

# Reconstruction of *E. coli* Osteomyelitis of Costa: A Case Report

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**Summary:** We report a case of *E. coli* osteomyelitis of the ribs in an immunocompetent 66-year-old man. After radical surgical debridement, bone and soft-tissue defects were covered with a rectus abdominis muscle flap. The postoperative course was uneventful, and there was no recurrence of chest symptoms. Among the various types of osteomyelitis, Gram-negative bacteria such as *E. coli* osteomyelitis is a relatively rare disease. Osteomyelitis is known to supervene in trauma or postoperative infection and to frequently begin with cellulitis, vascular access, endocarditis, or urinary tract infection, which spreads through the blood to the bone. To add to the difficulty of making a correct diagnosis, the early symptoms of osteomyelitis are often non-specific. We should never forget osteomyelitis in the differential diagnosis of these antecedent infections. (*Plast Reconstr Surg Glob Open* 2021;9:e3413; doi: 10.1097/GOX.0000000000003413; Published online 17 February 2021.)

Costal osteomyelitis is a relatively rare disease. The main causal bacterium is often *Mycobacterium tuberculosis* or Gram-positive anaerobic bacteria; there are a few cases of costal osteomyelitis caused by Gram-negative bacteria. We described a case of *Escherichia coli* (*E. coli*) osteomyelitis of the costa that was associated with an antecedent infection of acute epididymitis in an adult patient. The patient was successfully treated with radical debridement and a rectus abdominis muscle flap.

## CASE REPORT

A 66-year-old man was admitted to our hospital with a 2-week history of fever and swelling of the left scrotum with moderate pain. He had no past medical history. He was diagnosed with acute epididymitis and was prescribed antibiotics. The symptoms disappeared after 2 months, but he recognized a subcutaneous mass at his left precordia. Magnetic resonance imaging (MRI) suggested an inflammatory pseudotumor that had become a subcutaneous abscess. Skin incision and tissue biopsy were performed, and a bacterial culture grew *E. coli*. Cefazolin was administered for 1 week. One month later, he developed

wound infection (Fig. 1). A laboratory analysis showed an enhanced inflammatory response (Table 1); thus, the administration of cefazolin was restarted. MRI showed inflammation of, and fluid collection around, the left medial seventh costochondral junction and fistula toward the skin (Fig. 1). Based on these clinical findings, we diagnosed the patient with osteomyelitis of the seventh costal bone caused by *E. coli*. He underwent surgical debridement (Fig. 2), followed by negative-pressure wound therapy. The wound was reduced in size, but the fistula did not close (Fig. 3). The administration of cefazolin was ceased after 1 month of treatment. Thereafter, the wound infection relapsed. We therefore restarted the administration of cefazolin again. We also performed aggressive debridement of the remaining bone sequestrum and covered the defect with a rectus abdominis muscle flap (Fig. 3). After this surgery, we ceased the administration of antibiotics. We monitored CRP to ensure infection was cleared. The postoperative course was uneventful. At 2 years after surgery, there was no recurrence of chest symptoms (Fig. 4).

## DISCUSSION

Osteomyelitis, originating from hematogenous spread, remains a challenging condition for both the physician and the patient. The morbidity is frequently derived from primary infectious disease, including cellulitis, vascular access, endocarditis, and urinary tract infection, which spreads through the blood to the bone.<sup>1</sup> Osteomyelitis often affects the vertebrae and the pelvis in adults, and the femur and tibia in children.<sup>1</sup> Another report showed that it is a common infection in children, with common sites including the appendicular skeleton, lumbar vertebrae, and vertebral bodies.<sup>2-4</sup> Although extremely rare, it has

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Received for publication September 16, 2020; accepted December 10, 2020.

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DOI: 10.1097/GOX.0000000000003413

**Disclosure:** The authors have no financial interest to declare in relation to the content of this article.



**Fig. 1.** Photograph of the patient's left precordia. The wound had erythema and swelling with a warm feeling.



**Fig. 2.** A perioperative photograph of surgical debridement and sequestrectomy of the left seventh costa. It was positive for *E. coli*.

been reported in smaller bones, such as the ribs.<sup>1</sup> Costal osteomyelitis is usually unifocal and an extremely rare entity that accounts for <1% of all hematogenous osteomyelitis. In the ribs, hematogenous disease occurs at the site of the largest blood supply, where the bone is more metabolically active, anteriorly near to the costochondral junction (76%), posteriorly near to the costovertebral angle, as was observed in our case.<sup>3-5</sup> The earliest symptoms of rib osteomyelitis are often subtle and non-specific, and the diagnosis is frequently delayed. In most reported cases, the diagnosis came more than 6 months after the onset; consequently, surgery is often required for curative treatment. Early recognition and prompt treatment can allow a full recovery with antibiotic therapy and prevent severe complications, such as fracture, swelling, and abscess and bacteremia.<sup>1,6</sup> From an etiological point of view, the

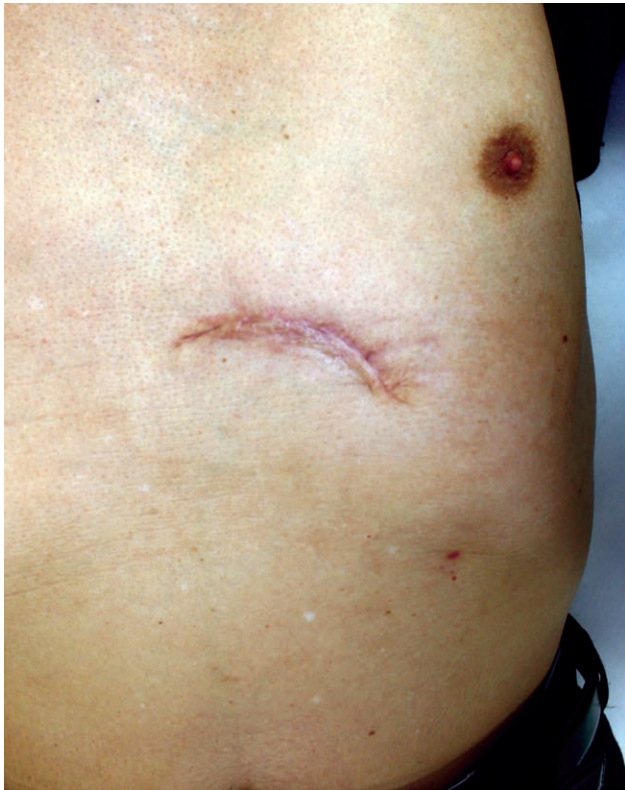
main causal microorganisms are *M. tuberculosis* and Gram-positive bacteria such as *Staphylococcus aureus*, *Hemophilus influenzae*, and *Actinomyces spp.*<sup>1</sup> Also, rib osteomyelitis mainly occurs due to *Staphylococcus aureus* in industrialized countries, contrary to the developing world, where it frequently occurs due to *Mycobacterium tuberculosis*.<sup>4,5</sup> On the other hand, Gram-positive bacteria, including *E. coli*, have been reported in a few cases. The entry point of *E. coli* rib osteomyelitis is usually the urinary or gastrointestinal tracts.<sup>1</sup> In this case, the route of infection seemed to be the urinary tract. It took about 3 months after the subcutaneous mass was recognized for osteomyelitis of the rib to be diagnosed. The patient was treated with antibiotics, surgical debridement, drainage, and partial resection, but these treatments did not lead to a full recovery. Free rectus abdominis muscle flap placement was ultimately required. Although he presented with common symptoms, including fever, chest pain, and abscess, there were other symptoms that made the diagnosis less obvious. When unclear symptoms and laboratory data showing generalized inflammation are found, physicians should consider osteomyelitis in the differential diagnosis. MRI is the most sensitive and

**Table 1. Laboratory Data at the Time of Exacerbation**

Hematology		Biochemistry	
RBC	475 × 10 <sup>4</sup> /µl	BUN	14 mg/dl
Hb	14.5 g/dl	Cr	0.81 mg/dl
Ht	44.3%	AST	20 mg/dl
WBC	7400 /µl	ALT	11 mg/dl
Seg.	76.5%	LDH	147 mU/ml
Eo.	2.9%	T-Bil	0.7 mg/dl
Baso.	0.3%	<b>Serology</b>	
Mono.	7.5%	CRP	4.78 mg/dl
Ly.	12.8%		
Plt	13.1 × 10 <sup>4</sup> /µl		



**Fig. 3.** Fifty days after surgery, the ulcer was reduced but was not completely epithelized. We therefore added debridement and placed a rectus abdominis musculocutaneous flap.



**Fig. 4.** There were no complications at 2 years after the second operation.

specific diagnostic test for rib osteomyelitis.<sup>6</sup> It allows for the identification of abscesses and differentiation between bone and soft-tissue infection. The presence of fluid-filled cavities in the soft tissues can be used to differentiate rib osteomyelitis from tumors. Another report showed that C-reactive protein (CRP) is useful in diagnosis and monitoring the course of acute hematogenous osteomyelitis.<sup>2</sup> In conclusion, the diagnosis of rib osteomyelitis requires a

high index of suspicion given its non-specific clinical manifestations, which can easily mimic other diagnoses, such as urinary tract infections, pneumonia, or bone tumors. Although rare, clinicians should be aware of the possibility of rib osteomyelitis.

### CONCLUSIONS

Among the various types of osteomyelitis, *E. coli* osteomyelitis is a relatively rare disease. We reported a case of *E. coli* osteomyelitis of the ribs in an immunocompetent adult, which was difficult to differentiate from a chest wall tumor. Osteomyelitis is known to supervene in trauma or postoperative infection and to begin with cellulitis, endocarditis, or urinary tract infection. We should keep osteomyelitis in mind when treating these antecedent infections.

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