

## Primary Sternal Osteomyelitis: A Case Report and Review of the Literature

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### ABSTRACT

Primary sternal osteomyelitis is a rare clinical entity generally caused by *Staphylococcus aureus* or *Pseudomonas aeruginosa*. Although rare it carries significant morbidity including spread to mediastinal structures and even mortality. Diagnosis is generally made on clinical suspicion in a patient with anterior chest pain and swelling, fever and raised inflammatory markers. Management is generally aggressive surgical debridement and intravenous antibiotics. Hyperbaric oxygen can be used where available and reconstructive options need to be considered in those with extensive dissection. Herein we report the case of a 55 year old male with no previous chest surgery or trauma who presented with primary sternal osteomyelitis.

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### Introduction

Primary sternal osteomyelitis (PSO) is a rare, yet potentially devastating presentation. Sternal osteomyelitis with underlying mediastinal infection is far more common in post-cardiac surgery patients (1). In this group, its incidence rate has been reported to be 1-2%; however, the rate of mortality ranges between 14% and 47%. This case report outlines a 55 year old male who presented with PSO and no previous chest trauma or surgery.

### Case presentation

In this study, we present the case of a 55-year-old male patient, who referred to the emergency department with a two-week history of anterior chest wall pain and swelling. The patient denied any upper-aero digestive symptoms or systemic complaints. The patient's background comorbidities included chronic liver disease, chronic alcoholism, hypertension, gastroesophageal reflux and cerebral

vascular diseases including cerebral haemorrhage secondary to aneurysmal rupture and right perinephric abscess.

The patient also had a positive hepatitis C status. However, he denied prior history of intravenous drug use or previous blood transfusion. The patient had history of recurrent falls due to poor mobility and residual right-sided hemiparesis as a result of two previous strokes. Moreover, the patient denied any blunt or penetrating trauma to the chest and had no previous history of cardiac surgery.

On examination, the patient's vital signs were as follows: respiratory rate of 18 bpm, blood pressure of 130/89 mmHg, irregular heart rate of 106 bpm and 36.2 °C temperature. He was cachectic and had an obvious anterior chest wall deformity, associated with marked swelling and overlying skin erythema (Figure 1). A tender fluctuant

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mass measuring approximately 20cm x 10cm was also palpable. Initial investigations revealed a white blood cell count of  $11.3 \times 10^9/L$  and an elevated C-reactive protein (CRP) level of 70 mg/L. Chest computed tomography (CT) scan demonstrated an 18 mm discontinuity in the mid-sternum with associated soft tissue collection with anterior and retrosternal extension to both pectoralis muscles and the anterior pericardium, respectively (Figure 2). Blood cultures were taken and the patient was commenced empirically on vancomycin and tazocin due to past history of *Methicillin-resistant Staphylococcus aureus (MRSA)*.

Subsequently, an incision was made and drainage of the collection, demonstrating a large volume of purulent fluid with significant bilateral extension to both pectoral muscles and the retrosternal region, was performed. Wound cultures were taken, and bone and soft tissue fragments were sent for histopathological examinations.

Post-operatively, the wound was left open and was packed with betadine-soaked gauze to promote granulation and healing. The patient was initially transferred to the high-dependency unit, and intravenous antibiotics and daily dressing changes were continued. Blood and wound cultures, taken on presentation and intraoperatively, demonstrated *Methicillin-sensitive Staphylococcus aureus*, and the patient was switched accordingly to intravenous flucloxacillin. Tissue histopathology failed to present evidence of underlying malignancies.

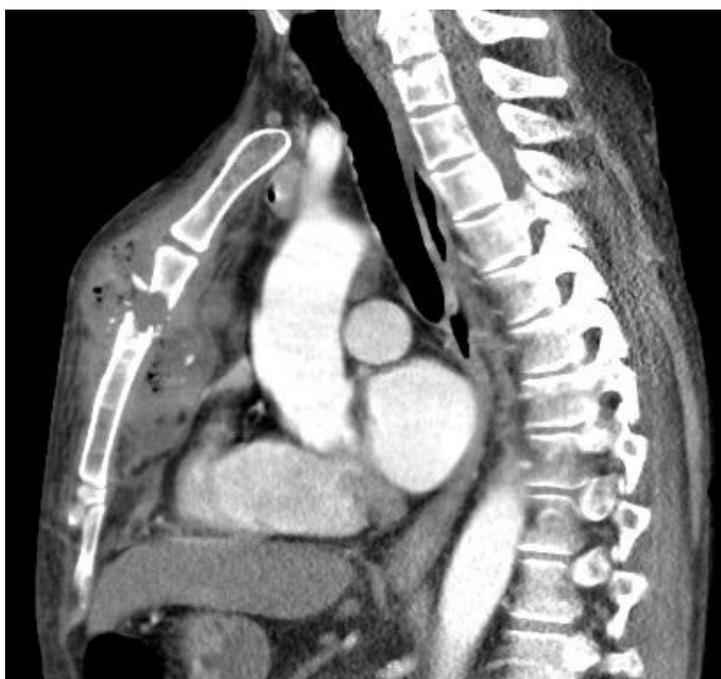


**Figure 1.** Patient prior to incision and drainage: marked deformity of anterior chest wall with overlying erythema and swelling

On day 10 of admission, patient was returned to the operating theatre for further washout due to ongoing haemorrhage. Transthoracic echocardiogram was used to determine any evidence of endocarditis, which was not detected. The patient was discharged from our facility after two weeks of intravenous antibiotics, with a peripherally inserted central catheter insitu for four weeks of intravenous flucloxacillin.

## Discussion

Gill and Stevens reported two cases of PSO in 1989 and conducted a literature review, reporting



**Figure 2.** Sagittal computed tomography scan demonstrating a ~18mm discontinuity in the sternal body with associated soft tissue collection: anteriorly, fluid and gas collections were visualised underlying both pectoralis muscles, whilst posteriorly, the collection is extending to the anterior mediastinum adjacent to the pericardium

55 cases of this condition (1). A review of the English-language literature has yielded 46 reported cases since 1989. In the pre-antibiotic era, Wilkensy and Samuels estimated the mortality rate of this disease to be 27% (2). PSO has been reported to occur in all age groups, including the infant and paediatric populations (3, 4). In both paediatric and adult populations, sternal osteomyelitis typically occurs secondary to sternotomy or trauma.

PSO has been described as a disease occurring predominantly due to haematogenous spread in the setting of intravenous drug use and immunodeficiency (5). PSO may also occur in the setting of contiguous spread from the adjacent structures. When PSO occurs as primary osteomyelitis in children, it is usually due to *Staphylococcus aureus* or *Salmonella* in children with sickle cell disease (6). In adults, PSO most commonly occurs due to *Staphylococcus aureus* or *Pseudomonas aeruginosa* and is estimated to account for approximately 0.3% of all cases of osteomyelitis (7). Although rare, immigration has been introduced as a cause of tubercular PSO (10); moreover, this condition has been reported in endemic parts of the world (8-11). *Aspergillus*(12), *Nocardia nova*(13) and *Actinomyces israelii*(14) are rare pathogens which have been reported in PSO.

### **Clinical presentation and diagnosis**

PSO in an unusual presentation, which is observed in immunocompromised patients, although in rare cases, it has been reported in patients with no known risk factors. Diagnosis of PSO should be based on clinical suspicion in patients with evidence of overlying inflammation (pain, swelling and erythema) with known risk factors such as immunodeficiency, intravenous drug use or a history of chest trauma.

A complete examination should be performed in case distal seeding of infection is described (15). Blood samples should be obtained for culture, identification of inflammatory markers, sensitivity testing, basic metabolic panel, complete blood count, electrolyte count, urinalysis (urea and creatinine) and liver function tests. Imaging findings on chest X-ray are usually subtle and CT scanning should be performed to assess the extent of sternal disease and soft tissue involvement. Additional bone imaging modalities have been advocated if available (16); however, in the present case, further imaging would have added little value.

### **Treatment and management**

Localised cases have been conservatively treated with intravenous antibiotics. Nevertheless, the mainstay treatments are incision and drainage and early surgical

debridement, in addition to antimicrobial therapy. Hyperbaric oxygen therapy has also been suggested to accelerate recovery and wound healing, thereby, eliminating the need for further reconstructive procedures (17).

Since PSO is less aggressive relative to secondary sternal osteomyelitis, aggressive debridement is not required (18). Accordingly, it has been suggested that keeping the posterior periosteum intact is desirable to prevent the spread of infection to the mediastinum and to allow new bone formation and stability (18, 19). Preservation of the periosteum may not be possible, as the infective process may not leave it intact, as presented in our case.

For cases requiring extensive debridement, reconstructive options must also be borne in mind. Local rotational flaps such as pectoralis major myocutaneous pedicle flap can be used for reconstruction in such cases (8, 9).

### **Complications**

The complications of PSO include local abscess formation, sepsis and distal haematogenous spread (15). Delayed presentation may lead to chronic sinus tract or fistula formation, which indicates the need for further debridement and eventual surgical repair (10).

### **Conclusion**

PSO is a rare and insidious presentation which can therefore be missed without appropriate clinical suspicion. We presented the case of a 55-year-old male with PSO and outlined a treatment approach consisting of surgical debridement and antibiotic therapy. PSO should be borne in mind as a cause of anterior chest pain and swelling in a febrile patient.

### **Conflict of Interest**

The authors declare no conflict of interest.

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