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A Rare Case Of Isolated Sternal Tuberculosis Revealing A Dumbbell-Shaped Cold Abscess

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ABSTRACT

Sternal tuberculosis (TB), a rare form of musculoskeletal TB, poses notable challenges in both diagnosis and treatment due to its uncommon occurrence along with nonspecific symptoms. This review consolidates current knowledge on sternal TB, covering its epidemiology, clinical manifestations, diagnostic techniques, and management strategies. Sternal TB usually results from hematogenous dissemination or direct spread from adjacent infections. Patients often present with localized pain, swelling, and fluctuant masses, which can be mistaken for pyogenic osteomyelitis or malignancies. Systemic symptoms like fever and weight loss are inconsistently observed. Imaging techniques such as X-ray, CT, and MRI typically reveal osteolytic lesions, periosteal reactions, or abscesses, while definitive diagnosis relies on histopathology and nucleic acid amplification tests like PCR. The primary treatment involves a 9–12 month regimen of multidrug antitubercular therapy (ATT), with surgical intervention—such as debridement or abscess drainage—considered in cases of extensive bone damage or inadequate response to medical therapy. Due to the vague clinical presentation, delayed diagnosis is common and may lead to complications like fistula formation, deformities, or secondary infections. A strong clinical suspicion is crucial, especially in endemic areas where tuberculosis is common or in immunocompromised patients. This review highlights the importance of an interdisciplinary approach to improve outcomes in this rare but potentially debilitating condition

Keywords: *Sternal tuberculosis, Tuberculosis, Cold abscess, Osteomyelitis, Extrapulmonary TB, Antitubercular therapy (ATT), Chest wall swelling*

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1. INTRODUCTION

Mycobacterium tuberculosis is the causative agent of tuberculosis (TB), a serious worldwide health concern. Extrapulmonary TB accounts for 15–20% of cases in immunocompetent people[1]. Musculoskeletal TB represents 1–3% of all TB cases, with sternal involvement being exceptionally rare, occurring in less than 0.5% of skeletal TB cases. Sternal TB abscesses are diagnostically challenging due to their nonspecific presentation, often resembling pyogenic infections or inflammatory conditions, leading to delays in diagnosis, which can have higher chances of side effects, including fistulae, bone loss, and systemic dissemination.

The sternum's vascular supply and anatomical position make it vulnerable to hematogenous dissemination or contiguous spread from mediastinal lymph nodes. Risk factors include immunosuppression (e.g., HIV, diabetes), malnutrition, and residence in TB-endemic areas[2]. The patients typically present with painless swelling, sinuses and fluctuant masses, rarely with a painful swelling and sometimes present with systemic symptoms like low-grade fever or unintentional loss of weight[3]. MRI and CT can detect abscesses, periosteal responses, or osteolytic lesions. However, definitive diagnosis requires histopathology and microbiological confirmation via AFB staining, culture, or NAATs.

Management involves a 9–12 month course of multidrug ATT, with surgical drainage reserved for extensive necrosis or persistent abscesses[4]. Given the lack of certain clinical characteristics, a high score of suspicion is crucial, particularly in high-risk populations. This article reviews the etiology, clinical presentation, diagnosis, and treatment of sternal TB abscesses, early detection and management emphasizing its importance in improving patient outcomes.

2. CASE PRESENTATION

A 17-year-old male from Assam, India, came with a painless swelling on the anterior chest wall that had been present for the past two months, rapidly increasing in size over the last month accompanied by growing discomfort. There were no constitutional symptoms of Tuberculosis. There was no history of recent surgery or prior chest trauma.. There were no notable medical history and was not immunocompromised. There was no known history of tuberculosis exposure either at his workplace or within his family. He was employed at a paint company and fell under the upper-lower socioeconomic class according to the modified Kuppuswamy scale. On examination, he had an average build, was afebrile, with 86 beats per minute for the pulse, 14 breaths per minute for the respiratory rate, and 120/80 mmHg for the blood pressure. A large, visible swelling measuring 10x4 cm in diameter was observed on the anterior chest wall, extending from the manubrium sternum to the xiphisternum. It was soft, non-tender, fluctuant, and not warm to the touch. The skin appeared normal, and no other notable findings were present. There was no cervical lymphadenopathy, and the status of the Bacillus Calmette–Guérin (BCG) immunization was uncertain. Exams of the chest and abdomen revealed nothing unusual. Hemoglobin was 9.3%, the total leukocyte count was 5900, with 63.3% neutrophils and 27.9% lymphocytes, and the high erythrocyte sedimentation rate (ESR) was 120 mm/hr, according to the laboratory data. Tests for kidney and liver function were within normal ranges, and the chest X-ray showed no abnormalities. Computed tomography chest showed a fairly defined osteolytic focus involving left 3rd sternocostal joint with suspicious communication seen anteriorly with an hypodense collection in the subcutaneous plane of anterior chest wall associated with surrounding inflammatory changes and other features as described, features suggestive of infective etiology likely sternal osteomyelitis with abscess.

The pus was aspirated from the swelling and sent for diagnostic testing. The Mantoux test was positive, with an induration measuring 21 mm. AFB were not detected in the pus sample, while Gram staining revealed gram-positive cocci. CB-NAAT confirmed the presence of *Mycobacterium tuberculosis* and showed susceptibility to rifampicin. No growth was observed in the pus culture or KOH mount. Sputum analysis using CB-NAAT did not detect *TB mycobacterium.* For the first two months (2HRZE), the 62 kg patient was placed on a daily anti-tubercular therapy (ATT) regimen that included isoniazid (300 mg), rifampicin (450 mg), pyrazinamide (1200 mg), and ethambutol (800 mg).

3. DISCUSSION

In 2020, Globally, there were 1.5 million TB-related deaths and 10 million new infections. About 27% of all TB cases worldwide occurred in India, where an estimated 2.64 million new cases were reported in 2020[1]. This covers both extrapulmonary and pulmonary tuberculosis. In 2020, India's incidence rate was almost 193 cases per 100,000 people. India reported about 440,000 TB-related deaths in 2020, which is roughly 30% of global TB deaths. It is estimated that 33% of the absolute people are infected with latent TB, with 40% coming from India[5]. In comparison to developed countries, T.B. is much more prevalent in developing countries. Human Immunodeficiency Virus (H.I.V.) coinfection with T.B. and the development of strains resistant to the most effective, 1st line T.B. drugs are the two main factors responsible for the existing epidemic caused by T.B.[6]. Tuberculosis remains a major global health challenge, with extrapulmonary TB accounting for 15–20% of cases in immunocompetent individuals. Musculoskeletal TB represents 1–3% of all TB cases, with sternal involvement being exceptionally rare, occurring in less than 0.5% of skeletal TB cases. Among all extrapulmonary tuberculosis (EPTB) cases, musculoskeletal TB accounts for 10–25%, with the spine being the most frequently affected site (50–69%), with 10–13% of instances occurring in the hip, knee, and ankle/foot[7].

Sternal tuberculosis is an uncommon type of TB that affects flat bones. It can happen alone or in conjunction with pulmonary tuberculosis. An isolated sternal primary cold abscess can be difficult to diagnose, especially when there is no evidence of pulmonary involvement[8]. Typically, the infection spreads from the chest's main location and could show up as an ulcer., a draining sinus, or edema, which frequently has systemic symptoms. On the other hand, in our instance, a solitary cold abscess of the sternum developed. without any constitutional signs of tuberculosis. While 60–80% of skeletal tuberculosis cases include the major weight-bearing joints or the spine., sternal TB accounts for only about 1% of cases.

The exact mechanisms underlying primary sternal TB in relation to TB of other organs remain unclear. Possible contributing factors include subclinical TB contamination and an immunocompromised state. Risk factors for sternal TB infection include living in or traveling to TB-endemic regions and having close contact with TB-positive individuals. Moreover, procedures like coronary artery bypass graft surgery that involves harvesting the left internal mammary artery, along with underlying conditions such as diabetes mellitus, increases the likelihood of postoperative sternal infections. Isolated sternal tuberculosis is more commonly reported than cases involving simultaneous TB infection of the sternum and other organs, as such infections made up 19.5% of cases. Also, postoperatively sternal mycobacterial infections has a highly variable latency period, appearing anywhere from a few weeks to several years after surgery.

Diagnosis of the disease is frequently delayed due to its nonspecific symptoms and gradual progression. Typically, patients experience symptoms for approximately 6.3 months before receiving a diagnosis. The clinical presentation is varied, with swelling and localized pain over the sternum being the most common symptoms. Some patients may develop skin ulcers or discharging sinuses. Although less common weight loss, fever, nocturnal sweats, and malaise are some possible

symptoms. In our patient, there were no early constitutional symptoms[9]. He first observed a painless swelling, which began causing discomfort over the past month due to its rapid enlargement. Subsequent evaluation confirmed primary sternal tubercular osteomyelitis accompanied by a cold abscess.

In most cases, blood test results are with the exception of an elevated erythrocyte sedimentation rate (ESR), within normal bounds. Chest X-rays are normal in around 70% of patients, while about 40% show evidence of tuberculosis at other sites, most frequently affecting the lymphatic system. Skin tests for tuberculin are positive in about 81% of patients with sternal tubercular osteomyelitis.

Radiological indicators may not be immediately apparent, and symptoms may last for a long time before being picked up by imaging methods. The location, extent, soft tissue abnormalities, and bone destruction can all be determined more accurately with CT and MRI than with plain X-rays, which frequently show no abnormalities. The typical CT presentation of sternoclavicular tuberculosis includes calcifications, underlying pleuro-parenchymal tubercular involvement, erosion of bone and cartilage, soft tissue masses that cross fascial planes with diffuse enhancement suggestive of granulation tissue and rim enhancement suggestive of abscesses. MRI is excellent in detecting bone marrow involvement and defining abscesses in soft tissues. Early signs of infection, such as cellulitis and myositis, are clearly visible on MRI. Cellulitis is characterized by Myositis causes hyperintensities of the afflicted muscles on T2-weighted imaging, whereas edema replaces the subcutaneous fat signal on T1-weighted images and enhances it., often accompanied by muscle swelling[10]. In later stages, MRI reveals other changes like bone destruction, joint effusions, and osteomyelitis. Additionally, MRI can identify the creation of sinus tracts, which show up on T2-weighted images as a linearly high signal intensity with a characteristic "tram-track enhancement" pattern. Although ultrasound has limited utility in the early stages, it becomes more useful later on for detecting abscesses, osteolytic lesions of the sternum, or rib lesions. In our patient, there was no involvement of the deeper planes.

A definitive diagnosis of sternal osteomyelitis requires aspiration or excisional biopsy for histopathological examination, as radiological findings alone cannot distinguish between different causes of osteomyelitis and may sometimes mimic neoplastic conditions[11]. Diagnosis is typically confirmed by the presence of AFB along with positive AFB cultures, along with histopathological evidence of caseous necrosis and granulomas. In cases where smear or culture results are negative, molecular tests such as PCR amplification and the CB-NAAT can provide additional diagnostic support.

ATT remains the primary treatment for sternal TB, typically consisting of a standard four-drug regimen administered over several months. Cold abscesses or fluid collections could be effectively managed through aspiration. Surgery is generally considered in specific cases, such as when an open biopsy is needed due to inconclusive needle aspiration, the presence of draining sinuses, severe bone or joint destruction requiring debridement, significant mediastinal involvement, secondary infection or mediastinitis, or disease progression despite appropriate ATT. Drainage after surgery is only recommended when the abscess persists despite aspiration and antitubercular therapy. Surgical intervention is primarily performed for persistent draining sinuses and extensive bone damage, involving meticulous debridement followed by closure using flaps like the rectus abdominis, latissimus dorsi, omental flaps, or pectoralis major. Reconstruction of the chest wall or vacuum-assisted closure might also be necessary, depending on the severity.

4. CONCLUSION

Mycobacterium tuberculosis-induced primary sternal osteomyelitis is still an uncommon occurrence. even in regions with high TB prevalence. Tubercular sternal involvement can manifest in diverse ways and affect individuals across all age groups. Due to its nonspecific symptoms, a high index of suspicion is crucial for timely diagnosis, which is often delayed. CT scans and MRI provide valuable diagnostic clues, but definitive confirmation relies on culture or histopathological examination. ATT is the main method of treatment. Draining abscesses surgically should be considered only when they fail to resolve with aspiration and ATT.

Fig 1: Clinical pictures showing the extent of the abscess

Fig 2: HRCT Thorax showing the extent of the abscess with osteolytic changes

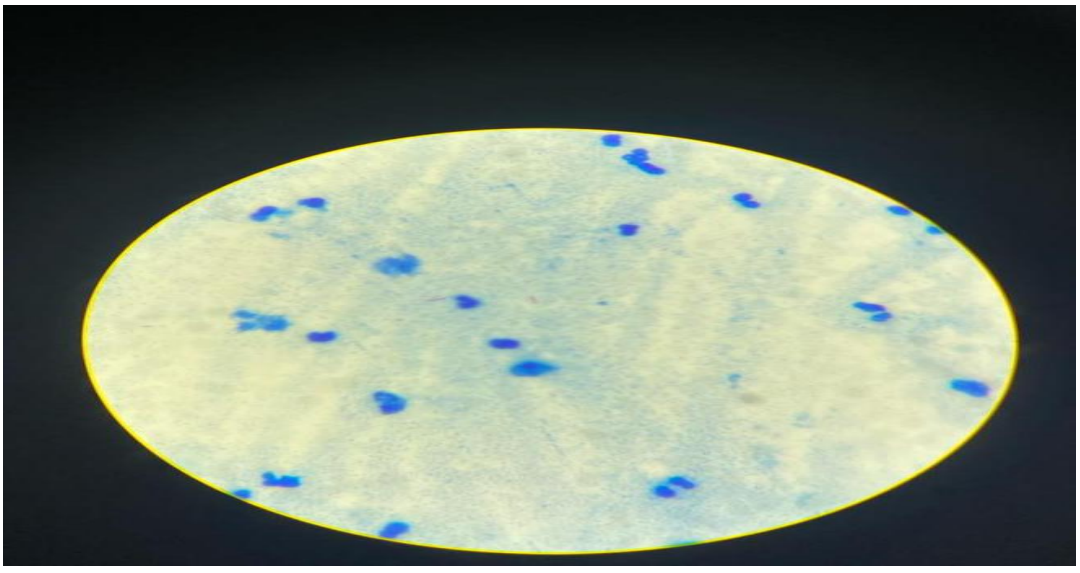

Fig 3: Positive AFB staining for the patient

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