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CASE REPORT

Rib Osteomyelitis in the postoperative period of an infant with congenital lobar emphysema: a case report

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Abstract

Osteomyelitis is one of the most prevalent invasive infections in children; however, costal arch osteomyelitis is extremely rare, accounting for only 1% of cases. The main etiologies are due to trauma, adjacent infections, or hematogenous spread. *Staphylococcus aureus* is the most prevalent pathogen, requiring the initiation of empirical antibiotic therapy for all patients suspected of having osteomyelitis. Symptoms and laboratory changes are nonspecific, and radiographs may not detect changes immediately. Magnetic resonance imaging is considered the gold standard for diagnosis, as it can detect changes more early on. In this study, we describe a clinical case of an infant diagnosed with congenital lobar emphysema who developed costal arch osteomyelitis in the late postoperative period following a lobectomy. This case illustrates the importance of early suspicion and diagnosis of this condition, as well as effective treatment to reduce morbidity and mortality associated with it.

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INTRODUCTION

Osteomyelitis is one of the most common invasive infections in the pediatric population, with an annual prevalence of 8 per 100,000 children in developed countries.[1] However, osteomyelitis of the costal arch is a rare event, accounting for only about 1% of all cases.[2] Its main etiologies include trauma, adjacent infections, or hematogenous dissemination.[3] The most common clinical manifestations are nonspecific, often presenting only with fever without localized signs, which contributes to the difficulty in establishing an early diagnosis.[4]

The present report describes a case of costal arch osteomyelitis following lobectomy in an infant diagnosed with congenital lobar emphysema.[5]

CASE SUMMARY

A 4-month-old infant had been hospitalized since birth due to congenital lobar emphysema involving the upper and lower lobes of the right lung. At 11 days of life, an emergency right upper lobectomy was performed due to worsening respiratory distress. However, the child remained dependent on mechanical ventilation and required a second surgical intervention at 47 days of life, when a right lower lobectomy was performed.

Two months after the last surgery, the patient developed fever, vomiting, and diarrhea. Laboratory tests and chest radiography were performed but showed no significant abnormalities. After two days of persistent symptoms, the infant's condition worsened, with marked irritability, respiratory distress, and tachypnea, prompting the initiation of empirical intravenous Cefepime.

However, the fever persisted for five days after starting the antibiotic. Repeat laboratory tests revealed leukocytosis (27,300/mm^3; 9% bands and 48% segmented neutrophils) and C-reactive protein (CRP) of 10.5 mg/dL.

After multidisciplinary discussion, a chest computed tomography (CT) scan was performed to better clarify the pulmonary condition, considering the postoperative anatomical alterations observed in prior radiographs. The CT revealed osteomyelitis of the right 3rd costal arch, involving the anterior two-thirds of the bone, along with a subcutaneous soft-tissue collection.

Blood cultures were negative, and bone-adjacent secretion was not collected, as the patient was already on day six of Cefepime therapy and was hemodynamically unstable in the pediatric intensive care unit (PICU). An immunodeficiency workup was performed and returned normal results.

Thus, Vancomycin was empirically added, resulting in defervescence and clinical improvement, and antibiotic therapy was maintained for six weeks. The infant showed complete resolution of symptoms and improvement in laboratory parameters after three weeks of intravenous antibiotics.

He remained hospitalized for completion of therapy due to other conditions requiring inpatient care. The child continued to exhibit significant tachypnea following the lobectomies, and oral feeding was contraindicated, necessitating the placement of a gastrostomy tube (GTT). The pediatric surgery team decided to perform the procedure after completing antibiotic therapy.

After six weeks of treatment, the infant was asymptomatic and hemodynamically stable, and the GTT was successfully placed without complications. He remained hospitalized briefly for diet progression and was subsequently discharged without sequelae from the osteomyelitis.

FIGURES I AND II

The infant showed complete resolution of symptoms and improvement in laboratory findings after three weeks of intravenous antibiotic therapy. The patient remained hospitalized to complete the intravenous treatment, as other medical conditions required continued inpatient care. Due to significant tachypnea following the lobectomies, oral feeding was contraindicated, and the placement of a gastrostomy tube (GTT) was indicated. The pediatric surgery team chose to perform the procedure after completing antibiotic therapy. After six weeks of treatment, the child was asymptomatic and hemodynamically stable, and the GTT was successfully performed without complications. The patient remained hospitalized briefly for diet advancement and was subsequently discharged without sequelae from the osteomyelitis.

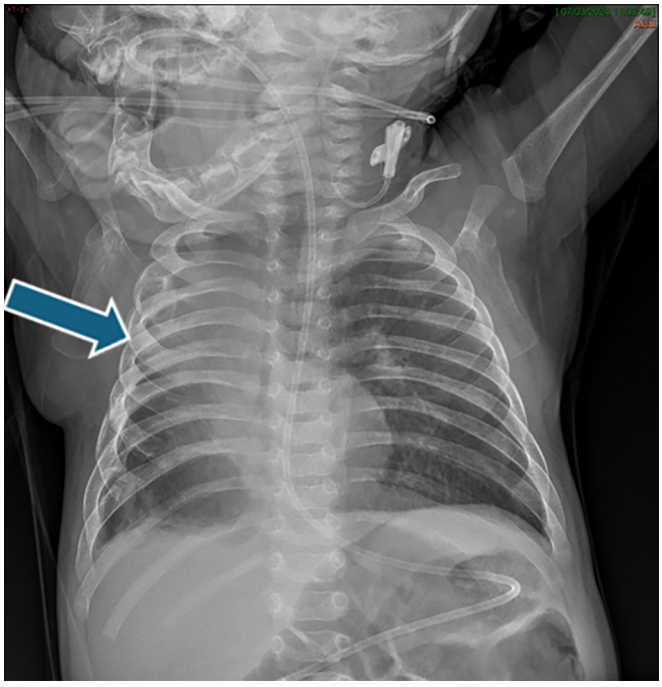


Figure 1. Chest Radiograph. Caption: CT scan and chest X-ray confirming the diagnosis of osteomyelitis of the right 3rd costal arch, involving the anterior two-thirds of the bone.

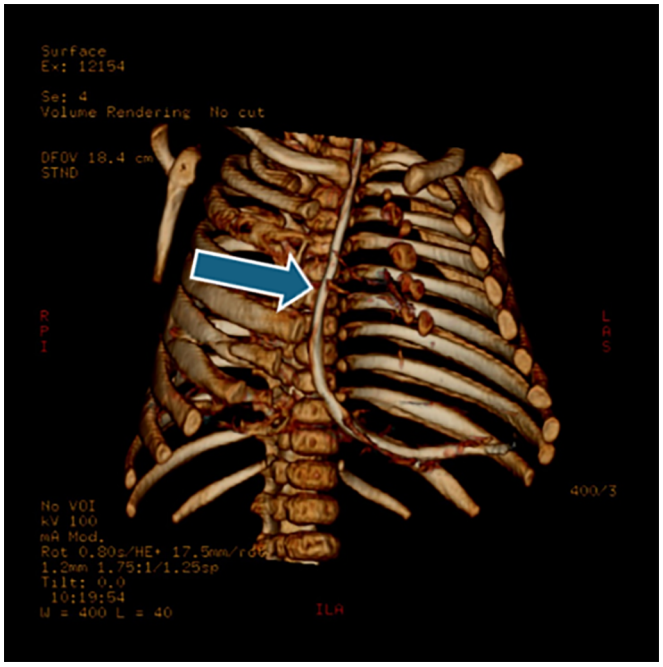


Figure 2. Chest Computed Tomography (CT). Caption: CT scan and chest X-ray confirming the diagnosis of osteomyelitis of the right 3rd costal arch, involving the anterior two-thirds of the bone.

DISCUSSION

Costal arch osteomyelitis is an extremely rare condition that may occur through hematogenous spread, as a consequence of trauma, or due to adjacent infection (such as cellulitis or pneumonia).[3] The hematogenous route is the most common, primarily affecting areas with greater blood supply — the costochondral junction anteriorly (76%) and the costovertebral angle posteriorly.[6] In the present case, the patient developed osteomyelitis in the anterior two-thirds of the costal arch, involving the costochondral junction. However, the primary cause of osteomyelitis could not be determined, since the patient had undergone prior thoracic surgery, suggesting that the infection may have resulted from either trauma or hematogenous dissemination.

The main clinical manifestations include fever, irritability, anorexia, and occasionally local pain, swelling, and erythema. Laboratory findings may show leukocytosis with neutrophilia and elevated C-reactive protein, although these are nonspecific and make the diagnosis of osteomyelitis particularly challenging.[7] In this case, the patient did not develop any localizing signs such as pain, erythema, or swelling, but instead presented with fever, irritability, vomiting, and respiratory distress. The nonspecific nature of these symptoms, along with the delay in laboratory abnormalities, contributed to a delay in diagnosis.

The most common pathogen is *Staphylococcus aureus*; however, in developing countries, *Mycobacterium tuberculosis* can also be identified, and fungal infections are possible in immunocompromised patients.[3,8] Less frequently, *S. pneumoniae*, *S. pyogenes*, and *Bartonella henselae* have also been reported.[2]

The most sensitive imaging modality for diagnosis is magnetic resonance imaging (MRI), but the gold standard remains culture of aspirated bone secretion or positive blood cultures.[2,6] Radiography often fails to detect osteomyelitis in its early stages, as bone destruction may take 2–3 weeks to become radiographically visible.[3] In this case, it was not possible to identify the causative pathogen, as the patient's clinical instability prevented sample collection, and blood cultures were negative. The initial chest X-ray was unremarkable, and the diagnosis of costal arch osteomyelitis was only suspected after computed tomography (CT) revealed bone involvement.

First-line antibiotic therapy for osteomyelitis typically includes beta-lactams such as Cefazolin or Cefepime, which are effective against the main pathogens, including *Staphylococcus aureus* (methicillin-sensitive), *Streptococcus pyogenes*, and *Streptococcus pneumoniae*. However, methicillin-resistant *Staphylococcus aureus* (MRSA) has become an increasing concern in both hospital and community settings due to its growing prevalence and multidrug resistance.[9]

Moreover, the biofilm formation by MRSA in osteomyelitis presents a major therapeutic challenge, as these infections are more resistant to eradication and may lead to serious complications, including death. Therefore, when infection by MRSA is confirmed or suspected, it is recommended to broaden antibiotic coverage with Clindamycin or Vancomycin.[9]

In this case, the patient was initially treated with a beta-lactam (Cefepime) but showed clinical worsening. Given that the child had been hospitalized since birth, the team decided to add Vancomycin, resulting in significant clinical improvement — suggesting a possible MRSA infection.

When feasible, the antibiogram from bone secretion or blood culture should guide antibiotic selection.[6] The duration of treatment depends on clinical evolution but is typically 4 to 6 weeks according to the literature.[1] If the child shows clinical, laboratory, and radiological improvement, a transition from intravenous to oral therapy may be considered, reducing hospitalization time.[1] In the reported case, the patient received Cefepime and Vancomycin for six weeks, showing marked clinical improvement within the first three weeks. However, due to other complex medical conditions, hospitalization was extended until the full six-week intravenous course was completed. After full recovery, the child was discharged without sequelae.

Conservative treatment is effective in over 90% of cases when osteomyelitis is diagnosed early. However, if clinical worsening occurs despite antibiotic therapy or in the presence of abscess formation, surgical drainage or debridement should be considered.[1,4]

CONCLUSION

The reported case and the reviewed literature highlight costal arch osteomyelitis as an extremely rare and diagnostically challenging condition. This difficulty arises because it may present only with nonspecific symptoms and may not be detected early on simple radiographs. Therefore, clinicians should remain alert to this possibility in order to achieve early diagnosis and effective treatment, ultimately reducing the morbidity and mortality associated with this infection.

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