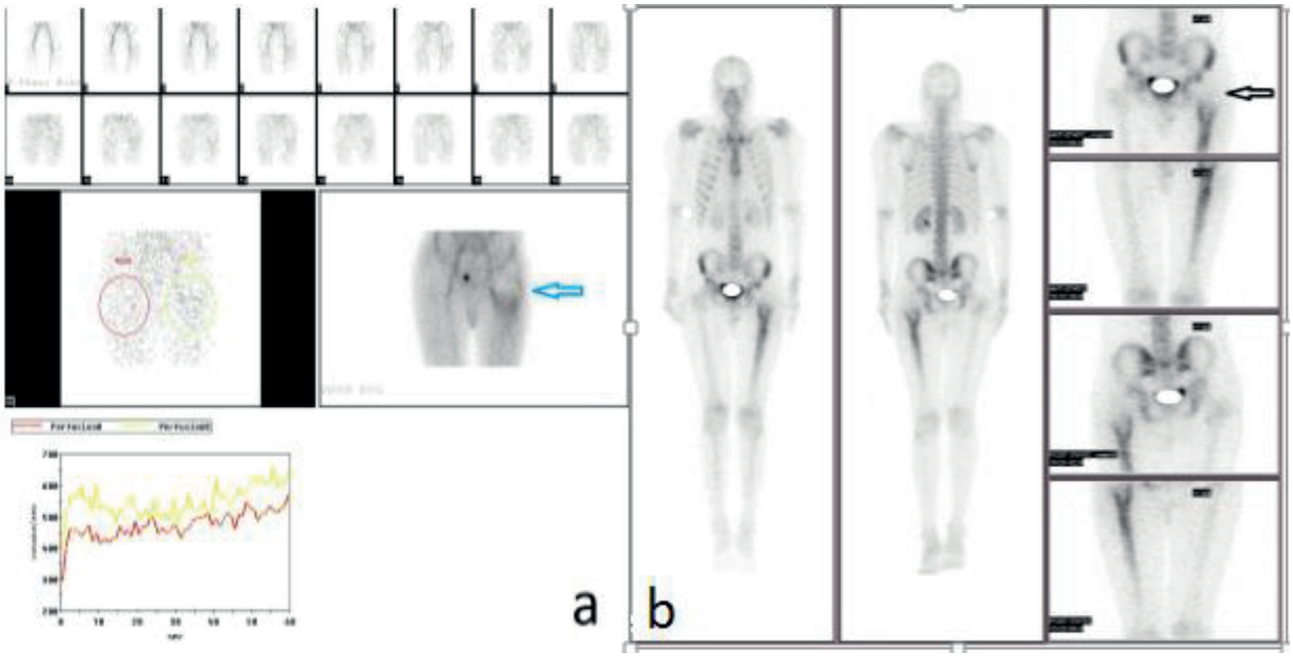

Figure 1. *(a,b) Increased perfusion with pool activity in the left thigh (blue arrows) (a). Abnormal increased uptake in the sub-trochanteric region with photon deficient area in the head and trochanteric region of left femur (black arrows) (b).*

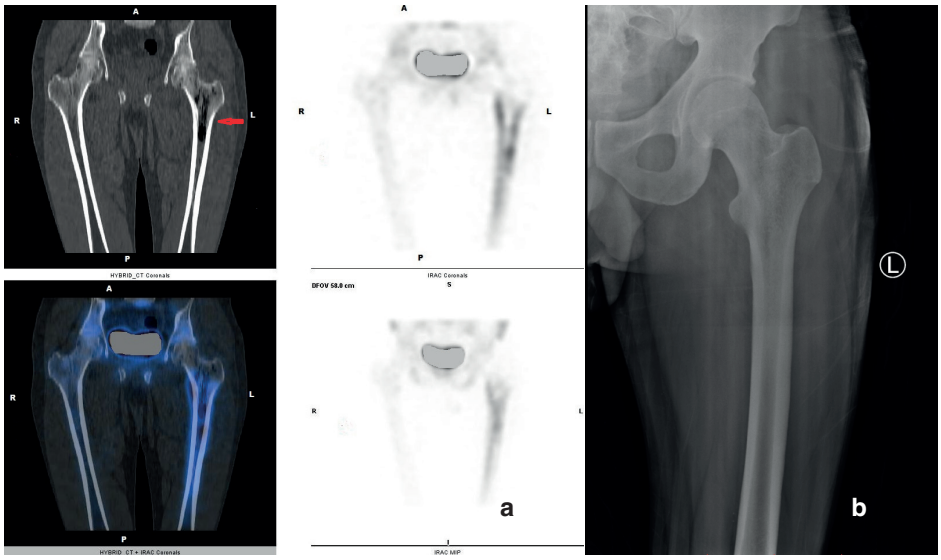

Figure 2. *(a) Tc99m MDP SPECT-CT showing air in left femur (red arrows) and (b) left femur radiographs reveal no abnormality in the visualized skeleton.*

Blood culture was done to characterize the pathogenic organism, but no growth was found, probably due to prior administration of intravenous antibiotic.

Discussion

Intraosseous gas in the extra-axial skeleton is rare but pathognomonic for emphysematous osteomyelitis [4]. It commonly involves vertebrae, pelvis, sacrum, femur, tibia, fibula, and midfoot bones [5]. The common sources of infection so far described to cause emphysematous osteomyelitis are intra-abdominal, skin, and urinary tract infections [6]. The most often mechanism of spread of infection is hematogenous dissemination [5] Diabetes mellitus and malignancy are most common risk factors to predispose patients to emphysematous osteomyelitis [1]. The common organisms responsible for Emphysematous osteomyelitis are the members of the Enterobacteriaceae family or anaerobes particularly, *Fusobacterium necrophorum* [4]. The precise organism responsible for the intraosseous gas production was not identified in our case due to prior use of intravenous antibiotics.

The differential diagnosis for the presence of intraosseous gas on radiological examination, includes intraosseous pneumocystis, osteonecrosis, bone malignancy, penetrating wounds, postbiopsy, open fractures, and lymphangiomatosis of the bone [7]. However extensive

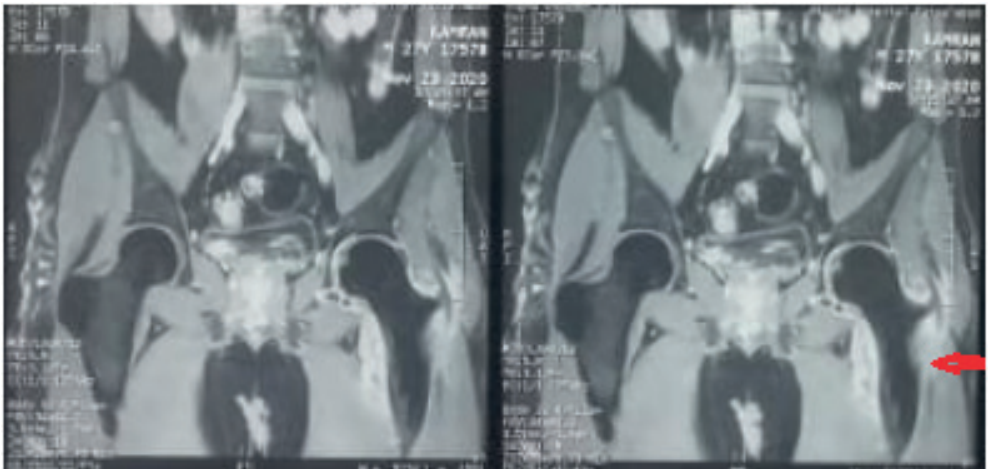

Figure 3. *MRI showing edematous changes in the surrounding musculature of left femur and marrow replacement changes in left femur (red arrow).*

intraosseous gas associated with bone oedema or fluid collections in adjoining soft tissue should raise suspicion of emphysematous osteomyelitis [8]. CT not only play a confirmatory role, and also revealed the extent of intraosseous gas and depict adjoining soft tissue involvement.

Emphysematous osteomyelitis is most often associated with significant morbidity and mortality, as high as 32% particularly in patients with diabetes mellitus. It should be promptly treated with intravenous antibiotics to avoid fatal complications of bone necrosis and destruction. The duration of treatment with antimicrobial agents is 4-6 weeks, similar to the treatment of osteomyelitis.

Surgical intervention is needed in cases of complications such as abscess formation or necrosis, or if patients do not respond to anti -microbial agents. It involves debridement or even amputation to remove all infected bone and soft tissue to prevent the spread of the infection and further tissue loss [9].

Conclusion

We conclude that the nuclear physician must include this rare condition of emphysematous osteomyelitis in differential diagnosis while interpreting such pattern of abnormal uptake on planner bone scan and should further evaluate it with SPECT-CT scintigraphy. The implications of early and appropriate identification of this rare phenomenon of intraosseous gas is to expedite management of this potentially threatening disease.

What is new?

Emphysematous osteomyelitis is a rare but fatal condition, caused by gas-forming bacteria. The authors reported a rare case of emphysematous osteomyelitis of left femur in a 27-year-old diabetic male, diagnosed on Tc99m MDP (methylene diphosphonate) SPECT-CT scintigraphy. The pattern of uptake in emphysematous osteomyelitis on Tc99m MDP SPECT-CT scintigraphy was not reported previously.

List of Abbreviations

MDP	Methylene diphosphonate
MRI	Magnetic resonant imaging
SPECT-CT	Single-photon emission computed tomography + computed tomography

Conflict of interests

The authors declare that there is no conflict of interests regarding the publication of this case report.

Funding

None

Consent for publication

Written informed consent was taken from the patient.

Ethical approval

Ethical approval is not required at our institution for publishing an anonymous case report.

Author details

Farkhanda Gillani[1], Muhammad Babar Imran[2], Owais Qadeer Gill[3], Muhammad Shahzad Afzal[4]

1. Nuclear Medicine Department, PINUM, Cancer Hospital, Faisalabad, Pakistan
2. Director, PINUM Cancer Hospital, Faisalabad, Pakistan
3. Consultant Radiologist, PINUM Cancer Hospital, Faisalabad, Pakistan
4. Head of Nuclear Medicine Department, PINUM Cancer Hospital, Faisalabad, Pakistan

References

1. Luey C, Tooley D, Briggs S. Emphysematous osteomyelitis: a case report and review of the literature. Int J Infect Dis. 2012;16(3):e216–20. https://doi.org/10.1016/j.ijid.2011.11.007
2. Ram PC, Martinez S, Korobkin M, Breiman RS, Gallis HR, Harrelson JM. CT detection of intraosseous gas: a new sign of osteomyelitis. AJR Am J Roentgenol. 1981;137(4):721–3. https://doi.org/10.2214/ajr.137.4.721
3. de Divitiis O, Elefante A. Cervical spinal brucellosis: a diagnostic and surgical challenge. World Neurosurg. 2012;78(3–4):257–9. https://doi.org/10.1016/j.wneu.2012.01.050

4. Jinhee L, Chai HJ, Myun HL, Eun-GJ, Youn JK, Sang IK, et al. Emphysematous osteomyelitis due to *Escherichia coli*. Infect Chemother. 2017;49:151–4. https://doi.org/10.3947/ic.2017.49.2.151
5. McDonnell O, Khaleel Z. Emphysematous osteomyelitis. J Am Med Assoc Neurol. 2014;71:512. https://doi.org/10.1001/jamaneurol.2013.90
6. Larsen J, Muhlbauer J, Wigger T, Bardosi A. Emphysematous osteomyelitis. Lancet Infect Dis. 2015;15:486. https://doi.org/10.1016/S1473-3099(14)71017-5
7. Janson. P, Shaifali. K, Jose LM. Anaerobic osteomyelitis of femoral head with intraosseous, intra-articular, bursal and muscle pneumatosis. Skeletal Radiol. 2003:32(1);46–48. https://doi.org/10.1007/s00256-002-0567-z
8. Christopher L, Debbie T, Simon B. Emphysematous osteomyelitis: a case report and review of the literature. Int J Infect Dis. 2012;16(3):216–20. https://doi.org/10.1016/j.ijid.2011.11.007
9. Ali SK, Sua S, Aktug D, Bahattin KA. The life-saving little tip: intraosseous gas. BMJ Case Rep. 2013. https://doi.org/10.1136/bcr-2013-201648

Summary of the case

1	**Patient (gender, age)**	27 years old, male
2	**Final diagnosis**	Emphysematous osteomyelitis
3	**Symptoms**	Pain in left thigh
4	**Medications**	I/V antibiotics (Ciprofloxacin)
5	**Clinical procedure**	Tc99m MDP SPECT-CT scintigraphy
6	**Specialty**	Nuclear Medicine