INTRAOSSEOUS EMPHYSEMATOUS OSTEOMYLITIS OF THE PELVIS WITH MYOSITIS AND ABSCESS FORMATION IN A CHEMOTHERAPY PATIENT:

ABSTRACT

Intraosseous emphysematous osteomyelitis is a rare but serious bone infection characterized by the presence of gas within the medullary cavity, most often in patients with immunosuppression or diabetes. Its occurrence in the pelvis bone is exceptionally uncommon. We present a 54-year-old female with locally advanced breast carcinoma who, one week after completing her final chemotherapy cycle, developed progressive lower abdominal and bilateral lower limb pain, fever and difficulty in weight-bearing. Cross-sectional imaging (MRI and CT) revealed marrow edema with intramedullary gas locules in bilateral pelvic bones and proximal femur, along with peripherally enhancing collections in the right iliacus, psoas and pectineus muscles – consistent with myositis and intramuscular abscess formation. Blood cultures isolated *Escherichia coli*, sensitive to carbapenems. The patient was managed conservatively with intravenous meropenem for six weeks, supportive care, and physiotherapy without surgical debridement. She showed marked clinical and radiological improvement, with normalization of inflammatory markers. The case underscores the importance of maintaining a high index of suspicion for rare

infectious complications in oncologic patients – especially those immunocompromised – presenting with musculoskeletal symptoms. Prompt imaging and microbiological confirmation, together with early targeted therapy, are critical to favourable outcomes.

KEYWORDS: Intraosseous emphysematous osteomyelitis; pelvis; myositis; abscess; chemotherapy; *E-coli*

INTRODUCTION

Intraosseous emphysematous osteomyelitis is an uncommon and potentially life-threatening form of osteomyelitis characterized by gas formation within the medullary cavity of bone in the absence of trauma, surgery, or penetrating injury. The condition is most frequently associated with gas producing organisms such as *Escherichia coli*, klebsiella pneumoniae, and clostridium species, and tends to occur in patients with underlying risk factors including diabetes mellitus, immunosuppression, malignancy, or neutropenia.

Pelvic bone involvement is exceedingly rare, and diagnosis may often be delayed because clinical and radiologic findings are nonspecific initially. In oncology patients, particularly those undergoing chemotherapy, immunosuppression may predispose to hematogenous seeding with unusual organisms. Early recognition is vital, as delay can lead to extensive bone necrosis, systemic sepsis and high morbidity/mortality.

We present a rare case of Intraosseous emphysematous osteomyelitis of the bilateral pelvis and proximal femur with extension into adjacent muscles causing myositis and intramuscular abscess formation in a patient recently treated with chemotherapy for breast carcinoma.

CASE REPORT

A 54 year old female with a known diagnosis of locally advanced breast carcinoma (Ki67 high, ER/PR negative) presented one week after completing her final scheduled chemotherapy cycle. Her comorbidities included diabetes mellitus. She had no prior history of orthopedic surgeries, local injections or known bone disease.

She developed progressively worsening lower abdominal pain and bilateral lower limb pain over five daysassociated with fever, malaise, and inability to bear weight. There was no history of trauma, recent injections, instrumentation, or travel.

On examination, she appeared acutely ill. Vital parameters revealed a temperature of 38.7 ^{0} C, pulse 108/min, blood pressure 100/70 mmHg. Local examinationdemonstrated tenderness over the bilateral iliac and gluteal regions, mild soft tissue swelling, restricted active hip motion, but no overlying skin changes, open wounds or erythema.

Laboratory Investigations

Laboratory evaluation revealed elevated inflammatory markers (white blood cell count with neutrophilic predominance, elevated C-reactive protein, ESR). Pro-calcitonin levels were elevated. Renal and hepatic function tests were within acceptable limits. Blood chemistry (glucose, electrolytes) was assessed.

Imaging findings

Plain Radiography

Anteroposterior radiograph of the pelvis demonstrated minimal abnormalities, with subtle haziness of bilateral iliac bones. No gross osteolysis, cortical destruction, or fractures were identified(Figure 1A).

Magnetic Resonance Imaging

MRI of the pelvis revealed diffuse marrow edema involving bilateral pelvic bones and proximal femur. Multiple small intramedullary gas locules were identified, appearing as signal void foci within the marrow. Additionally, peripherally enhancing collections with internal air foci were noted in the deep portions of the right iliacus, psoas, and pectineus muscles, consistent with intramuscular abscesses and associated myositis (Figures 1B and 1C).

Computed Tomograghy

CT of the pelvis(bone window settings) confirmed the presence of intramedullary gas within the bilateral pelvic bones and proximal femur. Adjacent soft tissue stranding and intramuscular collections were noted. No evidence of cortical breach, sequestrum formation or frank osteolysis. (Figures 2A and 2B).

Microbiological Findings

Ultrasound-guided aspiration of the abscess was proposed but deferred due to lack of patient consent. Blood cultures grew Escherichia coli, showing resistance to beta-lactams and aminoglycosides, sensitivity to carbapenems.

Diagnosis

Based on clinical presentation, imaging findings, and positive blood cultures, a diagnosis of intraosseous emphysematous osteomyelitis involving the bilateral pelvis bones and proximal femur with associated myositis and intramuscular abscess formation, was established.

Treatment and Follow Up

The patient was initiated on intravenous meropenem(1 g every 8 hours), guided by antimicrobial sensitivity. Supportive management included intravenous fluids, analgesics and physiotherapy. In view of absence of cortical destruction, sequestration or bone necrosis surgical intervention was not pursued.

Intravenous antibiotic therapy was continued for six weeks. Follow-up imaging demonstrated significant regression of intramuscular abscesses and resolution of marrow changes (Figure 3). Clinically, the patient showed marked improvement with restoration of ambulation and normalization of inflammatory markers.

DISCUSSION

Intraosseous emphysematous osteomyelitis is an uncommon variant of bone infection. The presence of gas is a radiologic hallmark, typically implicating gas producing organisms such as *E. coli*, Klebsiella or Clostridium. The pelvis is an unusual site, and cases reported in literature are scarce.

Immunocompromised states, such as those induced by chemotherapy, increases the risk of hematogenous spread and unusual infections. In this patient, transient bacteremia by *E. coli* likely seeded the pelvic bone marrow. The adjacent myositis and abscess formation suggest contiguous spread into muscle compartments.

Imaging is pivotal. MRI is superior in delineating marrow edema, soft tissue involvement, and abscess, whereas CT is particularly sensitive in detecting intramedullary gas and fine bone changes. The combination of those modalities aids in early diagnosis and in excluding alternative etiologies (e.g. necrotizing soft tissue infection, gas gangrene, posttraumatic gas).

Management principles include prompt initiation of broad-spectrum intravenous antibiotics tailored to culture sensitivity, drainage of abscess collection where feasible, and surgical debridement if necrosis or sequestra are present. The decision to forgo surgery in this case was based on stable bone architecture and absence of necrotic tissue. Fortunately, the patient's outcome was favorable. A review of published case suggest that delayed diagnosis is associated with higher morbidity or mortality, underscoring the importance of early recognition. This case adds to the limited literature on pelvic and femoral intraosseous gas-forming osteomyelitis in oncology patients and reinforce vigilance in immunocompromised patients presenting with musculoskeletal symptoms.

CONCLUSION

Intraosseous emphysematous osteomyelitis in the pelvis is extremely rare, particularly in chemotherapy patients. In such patents presenting with fever and localized musculoskeletal discomfort, a high index of suspicion should be maintained. Prompt cross-sectional imaging and microbiological analysis are key to diagnosis. Early targeted antimicrobial therapy, and drainage when needed, can lead to favorable outcomes even without surgical debridement.

PATIENT CONSENT

Written informed consent for publication (including use of anonymized radiologic images) was obtained from the patient.

TEACHING POINTS

1. Intraosseous gas in the absence of trauma or recent surgery is pathognomic for emphysematous osteomyelitis and mandates urgent evaluation.
2. Immunocompromised state – including recent chemotherapy predispose to hematogenous seeding by gas-forming organism such as Escherichia coli, even in atypical skeletal site like the pelvis.
3. CT is superior for detecting intramedullary gas, while MRI is more sensitive for assessing marrow edema, soft tissue involvement, and associated abscess formation – making combined imaging crucial for early diagnosis.
4. Early culture-directed intravenous antibiotic therapy may result in favourable outcome without surgical debridement when there is no cortical destruction. Sequestrum, or necrotic bone.

MCQs

1) A 54 year old immunocompromised patient present with fever and pelvic pain. CT demonstrated intermedullary gas within the iliac bone without prior trauma or surgery. The most likely diagnosis is:
   a) Avascular necrosis
   b) Osteosarcoma
   c) Intraosseous emphysematous osteomyelitis

d) Osteoradionecrosis

Answer:c

Explanation: intramedullary gas in the absence of trauma, surgery, or penetrating injury is highly suggestive of emphysematous osteomyelitis. Malignancy and avascular necrosis do not produce gas within bone.

2) Which imaging modality is most sensitive for detecting intramedullary gas in emphysematous osteomyelitis

a) Plain radiography

b) MRI

c) CT

d) Ultrasound

Answer: c

Explanation: CT is highly sensitive in detecting small gas locules within bone due to its superior spatial resolution and bone window evaluation. MRI is superior for marrow edema and soft tissue involvement but may not detect gas as reliable as CT.

3) Which organism is most commonly associated with intraosseous emphysematous osteomyelitis in immunocompromised patients?

a) Staphylococcus aureus

b) Escherichia coli

c) Mycobacterium tuberculosis

d) Candida albicans

Answer: b

Explanation: gas forming gram-negative bacilli, particularly Escherichia coli and Klebsiella pneumoniae, are commonly implicated in emphysematous osteomyelitis, especially in immunocompromised or diabetic patients.

4) Which of the following is the strongest indication for surgical debridement in emphysematous osteomyelitis?

a) Presence of marrow edema

b) Elevated inflammatory markers

c) Cortical destruction with bone sequestration

d) Positive blood cultures

Answer: c

Explanation: surgical debridement is indicated when there is necrotic bone, cortical destruction, or sequestrum formation. In the absence of these features, selected patients may respond to prolonged culture directed intravenous antibiotics alone.

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