A 27-year-old man presented with a 2-month history of a soft tissue mass of his right anterior chest wall. He complained of pain, but no other local or systemic signs of illness. Past medical/surgical history was unremarkable. Patient denied both trauma and intravenous drug abuse. Physical examination confirmed the presence of a $3 \times 4$ cm mass that was tender to palpation with mild erythema overlying the subcutaneous tissues and skin at the right sternoclavicular joint. There was no palpable adenopathy. Laboratory findings were within normal limits, except for an elevated ESR of 39 (reference range = 0-9).

A chest radiograph (Fig 1) showed haziness at the right lung apex and at the right sternoclavicular joint. Tomograms of the area (Fig 2) showed a moth-eaten, lytic region of the medial right clavicle with some sclerosis and expansion and loss of the cortex. There was also a lytic lesion of the medial left clavicle. A $^{99m}$Tc labeled methylene diphosphonate bone scan (Fig 3) showed marked uptake at the right sternoclavicular joint and moderate uptake at the left sternoclavicular joint. The sternum was not involved. No other foci of abnormal tracer uptake were identified. A computer tomography (CT) scan (Figs 4A-B) showed a $3 \times 3$ cm multiseptated, expanding, radiolucent lesion of the medial right clavicle. The clavicular margins were sclerotic and ill-defined. A $1 \times 2$ cm radiolucency was present in the medial left clavicle. Your differential diagnosis is? The diagnosis you favor?

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Osteomyelitis of the Clavicle

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An open incision biopsy was performed. The pathologic examination was inconclusive. The patient returned 2 weeks later with complaints of continuing pain and enlargement of the mass. The patient then underwent surgical debridement and wound packing. The microscopic section showed mainly fibrocollagenous and trabecular bone and chronic inflammatory cells. No microorganisms were seen. Intravenous antibiotics were started in the hospital. Gram stain, bacterial, and fungal cultures were negative at both biopsies. Blood cultures were also negative. The patient was sent home on PO antibiotics for 6 weeks. At follow-up examination 2 months later, the patient was asymptomatic without pain or signs of infection.

Diagnosis: Osteomyelitis, acute and chronic. Probably bilateral.

Discussion

Osteomyelitis of the clavicle is an uncommon disease. A review of acute osteomyelitis at all sites reports clavicular infection in 0% to 7%. It may result from hematogenous or contiguous spread of infection. Cases have been associated with prior head and neck surgical procedures, subclavian vein catheterization, trauma, intravenous drug abuse, immunosuppression, and chronic multifocal osteomyelitis. An idiopathic presentation is also possible.

We report a case of idiopathic, presumably bilateral, clavicular osteomyelitis. Although the left clavicle was not biopsied, changes present on CT, bone scan, and tomograms are highly suggestive of bilateral involvement.

The importance of this entity is twofold. The recognition of osteomyelitis, even in unusual sites, lends itself to definitive treatment and also distinguishes it from other unusual abnormalities that have a predilection for the clavicle.

Pain, swelling, and erythema of the clavicular region with an associated fever is characteristic of an acute onset of osteomyelitis. Radiographic evidence of significant osseous destruction in osteomyelitis may be delayed for up to 2 weeks. Then, destruction creates radiolucent areas of varying size, associated with mild periostitis. As in the above presented cases, in subacute and chronic stages of osteomyelitis, periostial bone formation and thick trabeculae may lead to considerable radiodensity and contour irregularity of affected bone. Cystic changes may occur within the sclerotic area, but sequestra are uncommon.

Technetium bone scan may be evident as a photopenic spot in early osteomyelitis, but later appears as an increased region of tracer accumulation. On a three phase bone scan, osteomyelitis is highly likely if there is increased tracer in all three phases. Eighty-four percent to 100% sensitivity has been reported. Gallium can be used as an adjunct to the bone scan study. It appears to correlate closely with activity, and can be used to determine response to treatment. Specificity has been further increased with the use of indium-111 leukocyte scintigraphy.

CT for evaluation of osteomyelitis delineates
osseous and soft tissue extension. Common but nonspecific findings include increased attenuation in the medullary canal, destruction of cortical bone, new bone formation, and soft tissue mass. These findings are common to both infection and neoplasm.

A bacteriologic diagnosis is important in evaluating the patient with questionable sternoclavicular osteomyelitis. A bone biopsy or possibly deep aspiration have been mandatory diagnostic procedures in the absence of positive blood cultures. Tissue biopsy is also important to exclude the possibility of tumor.

The radiographic differential diagnosis of sternoclavicular osteomyelitis includes malignancy, condensing osteitis, sternoclavicular hyperostosis, and possibly Friedrich’s disease.

Aggressive bone destruction combined with periostitis and soft tissue swelling stimulates the changes in malignant neoplasms. The initial evaluation of aggressive clavicular lesions should focus on ruling out primary, recurrent, or metastatic tumors. Although bone tumors in the clavicle are uncommon, having an overall incidence of 0.73%, approximately 89% of clavicular tumors are malignant. The most common primary bone tumors include multiple myeloma, plasmacytoma in adults, and Ewing’s sarcomas in children. Biopsy is diagnostic.

Condensing osteitis of the clavicle is a rare and benign disease that may be degenerative or mechanical in etiology. Most patients are women 20 to 50 years of age, with a history of stress to the sternoclavicular joint, usually associated with heavy lifting or sports activity. It presents with painful and tender swelling over the medial clavicle. Radiographs show bone sclerosis and enlargement of the medial clavicle. Adjacent osseous and soft tissue structures are not affected. Technetium bone scan shows abnormally increased uptake in the medial one third of the clavicle. Indium and gallium scanning demonstrate absence of the accumulation of tracer that would suggest an infection. Pathologic/histologic examination shows increased thickness of normal appearing cancellous bone.

Sternoclavicular hyperostosis affects the medial end of the clavicle with hyperostosis of the clavicle, sternum, and upper anterior ribs with soft tissue ossification. This condition is most common in men, is usually bilateral, and is often accompanied by pustular lesions of the palms and soles (pustulosis palmaris et plantaris). The radiographic abnormalities of sternoclavicular hyperostosis include ossification in the region of the costoclavicular ligament, inferior clavicular margin, and superior first rib. Hyperostosis of the sternum, clavicle, and upper rib is found. Other associated abnormalities include changes in the vertebral column that resemble ankylosing spondylitis or diffuse idiopathic sclerosing hyperostosis.

Aseptic necrosis of the medial end of the clavicle (Friedrich’s disease) should also be considered. This disease presents clinically and radiologically like osteomyelitis, with swelling of the sternoclavicular joint. Histologic examination shows aseptic necrosis. The condition resolves without treatment. Etiology is unknown.

CONCLUSION

Sternoclavicular osteomyelitis should be considered in patients with painful swelling of the sternoclavicular joint and a radiographically aggressive appearing lesion. The importance for patient care is early diagnosis. The management of clavicular osteomyelitis includes antibiotic treatment alone or combined with surgical debridement. Resection of the involved portion of the clavicle may be required if the diagnosis is delayed. With the increase of intravenous drug abuse and immunosuppressive illnesses, increased awareness may lead to earlier diagnosis. Combined radiographic/scintigraphic and CT findings may suggest the diagnosis, but a bacterial diagnosis from blood cultures or bone biopsy is mandatory, not only for antibiotic treatment purposes, but to rule out radiographically similar entities.

REFERENCES


Section Editor: Terrence C. Demos, MD