

A 7-Year-Old Boy With Left Sternoclavicular Swelling

Lisa L. S. Wong, MBBS, FRCR, and Wilfred C.G. Peh, MD, FRCP, FRCR

ABSTRACT

This case is presented to illustrate the imaging and clinical findings of a condition of interest to orthopaedic surgeons. The initial findings are noted on this page. The clinical and imaging diagnoses are presented on the following pages.

Dr. Wong is Senior Medical Officer, Department of Radiology, Queen Mary Hospital, Hong Kong, China.

Dr. Peh is Clinical Professor, Senior Consultant and Academic Head, Department of Diagnostic Radiology, Singapore General Hospital, Singapore.

Address correspondence to Professor Wilfred C.G. Peh, Department of Diagnostic Radiology, Singapore General Hospital, Outram Road, Singapore 169608; Tel: (65) 63266908, Fax: (65) 63265161, Email : gdrpcg@sgh.com.sg

CASE PRESENTATION

A 7-year-old boy presented with left sternoclavicular swelling for 2 months. There was no history of trauma, pain, or other sites of joint or bone involvement, and the patient had no fever or limitation of movement. The swelling did not subside with topical application of herbal medicine. Physical examination showed a prominent left sternoclavicular joint but no evidence of acute inflammation. The patient had full range of shoulder and cervical spine movement. Significant laboratory findings included a raised erythrocyte sedimentation rate (ESR) and leukocytosis.

What do the localized view of the chest radiograph and computed tomography (CT) of the left sternoclavicular joint show (Figures 1 and 2)?

What is your diagnosis? The correct diagnosis identified on the following page.



Figure 1. Anteroposterior chest radiograph coned to the sternoclavicular joints.

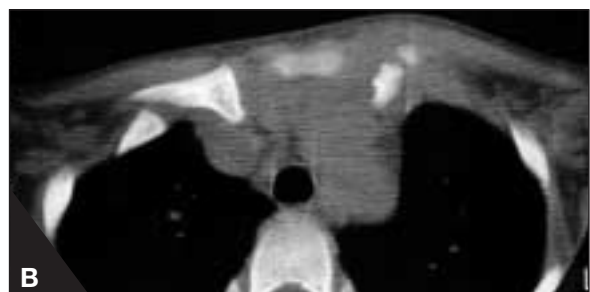
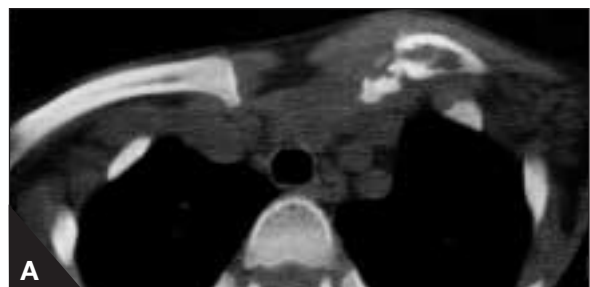


Figure 2. Axial CT scans of the (A) medial shafts of the clavicles and (B) sternoclavicular joints.

CORRECT DIAGNOSIS **Left Clavicular Head** **Osteomyelitis and Sterno-** **clavicular Septic Arthritis**

The localized view of the chest radiograph (Figure 1) shows an ill-defined osteolytic lesion enlarging the medial end of the left clavicle, with superior cortical destruction and periosteal new bone formation. These radiographic features are indicative of an aggressive process. Axial CT scans (Figures 2A and 2B) show expansion, osteolytic destruction, and fragmentation of the medial end of the left clavicle with involvement of the articular surface. There is bulging and thickening of the adjacent soft tissues anteriorly and medially. The right sternoclavicular joint is normal. No extension into the mediastinum is evident.

Open biopsy of the left clavicular lesion yielded multiple fragments of dark-brownish soft tissue mixed with bony fragments. Histopathological examination showed fragments of polymorphs in granulation tissue, fibrous connective tissue, and calcified bony fragments. There were focal multinuclear giant cells, but no definite granuloma formation was seen. Malignant cells were not detected. The Ziehl-Neelsen stain for acid-fast bacilli was negative. Culture of the material yielded heavy growth of *Staphylococcus aureus*, confirming the diagnosis of pyogenic septic arthritis of the left sternoclavicular joint.

The patient was treated with antibiotics for 6 weeks. The ESR returned to normal after treatment. The patient remains well at 3¹/₂ years of follow-up.

DISCUSSION

Infection of the sternoclavicular joint is an uncommon clinical entity that is often misdiagnosed on initial presentation. There are many recognized risk factors that predispose individuals to septic arthritis of the sternoclavicular joint. These include diabetes mellitus, intravenous drug abuse, human immunodeficiency virus infection, immunosuppression, clavicular fracture, pustular skin disease, rheumatoid arthritis, and subcla-

vian venous catheterization.¹⁻⁴ Sternoclavicular joint infection has also been reported in healthy patients with no significant medical history or predisposing factors.^{5,6}

The etiological agent in most cases is *Staphylococcus aureus*, although other pathogens have been reported—for example, group G streptococcus and *Proteus* and *Propionibacterium* species.^{1,3,4} Sternoclavicular brucellar arthritis has also been reported.⁷ Most of the infections occur by hematogenous spread from a distant focus or by contiguous spread. Septic involvement of the joint secondary to subclavian venous catheterization may rarely occur.² Specimens from biopsy at the site of lesion are more likely than blood culture to yield positive results.

Clinical Presentation

The clinical presentation is variable. The onset of symptoms is usually insidious but may range from 1 day to 2 months or even years. Patients may present with atypical chest pain or anterior chest discomfort that may simulate pain from the cardiac or pulmonary organs. Many have a low-grade fever, with or without chills. Systemic symptoms, including malaise and weight loss, may occur. Some patients, however, are afebrile and have a normal white cell count.

On physical examination, the distribution of infection is monoarticular. There may be swelling, tenderness, erythema in the sternoclavicular region, and restricted motion in the ipsilateral shoulder.

Occasionally, the patient may present in septic shock. More unusual presentations that have been reported include bilateral sternoclavicular joint involvement with cutaneous chest wall abscesses and life-threatening pyogenic mediastinitis.^{3,4,6,8,9}

Radiological Diagnosis

Radiological diagnosis may often be delayed. On radiographs, the bony changes described may be predominantly sclerotic, predominantly lytic, or mixed. Occasionally, soft tissue swelling, cortical erosion, periosteal reaction, and, in later stages, sequestrum formation

may be demonstrated. In infants, the development of periosteal new bone is often more rapid and exuberant than in older children and adults, although sequestration is less frequently encountered.

Radiographic diagnosis is difficult, as the radiographic features are often subtle and may be overlooked on radiographs if they are obscured by overlying ribs and soft tissues.

Computed Tomography and Nuclear Medicine

Conventional tomograms can increase sensitivity by revealing subtle erosions and subchondral destruction, but the patient will incur a higher irradiation dose. Nuclear medicine scans—for example, a technetium-99m radionuclide bone scan—are more sensitive and may be positive within hours to days but are not specific. Conventional computed tomography (CT) yields superior tissue contrast, although respiratory motion artifact may obscure details. Modern spiral CT scanners minimize motion artifact and have the added advantage of demonstrating a rapid-contrast bolus that enables one to distinguish the adjacent vasculature. It is also superior to the other techniques described above in that soft tissue involvement can be clearly demonstrated, and fine detail can be obtained using bone settings. In selected cases, coronal, sagittal, and/or oblique reconstructions of data may be performed.

CT findings in cases of sternoclavicular infection, include widening of the joint space, irregular subchondral bone and destruction, soft tissue thickening, and soft tissue infiltration. In later stages of clavicular head osteomyelitis, periosteal reaction, sequestra, reactive sclerosis, sinus tract formation, retrosternal abscess, and mediastinitis may be shown.

CT is useful in the follow-up evaluation and in guided needle aspiration of the infective process.^{3,9-11}

Magnetic Resonance Imaging

In cases of bone and joint infection, magnetic resonance (MR) imaging

demonstrates joint effusion, joint capsule distension, marrow edema, and erosions. Its advantages over CT include improved detection and delineation of abnormalities involving the bone marrow, cartilage, extra-articular soft tissues, and joint space; multiplanar capabilities; lack of an ionizing radiation hazard; and improved contrast resolution. The disadvantages of MR imaging compared with CT include decreased spatial resolution, motion artifact, longer examination times, less sensitivity to cortical erosions and calcification/ossification, and higher cost.

Management

Complications of sternoclavicular osteomyelitis can include chest wall abscess, retrosternal abscess, superior vena cava syndrome, and mediastinitis, particularly if diagnosis and treatment are

delayed. Septic shock leading to death may develop.^{3,7-9}

For minor infections of the sternoclavicular joint, appropriate antibiotic treatment alone is adequate.²⁻⁴ In more fulminant cases, particularly when simple drainage and débridement are ineffective, aggressive surgical management, including resection of the sternoclavicular joint, has been advocated.⁴

REFERENCES

1. Covelli M, Lapadula G, Pipitone N, Numo R, Pipitone V. Isolated sternoclavicular joint arthritis in heroin addicts and/or HIV positive patients: three cases. *Clin Rheumatol*. 1993;12:422-425.
2. Aglas F, Gretler J, Rainer F, Krejs GJ. Sternoclavicular septic arthritis: a rare but serious complication of subclavian venous catheterization. *Clin Rheumatol*. 1994;13:507-512.
3. Akkasilpa S, Osiri M, Ukritchon S, Junsirimonkol B, Deesomchok U. Clinical features of septic arthritis of sternoclavicular joint. *J Med Assoc Thai*. 2001;84:63-68.
4. Song HK, Guy TS, Kaiser LR, Shrager JB. Current presentation and optimal surgical management of sternoclavicular joint infections. *Ann Thorac Surg*. 2002;73:427-431.
5. McCarroll JR. Isolated staphylococcal infection of the sternoclavicular joint. *Clin Orthop*. 1981;156:149-150.
6. Gillis S, Friedman B, Caraco Y, Blankstein A, Yellin A, Friedman G. Septic arthritis of the sternoclavicular joint in healthy adults. *J Intern Med*. 1990;228:275-278.
7. Berrocal A, Gotuzzo E, Calvo A, Carrillo C, Castaneda O, Alarcon GS. Sternoclavicular brucellar arthritis: a report of 7 cases and a review of the literature. *J Rheumatol*. 1993;20:1184-1186.
8. Asnis DS, Dhaliwal GS. Bilateral sternoclavicular joint septic arthritis presenting as cutaneous abscesses. *Clin Infect Dis*. 1994;19:964-966.
9. Pollack MS. Staphylococcal mediastinitis due to sternoclavicular pyarthrosis: CT appearance. *J Comput Assist Tomogr*. 1990;14:924-927.
10. Alexander PW, Shin MS. CT manifestation of sternoclavicular pyarthrosis in patients with intravenous drug abuse. *J Comput Assist Tomogr*. 1990;14:104-106.
11. Tecce PM, Fishman EK. Spiral CT with multiplanar reconstruction in the diagnosis of sternoclavicular osteomyelitis. *Skeletal Radiol*. 1995;24:275-281.