Case Report

Pyogenic Arthritis of the Left Sternoclavicular Joint with Clavicular Osteomyelitis and Mediastinal Abscess without Obvious Triggers: A Case Report

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ABSTRACT

A 51-year-old woman visited the hospital because of pain and swelling in the left anterior chest region. Computed tomography revealed a large abscess with bone destruction in the left sternoclavicular joint and gas patterns from the subcutaneous tissue to the anterior mediastinum. There was no history of bone destruction of the sternoclavicular joint. Pathological examination revealed inflammatory cell infiltration in the bone and granulation tissue but no other lesions. Hence, a combined diagnosis of pyogenic arthritis of the left sternoclavicular joint, clavicular pyogenic osteomyelitis, and mediastinal abscess was made. The patient was treated three times with surgical debridement and antibiotics for 63 days. No recurrence was observed after discharge, and the patient is currently receiving regular outpatient care.

Key words: clavicle osteomyelitis, mediastinal abscess, pyogenic arthritis of the sternoclavicular joint

Introduction

Sternoclavicular pyogenic arthritis is a rare condition. It accounts for approximately 9% of all reported cases of pyogenic arthritis. It may cause serious complications, such as chest wall abscess and mediastinitis, and increase the risk of irreversible tissue damage. Therefore, early diagnosis and treatment are important.

We treated a case of pyogenic arthritis of the left sternoclavicular joint with clavicular osteomyelitis and mediastinal abscess without obvious triggers. The patient's condition improved with surgical debridement and antimicrobial therapy.

We report this rare case and review the relevant literature.

Case presentation

A 51-year-old woman visited our hospital with a chief complaint of left precordial swelling. She had a history of hypertension, hyperlipidemia, manic depression, and a bruise on her left clavicle that occurred in February 2017. From late October 2019, she became aware of pain in the left clavicle region, and from November 5 2019, she experienced severe pain and left precordial swelling, resulting in difficulty in raising her upper left arm. She visited a nearby physician on November 8 2019. Ultrasonography was performed, which was suggestive of subcutaneous abscesses. She was referred to our department and was urgently hospitalized on the same day because computed tomography (CT) revealed a mediastinal abscess with gas imaging. There was no specific incident, such as recent trauma, which could have caused the left clavicular pain.

The physical findings at the initial examination were as follows: height, 157.0 cm; weight, 81.1 kg; BMI, 32.9 kg/m²; body temperature, 38.9 °C; blood pressure, 149/106 mmHg; and heart rate, 119 beats/minute. She had a fist-sized swelling with a rippled surface and tenderness from the median precordium to the left clavicle. Signs of skin lesions including erythema were not observed (Fig. 1a). Table 1 shows the results of the blood examination. Chest radiography revealed no obvious abnormalities in the sternoclavicular joint (SCJ) or left clavicle (Fig. 1b). Contrast-enhanced CT images of her chest revealed bone destruction and osteosclerosis in the left SCJ.
CT also revealed abscesses with gas patterns and soft tissue shadows extending from the subcutaneous intramuscular regions around the left SCJ and the first sternocostal joint to the anterior mediastinum in the thoracic cavity; the abscess had compressed the left brachial vein (Fig. 2a, b).

We deemed it necessary to make an emergency incision for drainage based on the high degree of inflammation indicated by blood examination and the large size of the abscess formation with gas patterns indicated by CT images. We included tuberculosis and malignant tumors as the underlying causes of the bone destruction of the SCJ in the differential diagnosis. We performed surgical drainage and debridement on admission.

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**Table 1. Blood examination on admission**

| Variable                  | Value   | Reference value |
|---------------------------|---------|-----------------|
| White blood cells /µl     | 12,600  | 3,300-8,600     |
| Red blood cells ×10 /µl   | 354     | 386-492         |
| Hemoglobin g/dl           | 10.9    | 11.6-14.8       |
| Hematocrit %              | 32.8    | 35.1-44.4       |
| Platelets ×10 /µl         | 34.6    | 15.8-34.8       |
| Total protein g/dl        | 6.9     | 6.6-8.1         |
| Albumin g/dl              | 3       | 4.1-5.1         |
| Asparate aminotransferase U/l | 53     | 13-30           |
| Alanine dehydrogenase U/l | 115     | 7.0-23.0        |
| Lactate dehydrogenase U/l | 304     | 124-222         |
| Alkaline phosphatase U/l  | 677     | 106-322         |
| Creatine kinase U/l       | 622     | 41-153          |
| Total bilirubin mg/dl     | 1.13    | 0.4-1.5         |
| Blood urea creatinine mg/dl| 6.8    | 8.0-20.0        |
| Creatinine mg/dl          | 0.82    | 0.46-0.79       |
| Sodium mmol/l             | 142     | 138-145         |
| Potassium mmol/l          | 3.7     | 3.6-4.8         |
| Chloride mmol/l           | 101     | 101-108         |
| Glycosylated hemoglobin % | 5.9     | ≤6.0            |
| C-reactive protein mg/dl  | 23.29   | ≤0.14           |
| Procalcitonin ng/ml       | 0.31    | ≤0.05           |
| Prothrombin time seconds  | 11      |                 |
| Activated partial thromboplastin time seconds | 32.3 | 24-39 |
| D dimer ug/ml             | 3.4     | ≤0.5            |

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Fig. 1.  
a: Chest findings on admission. Swelling was observed in the left anterior chest region without redness of skin.  
b: Chest radiograph on admission. Decrease in the radiolucency of the left lung. No obvious abnormalities suggestive of bone destruction, neoplasm, and pulmonary tuberculosis.
the same day after confirming that the abscess exudate and induced sputum were negative for acid-fast bacteria using a smear test. T-Spot, polymerase chain reaction, and bacterial culture were later confirmed to be negative for tubercle bacillus. Bone destruction and granulation tissue formation were observed intraoperatively in the left SCJ. There was a large quantity of yellowish-white purulent exudate between the soft tissues deep to the clavicle (Fig. 3). We roughly sutured the wound and placed a Penrose drain under the skin after washing with povidone-iodine (ISODINE®) solution. Tazobactam/piperacillin (4.5 g, thrice daily) was administered after the surgery. A plain chest CT, which was obtained the next day, confirmed significant abscess reduction and no damage to the surrounding large vessels (Fig. 4). Histopathological examination of the clavicle and granulation tissue around the SCJ and the posterior aspect of the sternum (obtained intraoperatively) indicated a high degree of inflammatory cell infiltration (mainly neutrophilic leukocytes) but no neoplastic changes (Fig. 5). Therefore, we diagnosed pyogenic arthritis of the left SCJ, clavicular pyogenic osteomyelitis, and mediastinal abscess. We continued to wash the wound with povidone-iodine solution, and her fever decreased to approximately 36 °C on the third day of hospitalization. We performed additional debridement of the purulent soft tissues and removed the sequestrum from the sternum and clavicle at the fracture site of the left SCJ. Two Penrose drains were placed on the posterior surface of the sternum. Methicillin-sensitive Staphylococcus aureus was detected from the culture of pus obtained from a sterile puncture. We switched to cefazolin (2 g, twice daily) on the tenth day of hospitalization. We continued washing the site with physiological saline solution every day. We performed the third debridement of the hematoma and soft tissues around the left SCJ. A J-VAC (Johnson & Johnson, New Jersey, USA) drain was placed subcutaneously, and the wound was closed on the 17th day of hospitalization. Blood examination performed the next day indicated an improvement in the inflammation.
leukocyte count: 4,100/µL, C-reactive protein: 0.48 mg/dL; thus, the antibiotic was changed to cefaclor (250 mg, thrice a day, oral administration) on the 19th day of hospitalization. The pus culture of the intraoperative specimen obtained during the third surgery was negative. The drain was removed on the 24th day of hospitalization. The inflammatory response improved (Fig. 6), and she was discharged on the 31st day of hospitalization without evidence of reformation of abscess or hematoma on simple CT. Oral administration of antibiotics was continued until the 63rd day after hospitalization. No recurrence was observed on the 86th day after discharge. She is currently receiving regular outpatient care.

Discussion

Previously reported osteolytic lesions of the clavicle include osteoma, multiple myeloma, giant cell tumor, tuberculous osteomyelitis, and pyogenic osteomyelitis. SCJ infection was reported in 1.3% of patients with tuberculosis. Although rare, it is necessary to rule out the possibility of tuberculosis to prevent infection. Neoplasms and tuberculosis were carefully ruled out in this patient. Diagnoses of pyogenic arthritides of the SCJ and pyogenic osteomyelitis were made only after histopathological examination of the surgical specimen.

Sternoclavicular pyogenic arthritis is a rare condition. It accounts for only 1–9% of cases of pyogenic arthritis. Ross et al. studied 180 patients with pyogenic arthritis of the SCJ. They reported an average age of onset of 45 years, with risk factors including frequent use of intravenous drugs (21%), distal infection (15%), diabetes mellitus (13%), trauma (12%), and central venous line infection (9%); 23% patients developed the disease in the absence of any risk factors. Barkat Ali et al. listed obesity as one of the risk factors of SCJ infection. The only risk factor for sternoclavicular arthritis in this case was obesity and a history of left clavicle bruise two years ago. She had not received any direct injury to the SCJ just before disease onset that could have triggered it. Moreover, she did not have pneumonia, cellulitis, endocarditis, gingivitis, urinary sepsis, septic pulmonary embolism, bacterial peritonitis, intraperitoneal abscess, miliary tuberculosis, or burn wound infections in the forearm, which have been reported as foci of distant infections that can spread hematogenously and cause pyogenic sternoclavicular arthritis and clavicle osteomyelitis. The exact pathogenesis remains unknown.

Two cases of pubic osteitis (a condition involving inflammatory alteration of the bone due to trauma or overuse), which advanced to pyogenic pubic symphysis osteomyelitis, have been reported. A mechanism was described where increased blood flow during the process of spontaneous healing increased the susceptibility to hematogenous bacterial infection, leading to pyogenic osteomyelitis. Our patient worked as a convenience store clerk and carried heavy things during her daily work. If the same theory was applied to the clavicle and SCJ, the possibility that chronic inflammation caused by local discomfort and daily load at the site of bone and SCJ capsule inflammation or a small fracture site (which was not visible on CT), caused by the bruising, was complicated by bacterial infection, leading to the onset of pyogenic osteomyelitis, pyogenic SCJ, and mediastinal abscess cannot be completely denied. However, it is unlikely that the bruising contributed to the pyogenic arthritis in this case because no pain or swelling was observed in the same area after the bruising improved. The causality remains unclear, as the presence of a hematogenous bacterial infection was not proven, since the blood culture on admission was negative.

Clinical findings, enhanced inflammatory response on blood examination, and imaging tests are useful for the diagnosis of pyogenic arthritis of the SCJ. The clinical features of this
disease include tenderness of the SCJ (90%), precordial pain (78%), fever above 38 °C (65%), shoulder pain (24%), and reduced range of motion of the shoulder joint (17%). This disease should be considered in the differential diagnosis in patients with these symptoms. However, since the SCJ capsule is reinforced with a strong sternoclavicular ligament and there is little exudation from the joint, the disease exhibits few clinical features, with an average duration of 14 days before the appearance of symptoms. In this case, the duration between onset and increase in the severity of symptoms, which led the patient to seek medical assistance, was thought to be long. In fact, histopathological examination of the bone and soft tissue of the SCJ obtained intraoperatively revealed that bone destruction and granulation tissue formation were advanced, along with signs of osteomyelitis. Although there are no standardized diagnostic algorithms for pyogenic arthritis of the SCJ, diagnosis is based on the above-mentioned clinical and image findings such as bone destruction, joint space enlargement, and infectious complications by ultrasound, radiography, CT, and MRI. Gram stain and culture of joint fluid obtained by arthrocentesis and blood revealed a bacterial infection. Pathological examination of the surgical specimen confirmed the diagnosis of SCJ infection.

CT and magnetic resonance imaging (MRI) are more useful than simple radiographic examination. An MRI is reportedly better for evaluating abscess formation and visualizing the SCJ, sternocostal joints, and soft tissues. Moreover, pyogenic arthritis of the SCJ is often associated with serious complications such as osteomyelitis (55%), chest wall abscess (25%), and mediastinitis (13%); while abscess expansion above the SCJ can cause a deep neck abscess. Therefore, a delayed diagnosis may significantly affect the prognosis despite the low incidence of pyogenic arthritis of the SCJ. It is vital to accurately understand the pathological condition with a whole-body scan using CT/MRI to evaluate complications and detect potential distant foci of infection.

Pyogenic arthritis of the SCJ is treated with surgical debridement and antibiotic administration. An abscess or sequestrum caused by bone destruction and osteomyelitis requires early drainage or sequestrum removal. Any remaining infected bone or cartilage may cause reinfection. If the infection involves a wide area, adequate surgical management is required, including SCJ and rib resection. Careful attention should be paid not to damage the adjacent great vessels, and cooperation with other departments such as thoracic surgery and orthopedic surgery is essential during surgery in the SCJ, posterior sternum, and thorax area. We were able to close the wound with sutures after infection sedation in this patient. However, two-stage closure using plastic surgical treatments such as flaps and negative pressure wound therapy should also be considered to fill the dead space created by tissue deficiency, if debridement is performed over a wide area.

Pyogenic arthritis of the SCJ is most frequently caused by S. aureus (49%), followed by Pseudomonas aeruginosa, Brucella sp., and Escherichia coli. The empirical selection of antibiotics should involve drugs that are effective against S. aureus. Antimicrobial agents that can cover methicillin-resistant S. aureus and P. aeruginosa should be chosen, especially for
patients with specific risk factors. The duration of administration of antimicrobial agents is long: 4 weeks for pyogenic arthritis of the SCJ without complications, and 6 weeks if it is associated with osteomyelitis or mediastinitis. Previous studies reported that the average duration of administration was 41 days in patients undergoing conservative treatment alone using antimicrobial agents and 52 days in patients undergoing surgical treatment\(^5\). In this case, early surgical treatment and long-term antibiotic administration resulted in good outcomes.

**Conclusion**

We encountered a rare case of pyogenic arthritis of the SCJ in a woman who only had a risk factor of obesity (and possibly trauma two years ago). This rare condition is frequently associated with complications and potential primary foci in other parts of the body, requiring early diagnosis and full body examination. Early and adequate surgical management and antimicrobial agent treatments lead to better prognoses. From an anatomical perspective, careful attention should be paid to the intraoperative procedures, and cooperation with other departments is essential. Furthermore, long-term antibiotics and follow-up are necessary, even after resolution of infection to prevent recurrence.

**Conflicts of interest**

The authors have no conflicts of interest associated with this manuscript.

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