

## Case Report



# Septic Arthritis of the Manubriosternal Joint in an Adolescent: A Case Report

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No potential conflict of interest relevant to this article was reported.

## ABSTRACT

Septic arthritis of the manubriosternal joint is a rare condition, especially in adolescents, who often present with nonspecific symptoms that can mimic more common conditions such as musculoskeletal chest pain, costochondritis. Here, we report a case of septic arthritis in a 17-year-old girl and highlight the challenges in diagnosing and managing this condition in adolescents. Initially presenting with acute chest pain diagnosed as transient nonspecific chest pain, the patient's subsequent visits to the emergency department unveiled escalating symptoms, including high fever, prompting advanced imaging. Ultimately, the diagnosis of septic arthritis of the manubriosternal joint was confirmed, with blood culture growth revealing Methicillin-sensitive *Staphylococcus aureus*. Diagnostic delays have been attributed to the absence of typical symptoms and patient reluctance to be hospitalized. Our case emphasizes the importance of considering rare infectious etiologies in adolescents with chest pain and emphasizes the need for heightened suspicion in unusual anatomical sites. Further research is required to elucidate the pathogenesis and risk factors associated with this condition to aid in prompt diagnosis and treatment.

**Keywords:** Adolescent; Arthritis, infectious; Manubriosternal joint; Septic arthritis

## INTRODUCTION

Septic arthritis of the manubriosternal joint is an uncommon condition that is particularly rare in adolescents and can present with vague symptoms mimicking other more common conditions including, but not limited to, musculoskeletal chest pain, costochondritis, chest wall trauma, and respiratory infections such as pneumonia.<sup>1,2)</sup> Adolescents in particular may present with atypical symptoms, making diagnosis challenging and potentially delaying appropriate treatment.

We present a case of septic arthritis of the manubriosternal joint in a 17-year-old girl, highlighting the unique challenges encountered in the diagnosis and management of this condition in adolescents. In this case report, we aimed to highlight the importance of considering rare infectious etiologies in adolescents presenting with chest pain and discuss the clinical course and management strategies employed in this challenging scenario.

**Author Contributions**

Conceptualization: Lee JK; Investigation:  
Park S, Lee JK; Methodology: Park S, Lee JK;  
Writing - original draft: Park S; Writing - review  
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**CASE**

A 17-year-old female presented to the emergency department (ED) with acute chest pain that had begun three hours prior to her visit. The pain, described as crushing in nature, was localized on the left side at the mid-sternal level. On the numerical rating scale (NRS), the intensity of pain was rated 8 out of 10. The onset of the pain was sudden while she was socializing with friends at a karaoke establishment. However, she denied any other recent events that might have caused physical exertion or emotional stress.

Despite experiencing excruciating pain, her vital signs were stable, with a blood pressure of 134/76 mmHg, heart rate of 86 bpm, respiratory rate of 20 breaths/min, and a body temperature of 37.6°C. Physical examination revealed clear breathing sounds and regular heartbeats without murmurs. No abnormalities were observed upon examination of the chest, including the sternal area; there were no signs of swelling, tenderness, warmth, or redness. Additionally, no other abnormal findings were noted. The patient's height (155 cm) fell within the 10–25th percentile, while her weight (59.7 kg) was in the 75–90th percentile.

Laboratory findings showed a slightly elevated white blood cell count of 13,560 cells/ $\mu$ L, with neutrophil dominance (neutrophil 81.0%, lymphocyte 12.3%, monocyte 4.6%, eosinophil 1.7%, and basophil 0.6%). The C-reactive protein (CRP) level was within the normal range at 0.07 mg/dL (normal range: 0–0.3 mg/dL), and cardiac markers, including troponin T, were also within normal limits. Electrocardiogram (ECG) and chest radiography findings were unremarkable.

The patient had a history of COVID-19 8 months prior, with an otherwise unremarkable medical history, which included, but was not limited to, trauma, congenital deformity, and primary immune deficiency. Following evaluation in the ED, she was diagnosed with transient nonspecific chest pain and discharged after two hours of observation and conservative management, which provided pain relief.

Thirteen hours later, she returned to the ED with worsening chest pain radiating to both shoulders and a fever of 39.0°C. Her CRP level was elevated at 3.88 mg/dL, but cardiac markers and ECG results were normal. The ED pediatrician recommended further evaluation with chest computed tomography and admission; however, the patient and her parents refused. The patient was discharged with a 3-day supply of acetaminophen after observation and pain control.

The following day, she visited the ED for a third time within a 48-hour period due to worsening chest pain and fever. At this time, the chest pain worsened with breathing and movement and was accompanied by mid-sternal tenderness. Her body temperature peaked at 40.1°C, and CRP was significantly elevated at 15.28 mg/dL. Additionally, mild swelling, measuring approximately 3×2 cm, was observed, along with mild tenderness in the sternal area. However, no signs of warmth or redness were present. Contrast-enhanced chest computed tomography revealed an irregular articular surface at the manubriosternal joint without definite swelling of the adjacent soft tissue.

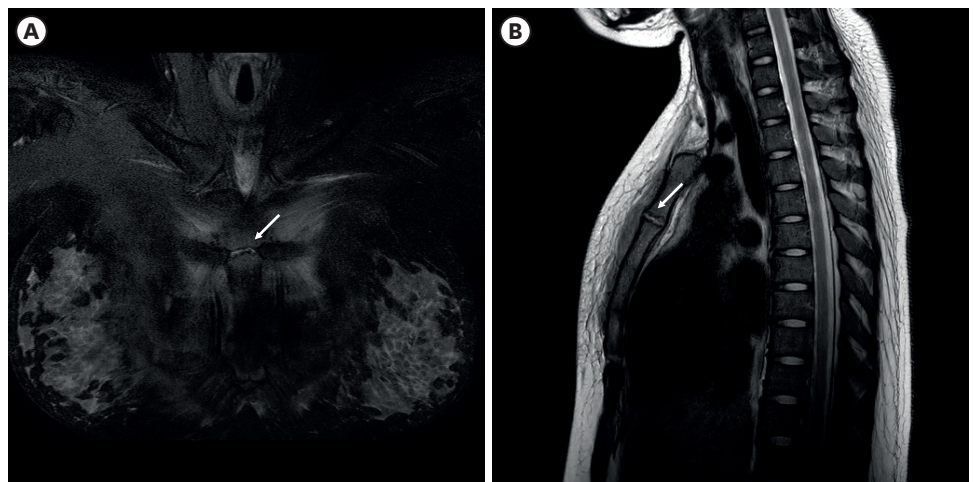
She was admitted to the pediatric ward and treated with intravenous antibiotics, including a combination of cefotaxime (2 g every 8 hours) and vancomycin (500 mg every 6 hours), based on a possible diagnosis of bacteremia or sepsis. As the possibility of endocarditis and/or pericarditis persisted, transthoracic echocardiography performed on hospitalization day 2 did

not reveal any abnormal findings. However, blood cultures obtained prior to admission (during the third visit to the ED) demonstrated bacterial growth (with a time to positivity of approximately 16 hours) in both samples, along with the presence of gram-positive cocci on staining.

On day 3, blood cultures confirmed methicillin-sensitive *Staphylococcus aureus* bacteremia. Additionally, a chest magnetic resonance imaging conducted on the same day revealed the following findings: articular surface irregularity with periarticular bone marrow signal change and enhancement at the manubriosternal joint, increased T2-weighted high signal change in the joint space, and an increased T2-weighted high-signal lesion with a non-enhancing portion in the pre- and retrosternal space around the manubriosternal joint, possibly indicating abscess formation, periarticular soft tissue swelling, and enhancement around the manubriosternal joint. The radiological diagnosis was septic arthritis of the manubriosternal joint (**Fig. 1**). Antibiotics were changed to first-generation cephalosporin (cefazolin, 2 g every 8 hours) based on the blood culture results. A consultation with the department of thoracic surgery was requested for possible abscess aspiration. However, upon review by the thoracic surgeons, it was advised that the attending physicians continue the antibiotics, as abscess formation was not definitively confirmed. Follow-up blood cultures drawn on day 3 showed no growth for both pairs.

The patient's fever and chest pain gradually improved during hospitalization, leading to her discharge on day 8 after completing an 8-day course of intravenous antibiotics. Upon discharge, she was prescribed oral antibiotics, specifically cephadrine. Two weeks after discharge, follow-up in the pediatric infectious disease outpatient clinic showed resolution of symptoms with no recurrence of fever or chest pain. Oral antibiotics were prescribed for 2 weeks. The patient did not return to the outpatient department for further follow-up, despite having an appointment scheduled 2 weeks later. Recent communication with the patient after more than 1 year since admission revealed that she is currently in good health, without any medical conditions, and has started her freshman year.

This study was approved by the Institutional Review Board (IRB) of the Chungbuk National University Hospital (IRB No. 2024-01-006). Written informed consent was obtained from the patient and her guardian for publication of this report.



**Fig. 1.** T2-weight coronal (A) and sagittal (B) magnetic resonance images of the chest wall demonstrating articular surface irregularity with periarticular bone marrow signal change and enhancement at the manubriosternal joint. White arrows indicate the manubriosternal joint.

## DISCUSSION

Herein, we present a case of septic arthritis of the manubriosternal joint in a 17-year-old female adolescent caused by Methicillin-sensitive *S. aureus* diagnosed by blood culture and imaging of the affected site. The diagnosis of the specific diseases was accomplished after multiple visits to the ED, partly because of limited awareness of the diagnosis. The ambiguity of symptoms, which did not align with typical bacterial arthritis presentations, further complicated the diagnostic process.

The diagnosis of bacterial arthritis is typically considered in patients presenting with fever and joint pain.<sup>3)</sup> While fever is often a key indicator in the diagnostic process, its absence does not rule out infection, especially in patients with immunosuppression. As the patient initially presented without fever, the possibility of infection may not have been considered immediately. Furthermore, a recent visit to a karaoke establishment may have led ED physicians to attribute chest pain to exertional activities. The patient's reluctance to be hospitalized during her second visit, which is not uncommon among teenagers, further contributed to the diagnostic delay.

The manubriosternal joint, known by multiple names including manubriosternal articulation, sternal angle, xiphisternal joint, and jugular notch, may be overlooked as a site of infection by physicians, including pediatricians. Despite its various names, this joint primarily comprises the manubrium and sternum.<sup>4)</sup> Consequently, physicians may not recognize it as a potential site for infection unless they possess a broad understanding of bone anatomy, as is the case in orthopedics.

Due to the rarity of this condition, little is known about its pathogenesis. However, patients predisposed to manubriosternal joint infections typically exhibit certain risk factors. These risk factors include, but are not limited to, intravenous drug abuse, immunosuppressive drugs, inflammatory joint disease, and primary sources of infection elsewhere.<sup>1)</sup> Above all, the incidence of septic arthritis of the manubriosternal joint itself is rare in an otherwise healthy person. Furthermore, despite a few case reports, a review of cases in adults demonstrated a median age of 42.5 years (range, 20–75 years) with a male predominance (70%).<sup>1,5,6)</sup> Therefore, the current case of a 17-year-old female is quite exceptional.

To the best of our knowledge, no case of septic arthritis involving the manubriosternal joint has been reported in individuals under the age of 18 years, despite recent publications on rib osteomyelitis in children.<sup>7)</sup> We conducted an extensive investigation into the patient's history to identify possible risk factors, including those mentioned above. Although Korea is not known for its high rate of intravenous drug abuse, we considered all possibilities. However, no notable needle marks were observed on either arm. We also explored the potential association with tattooing, which could lead to hematogenous spread of the infection. The patient reported only having a single sticker tattoo and no recent piercing history. Despite our thorough investigation, we were unable to identify any risk factors, including recent chest trauma.

In retrospect, the relatively early transition to oral antibiotics in this case, despite the unusual site of infection, is notable. Both randomized trials and observational research have demonstrated that administering intravenous antibiotics for short durations (approximately 7 days) followed by oral medication is equally effective in treating bacterial arthritis in children compared to longer periods of parenteral therapy.<sup>8)</sup> We believe that this approach likely yielded similar results in the current case, contributing valuable insights to the literature. However, due to the rarity of

septic arthritis of the manubriosternal joint, we did not encounter case with complications from inadequate treatment, underscoring the importance of ongoing monitoring in such cases.

One limitation of this case report is our inability to identify a specific risk factor for the development of septic arthritis in the manubriosternal joint, leaving open the slight possibility of a remote site of infection or inflammation leading to secondary joint involvement. However, given that the authors followed up with the patient for more than a year after hospitalization, the likelihood of an underlying malignancy contributing to the condition is considered low.

In conclusion, this case underscores the importance of considering rare diagnoses such as septic arthritis of the manubriosternal joint in patients with atypical symptoms. Diagnostic delays may result from a limited awareness of the condition and ambiguous symptomatology. Physicians should maintain a high index of suspicion for infection at unusual anatomical sites, such as the manubriosternal joint, particularly when typical presentations are absent. Further research is warranted to enhance our understanding of the pathogenesis and risk factors of this condition to facilitate timely diagnosis and management.

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## 요약

Manubriosternal 관절의 패혈성 관절염은 특히 청소년에서 드물게 발생하는 질환으로, 종종 근골격 흉통, 갈비뼈염 등과 같은 보다 흔한 진단과 비슷하게 비특이적 증상으로 나타난다. 우리는 17세 소녀의 패혈성 관절염 사례를 보고하며 이러한 질환의 진단과 치료에 대한 어려움을 강조한다. 처음에는 일시적 비특이적 흉통으로 진단된 급성 흉통으로 시작하여, 환자의 응급실 재방문에서 고열과 같은 증상이 심화되어 추가적인 영상 촬영을 진행하였다. 결과적으로 Manubriosternal 관절의 패혈성 관절염 진단이 확인되었으며, 혈액 배양 결과 메티실린 감수성 황색포도상구균이 검출되었다. 진단 지연은 전형적인 증상의 부재 및 환자의 입원에 대한 소극적 태도 등이 영향을 끼친 것으로 보인다. 이 사례는 흉통이 있는 청소년에서 드문 감염 원인을 고려하는 중요성과 전형적이지 않은 해부학적 부위에서의 감염 의심의 필요성을 강조한다.