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Pseudomonas Arthritis and Osteomyelitis in Heroin Addiction

Report of Three Cases

Paul M. Ross, MD, Robert C. Nestor, DO and Kent K. Wu, MD

Pseudomonas arthritis with osteomyelitis has been recognized with increasing frequency in both medical and surgical patients. Heroin addicts seem to be particularly prone to the development of septic arthritis as a complication of their habit.

At Henry Ford Ford Hospital, we have found Pseudomonas aeruginosa the prevailing offender in septic arthritis. It has been cultured from disc spaces of the cervical and lumbar spine, sacroiliac joint, pubic symphysis, ischial tuberosity, ribs, hip joint, acromioclavicular joint, lower sternum, and sternoclavicular joint.

Case Reports

Case 1. C. G., a 39-year-old heroin addict, was admitted to Henry Ford Hospital on August 10, 1970. Three weeks prior to admission, left shoulder pain had been treated by local cortisone infiltration by his private physician without relief of symptoms. The patient was seen in the Emergency Room the day before admission complaining of left pleuritic chest pain and limitation of motion of his left shoulder. He was diaphoretic and had a temperature of 40°C. The white blood cell count was 15,600 per mm³ with a shift to the left. A sputum stain revealed gram positive diplococci. He was diagnosed as having a left lower lobe pneumonia confirmed by X-ray and ampicillin trihydrate chemotherapy was begun. He was admitted the following day because of pleurisy.

Physical examination revealed a temperature of 38.8°C, blood pressure of 120/70, pulse 120 per minute, and respiration of eighteen per minute. There was non-specific lym-
Figure 1a
A radiolucent lesion is visualized at the medial end of the left clavicle.

Figure 1b
Microscopic section revealing acute and chronic osteomyelitis.
phadenoplasia involving the cervical and axillary nodes bilaterally. Auscultation of the lungs revealed rales over the left lower lobe. Examination of the heart revealed a sinus tachycardia. The liver was questionably palpable at the right costal margin. The skin over both arms and legs revealed multiple scars from injections. The left shoulder revealed deltoid, supraspinatus, and infraspinatus atrophy, and the patient was unable to fully abduct his left arm. There was tenderness over the left sternoclavicular joint, but no erythema or increased warmth.

Laboratory examination revealed hemoglobin of 11.6 grams per 100 milliliters, white blood cell count of 8,100 per mm³ with a normal differential. Routine laboratory studies were within normal limits. The febrile agglutinins revealed Salmonella typhosa 0 titer of 1:320, Salmonella paratyphi H titer of 1:640, Salmonella paratyphi A of 1:40, Salmonella paratyphi B of 1:80, and the Brucella abortus titer was negative. The hemoglobin electrophoresis revealed A type only. The serum was negative for Australian antigen. Chest fluoroscopy produced evidence of pleural fluid and partial collapse of the left lower lobe. A routine x-ray of the sternum and left clavicle was unremarkable. Lamino-

grams of the left sternoclavicular joint performed five days after admission (8/15/1970) revealed a localized area of radiolucency without evidence of bone destruction in the medial end of the clavicle (see figure 1a). A lung scan was predictably positive for a decreased uptake of the left lower lobe.

During the hospitalization period, results of blood, urine, stool cultures, and skin tests were consistently negative, but a low-grade fever persisted. Use of antibiotics was discontinued upon admission to the hospital and withheld pending diagnosis, despite the pneumonic process. On August 24, an open biopsy and resection were done of the proximal left clavicle and articular disc. A gelatinous light-brown material was found subcortically with granulation tissue in the sternoclavicular joint. Pseudomonas aeruginosa was isolated from the tissue, and under microscopy revealed acute and chronic osteomyelitis (see figure 1b). Because of postoperative clinical improvement, it was the opinion of the infectious disease consultant that antibiotics should be withheld and a localized osteomyelitis could be cured by the operative procedure. The patient was discharged on August 31 as asymptomatic, with roentgenogram showing resolution of the

Figure 1c
Roentgenogram revealing destruction of the right sternoclavicular joint. The left medial clavicle has previously been resected.
There is suggestion of a sequestrum of the right sternoclavicular joint. New bone formation is noted in the left sternoclavicular joint.

Case 2. B. G., a 24-year-old male heroin addict was admitted to the Henry Ford Hospital on October 25, 1972, complaining of pain and swelling of the right sternoclavicular joint. The year before, he had been hospitalized from December 2-20 for left sacroiliac osteomyelitis. Cultures of the urine and blood were negative. Aspiration of the sacroiliac joint had been unrewarding, and the patient had been given empirically oral Dicloxacillin and intramuscular Gentamycin. He was discharged asymptomatic after only two weeks of chemotherapy. He remained asymptomatic until three weeks prior to his current admission when he noted pain, swelling, redness, and limitation of abduction of his right arm.

Physical examination revealed a blood pressure of 110/60, pulse of 80 per minute, temperature of 37.2°C, and respiration eighteen per minute. Physical examination showed no abnormalities of the ear, nose, throat, lungs, abdomen or heart. The right posterior cervical and axillary nodes bilaterally were palpable. There was palpable tenderness over the manubrium and right sternoclavicular joint. The patient was unable to abduct the ipsilateral arm fully because of the sternoclavicular pain.

On December 3, open bone biopsies of the tender right sternoclavicular joint and manubrium were performed under local anesthesia. Blood cultures had been consistently negative, but cultures of both biopsied areas revealed Pseudomonas aeruginosa and Gentamycin chemotherapy was begun. A progress laminogram on December 21 revealed increased destruction of the right sternoclavicular joint (Figure 1c). When laminograms one month later (Figure 1d), suggested a sequestrum of the right medial clavicle, it was felt that the osteomyelitis was too disseminated for surgical treatment. The patient was discharged asymptomatic after eight weeks of Gentamycin chemotherapy. Two months after discharge he was still asymptomatic, with sedimentation rate of 15 millimeters per hour. Laminogram was suggestive of persistent osteomyelitis (Figure 1e). He was subsequently lost to follow-up.

Laboratory test results were hemoglobin of 14.3 grams per 100 milliliters, and white blood cell count of 6,200 mm³ with 49% polymor-
Pseudomonas Arthritis and Osteomyelitis in Heroin Addiction

Figure 1e
Persistent osteomyelitis of the right sternoclavicular joint. The left sternoclavicular joint appears to have healed with new bone formation.

phonuclear leukocytes, 42% lymphocytes, 7% monocytes, and 2% atypical lymphocytes. Sedimentation rate was 40 mm per hour. Urine drug screen revealed the presence of codeine, morphine, heroin, and phenothiazines. Blood drug screen revealed only phenobarbital. Blood cultures were negative. Chest roentgenogram was negative and routine films of the right sternoclavicular joint were unremarkable.

Pseudomonas antitoxin levels were elevated to a dilution greater than 4,096 and the organism was cultured from an aspirate of the right sternoclavicular joint. Intramuscular chemotherapy with tobramycin was initiated. Two days after admission, the patient underwent an incision and debridement with resection of the proximal clavicle of the right sternoclavicular joint, which was packed open. Seropurulent drainage and granulation tissue was retrieved from the joint, and subsequent cultures were positive for Pseudomonas aeruginosa.

The postoperative course was complicated by low-grade fever and tachycardia. Chest roentgenograms, taken 12 days postoperatively, revealed a poorly defined density over the right upper lobe. Radiographs confirmed an extrapleural retroclavicular mass (Figure 2). This apparent soft tissue swelling resolved uneventfully. The patient was discharged asymptomatic after six weeks of Tobramycin therapy, his wound having closed without incident.

When seen three weeks later, he had no tenderness, limitation of motion, or drainage from the operative site. Sedimentation rate was 12 mm per hour. He was subsequently lost to follow-up.

Case 3. A. C., a 21-year-old male heroin addict, was admitted to Henry Ford Hospital on January 30, 1974, with pain over the right sternoclavicular area. Three months previously he had been admitted to another hospital complaining of nuchal, right supraclavicular and bilateral shoulder pain. He had been treated for a viral pneumonia prior to that admission, but no antibiotics were administered. He was diagnosed as having osteomyelitis of the right sternoclavicular joint, but he left the hospital before an open biopsy could be performed. He was seen in the orthopaedic clinic on December 27, where laminograms revealed findings compatible
Figure 2
Lateral radiograph of the sternum indicating a retroclavicular mass.
with osteomyelitis of the right sternoclavicular joint, (Figure 3). This finding was confirmed by bone scan.

Physical examination revealed a blood pressure of 128/84, pulse 88 per minute, temperature of 36.8°C and respiratory rate 20 per minute. Examination of the ear, nose, throat, lungs, heart, and abdomen were negative. Needle marks were in evidence over both upper extremities. No cervical lymphadenopathy was appreciated. Although there was mild tenderness over the right sternoclavicular joint, the patient was able to fully abduct his arm.

Laboratory examination revealed hemoglobin of 15.6 grams per 100 milliliters, sedimentation rate of 6 millimeters per hour, white blood cell count 5,800 per mm$^3$ with 55% polymorphonuclear leukocytes, 32% lymphocytes, 3% atypical lymphocytes, 3% monocytes, and 6% eosinophils, and 1% basophil. Routine laboratory studies were within normal limits. A chest roentgenogram was normal. All blood cultures were negative. On February 4, the fifth day of hospitalization, the patient underwent resection of the medial end of the right clavicle. No evidence of acute inflammation was seen by microscopic examination, but Pseudomonas aeruginosa was isolated from the specimen and consequently Gentamicin chemotherapy was initiated.

The wound healed uneventfully, and the patient was discharged asymptomatic after six weeks of Gentamicin therapy. Routine views of the clavicle obtained two weeks after discharge disclosed uneventful healing of the resected right sternoclavicular joint. Sedimentation rate at that time was 10 mm per hour. The patient was subsequently lost to followup.

Discussion

In reviewing literature in the English language, we were able to document less than 50 cases of Pseudomonas arthritis and osteomyelitis, and only 10 cases involving the sternoclavicular joint. To the best of our knowledge, no report of Pseudomonas sternoclavicular osteomyelitis has appeared in the orthopaedic literature. Certainly, at the Henry Ford Hospital, Pseudomonas is the prevalent organism in the increasing numbers of pyarthroses diagnosed in heroin addicts.

There are several possible explanations. First of all, Pseudomonas is present in the stool of 10% of the normal population. Indeed, this organism can often be cultured from tapwater, which is otherwise quite free from microorganisms. It has been postulated that addicts haphazardly "sterilize" dirty needles by running hot tap water over them.
Ross, Nestor and Wu

They may then innoculate themselves with the organism. We may further speculate that the availability of antibiotics "on the street" leads many addicts to use them in inadequate doses for the numerous abscesses they incur. Certainly, the metabolic versatility of Pseudomonas makes it an opportunistic organism requiring little nutrition and able to resist most antibiotics. All three patients were long term addicts and two had a history of either previous or concomitant pneumonia. This combination has been reported.

The empirical use of antibiotics should be discouraged, as evident in patients 1 and 2. It may contribute directly to Pseudomonas superinfection. Screening laboratory tests generally are not diagnostic. The white blood cell count and sedimentation rate may be elevated in acute cases, but can be modified by injudicious use of antibiotics and chronicity. However a check of Pseudomonas antitoxin levels may be extremely helpful. The yield of positive blood cultures generally is not high. All our cases were negative. Kattan recently described a modified roentgenographic view which eliminates distortion of the sternoclavicular joint and which might prove useful in the diagnosis of early osteomyelitis. On occasion aspiration might be fruitful, but open biopsy should be used in chronic cases to culture the organism from the granulation tissue. Interestingly, in all our patients, pain was promptly alleviated postoperatively. Gentamycin is the drug of choice in Pseudomonas infections. We use a dosage of 3 mg/kg for six weeks, closely followed with serial audiograms and blood creatinine determinations. No adverse affects were encountered. In one case, we used an experimental drug, Tobramycin, with good results.

Summary

Pseudomonas sternoclavicular osteomyelitis is not difficult to diagnose providing one has a high index of suspicion. Open debridement is advised for culture of organism and may relieve pain.

References

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