



Pyogenic Vertebral Osteomyelitis in Heroin Addicts

RONALD S. FISHBACH, MD
JON E. ROSENBLATT, MD
JAMES G. DAHLGREN, MD
Los Angeles

The diagnosis of pyogenic vertebral osteomyelitis was made in seven narcotic addicts between 1967 and 1972. Vertebrae involved were either cervical or lumbar. Bacteriologic diagnosis was made in each case by percutaneous needle biopsy and aspiration. Staphylococcus aureus was cultured in two patients. Five patients had infections due to Gram-negative bacteria, including Klebsiella pneumoniae, Pseudomonas aeruginosa and Enterobacter. All patients were cured by treatment with antibiotics and immobilization.

NARCOTIC ADDICTS are subject to multiple medical complications, especially those related to the hematogenous dissemination of intravenously injected contaminated material. Despite frequent involvement of other organs, pyogenic osteomyelitis of the vertebral column has seldom been described^{1,2} In the last five years we have seen seven cases of pyogenic vertebral osteomyelitis in users of intravenous drugs. Our experience suggests that this problem is more common than is appreciated and is actually increasing in incidence.

Patients

Seven patients with pyogenic vertebral osteomyelitis were seen at the UCLA Hospital and Wadsworth Veterans Administration Hospital between 1967 and 1972. Each patient was a user of intravenous heroin who presented with progres-

sive neck or back pain. Duration of symptoms until admission ranged from ten days to seven months. A history of local trauma (five patients) and a short febrile course early in the illness (four patients) were each frequently noted. Before admission, all patients had been unsuccessfully treated with a variety of local supportive measures, including analgesics, muscle relaxants, bed rest and traction. Radiographic evaluation of the spine had been performed at least once on all patients, with negative results. On admission most patients were afebrile or had a low grade fever. Local tenderness of the involved vertebrae was elicited on palpation of the spine. Routine laboratory evaluation and blood cultures were performed. If, on admission, regular radiographs of the spine were negative, laminograms were performed. Radiographic evidence of osteomyelitis was demonstrated in all cases. Each patient underwent a percutaneous needle biopsy of the involved vertebra or disc space. The material obtained was cultured and yielded significant bac-

From the Infectious Disease Sections, Departments of Medicine, Wadsworth VA Hospital Center and University of California, Los Angeles, Center for the Health Sciences.

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Reprint requests to: R. S. Fishbach, MD, Infectious Disease Section, VA Wadsworth Hospital Center, Bldg. 213, Room 304, Wilshire & Sawtelle Boulevards, Los Angeles, CA 90073.

teria in all patients. Antibiotics were administered on the basis of sensitivity testing of the organisms isolated. Patients were treated for four to six weeks with antibiotics and immobilization, which were continued until the patients demonstrated radiographic signs of stabilization.

Illustrative Case Histories

CASE 2. A 24-year-old white man who used heroin and methedrine intravenously was admitted with a history of low back pain of ten days' duration following an automobile accident. Intermittent fever began four days before admittance. The temperature was 38.9°C (102°F) and on physical examination needle puncture marks were noted on both forearms and there was mild tenderness extending from the fifth lumbar and first sacral vertebrae to the left costovertebral angle. Leukocytes numbered 14,700 per cu mm and the erythrocyte sedimentation rate (ESR) was 32 mm in one hour. Routine lumbar-sacral spine films were negative. Blood cultures revealed *Klebsiella pneumoniae* and *Enterobacter* (species not determined) on separate occasions. Endocarditis was suspected and he was begun on cephalothin. Because of persisting severe low back pain, laminograms of the spine were performed and revealed narrowing of the disc space between the fifth lumbar and first sacral vertebrae with erosion of the adjoining vertebral bodies. A percutaneous biopsy of the disc space revealed both *Klebsiella pneumoniae* and *Enterobacter* on culture. The patient was treated in the hospital with gentamicin for one month and a back brace was fitted. Chloramphenicol was given by mouth for two months, at which time there was radiographic evidence of bone sclerosis with narrowing of the interspace.

CASE 7. A 42-year-old Negro man had had neck pain for seven months before admission. He had been a regular user of intravenous heroin for 30 years. He had been admitted to another hospital after several weeks of increasing pain and fever. Radiographs taken there were negative and he was treated with analgesics and traction. The pain persisted after discharge and two months later he was admitted to a different hospital. Radiographs at that time reportedly showed collapse of the fourth cervical vertebra. He was treated with traction and neck support and was then discharged with a neck brace. Because of continuing pain, he was referred to our hospital for laminectomy. On admission, the patient was afebrile. There was tenderness over the lower part

of the neck with pronounced decrease in range of motion in all directions. Hypesthesia was noted over the medial aspect of the left arm and ulnar part of the left hand. Leukocytes numbered 6,100 per cu mm and the ESR was 17 mm in one hour. X-ray films on admission showed collapse of the fourth cervical vertebra with narrowing of the interspaces between the third and fourth and the fourth and the fifth vertebrae. Irregularity of the bodies of the third, fourth and fifth vertebrae were noted, which on laminography was seen consistent with severe osteomyelitis. Percutaneous needle biopsy was performed. Culture of the material grew *Staphylococcus aureus*. Because the Gram stain of the aspirate suggested the presence of anaerobic bacteria as well as *S. aureus*, the patient was initially treated with clindamycin, 300 mg orally every six hours. When all culture material was finally evaluated and no anaerobic organisms were isolated, therapy was changed to dicloxacillin, 500 mg orally every six hours. The patient was also fitted with a Minerva jacket. At last report he was under therapy and doing well.

Results

Data on the seven patients are summarized in Table 1. Five of the seven were seen between 1971 and 1972. The age range was from 17 to 42 years, the average 28 years. There were six males and one female. In most patients the leukocyte count was within normal limits and in no case did it reach 15,000 per cu mm. The average was 9,350 per cu mm. The erythrocyte sedimentation rate was uniformly elevated, ranging between 17 mm and 39 mm in one hour with an average of 30 mm. Vertebral lesions were primarily cervical (two cases) or lumbar (five cases), with a tendency for involvement of the lower portions of each region. In Case 2 there was involvement of the fifth lumbar to the first sacral vertebrae. In five patients, osteomyelitis involved two vertebral bodies as well as the adjacent disc space. Only the body of the first lumbar vertebra was affected in Case 4, and there was involvement of three vertebrae with two disc spaces in Case 7. *Staphylococcus aureus* was isolated in two patients. *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* and *Enterobacter* (species not determined) were each isolated twice (Patient 1 was infected with both *Klebsiella* and *Enterobacter*). Blood cultures revealed the same organisms as those observed on biopsy in Cases 2 and 4. In four patients the main therapy was four to six weeks of gentamicin. The

TABLE 1.—Clinical Data in Seven Cases of Pyogenic Vertebral Osteomyelitis in Heroin Users

Patient	Age	Sex	Year of Admission	Admission laboratory data		Vertebrae involved	Needle biopsy	Culture results		Antibiotic treatment
				White cell count (per mm ³)	Sedimentation rate (mm/hr)			Blood		
1	17	M	1968	6,350	32	L ₂ -L ₃	<i>Pseudomonas aeruginosa</i>	.....		Gentamicin
2	24	M	1970	14,700	36	L ₅ -S ₁	<i>Klebsiella pneumoniae</i> , <i>Enterobacter</i>	<i>Klebsiella pneumoniae</i> , <i>Enterobacter</i>		Gentamicin →Chloramphenicol
3	26	M	1971	5,800	20	C ₅ -C ₆	<i>Enterobacter</i>	.....		Tetracycline
4	36	M	1971	12,000	31	L ₅	<i>Staphylococcus aureus</i>	<i>Staphylococcus aureus</i>		Methicillin
5	25	M	1971	10,800	35	L ₁ -L ₂	<i>Klebsiella pneumoniae</i>	.....		Gentamicin →Tetracycline
6	25	F	1972	9,700	39	L ₃ -L ₄	<i>Pseudomonas aeruginosa</i>	.....		Gentamicin Carbenicillin
7	42	M	1972	6,100	17	C ₃ -C ₅	<i>Staphylococcus aureus</i>	.....		Clindamycin →Dicloxacillin

average dose was 1.5 mg per kg of body weight intramuscularly every eight hours. No evidence of toxicity was noted. Carbenicillin (24 grams intravenously per day) and gentamicin in combination were used in Case 6 after *in vitro* synergism was demonstrated. Tetracycline, methicillin and clindamycin were the primary therapy in one case each. Six patients were cured of infection, judging by symptomatic response, fall in sedimentation rate and evidence of radiographic healing of the involved vertebrae. The patient in Case 7 is still being treated, but has had considerable symptomatic improvement.

Discussion

Staphylococcus aureus has been considered the most frequent etiologic agent in osteomyelitis of the spine.³⁻⁵ However, it appears that in heroin addicts Gram-negative bacteria are the most common cause of pyogenic vertebral osteomyelitis. The five cases recently reported by Lewis et al² were all due to *Pseudomonas aeruginosa*. In addition, Holzman and Bishko described three cases caused by *Pseudomonas*, by *Candida stellatoidea*, and by both *Pseudomonas* and *Staphylococcus aureus*.¹ Of our seven patients, only two were infected with *Staphylococcus aureus*; the other five cases were due to Gram-negative bacteria (*Pseudomonas*, *Klebsiella*, *Enterobacter*). We have recently noted a similar predominance of Gram-negative bacteria in endocarditis in heroin addicts.⁶ The origin of these bacteria is unclear. Addicts are often admitted to hospital because

of complications of drug use, and frequently they receive antibiotics. Their skin may thereby become colonized by nosocomial Gram-negative bacteria which may then enter the blood stream when narcotics are injected. It is also possible that the drugs themselves are contaminated during dilution and distribution.

Specimens for culture from our seven cases were obtained by percutaneous needle biopsy and aspiration of the intervertebral space. This procedure, performed under local anesthesia with fluoroscopic control, caused minimum discomfort and no complications. It should be the procedure of choice for obtaining culture material from sites of pyogenic vertebral osteomyelitis. The specimen obtained will frequently not be grossly purulent and it may even be necessary to wash the area with normal saline solution to obtain material appropriate for culture. However, even in these situations, cultures will yield significant pathogenic organisms.

Five of our patients gave a history of trauma preceding the development of symptoms. This antecedent has been noted by other observers.^{7,8} McLaurin suggested that trauma may provide a susceptible site for the implantation of bacteria.⁹ The lower cervical and lumbar vertebrae are the most common sites of adult hematogenous osteomyelitis and these are also the most mobile parts of the spine¹⁰ and the most likely to be involved in minor trauma.

The slowly progressive indolent nature of this disease, the long delay in making the diagnosis,

the absence of fever, the low white blood cell count and elevated erythrocyte sedimentation rate have all been previously noted.^{4,5,8,9,11} Because routine radiographs may be normal, it is often necessary to perform laminograms. If all radiographs are negative and symptoms persist, studies should be repeated after a short interval because of the delayed radiographic appearance of bone lesions in osteomyelitis.

Because of the wide variety of pathogens which may be involved in this disease, therapy must be based on the sensitivity of the specific organism isolated. In osteomyelitis due to Gram-negative bacteria, a bactericidal antimicrobial agent should be used whenever possible. The Gram-positive organisms encountered in these infections are frequently resistant to many antimicrobial agents, including the few clinically-useful bactericidal agents. In our experience, gentamicin appears to be the drug of choice for therapy of vertebral osteomyelitis due to these resistant bacteria. A combination of gentamicin and carbenicillin may provide enhanced activity against *Pseudomonas aeruginosa* as well as *Serratia marcescens*, an organism not encountered in our patients. Tetracycline was used as primary antimicrobial therapy in one patient infected with *Enterobacter*, resistant to most other agents. It was also used in another patient for continued oral therapy after discontinuation of gentamicin. Both patients had good clinical response.

It is likely that the increasing use of illicit intra-

venous drugs administered by unsterile methods will result in an increased incidence of pyogenic vertebral osteomyelitis. Five of our seven cases were seen in 1971-1972, suggesting that this increase is already occurring. Our data indicate that a user of intravenous drugs who presents with neck or back pain should be considered to have vertebral osteomyelitis until proven otherwise.

ADDENDUM

Since this report was written we have seen two additional patients: One was a 45-year-old man admitted with osteomyelitis of the eighth to eleventh thoracic vertebrae due to *Serratia marcescens*. He is improving on gentamicin therapy. The second patient, a 40-year-old man with osteomyelitis of the third and fourth lumbar vertebrae due to *Pseudomonas aeruginosa*, is currently under therapy with tobramycin.

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