Pasteurella multocida osteomyelitis: An unusual case presentation

HERBERT P VON SCHROEDER MD MSc, ROBERT S BELL MD FRCSC

HP VON SCHROEDER, RS BELL. *Pasteurella multocida* osteomyelitis: An unusual case presentation. *Can J Infect Dis* 1996;7(2):137-139. A healthy male farm employee developed an unusual infection caused by *Pasteurella multocida*. Atypical features included the chronic nature of the infection, the development of osteomyelitis of the tibia without direct animal inoculation, and lack of fever and leukocytosis. Radiographic appearance of *P multocida* osteomyelitis may be the result of osteoclast activation and can be confused with musculoskeletal tumour. *P multocida* infection requires a high degree of suspicion, and should be considered in cases of farm- or animal-related injuries even if there is no history of direct animal contact.

Key Words: Infection, Osteomyelitis, *Pasteurella multocida*, Tumour, Zoonosis

Ostéomyélite à *Pasteurella multocida* : tableau clinique inhabituel

RÉSUMÉ : Par ailleurs en santé, un jeune employé agricole a développé une infection rare causée par *Pasteurella multocida*. Les caractéristiques atypiques étaient entre autres la nature chronique de l'infection, l'installation d'une ostéomyélite au tibia, sans inoculation animale directe et l'absence de fièvre et de leucocytose. L'aspect de l'ostéomyélite à *P. multocida* à la radiographie peut être le résultat d'une activation des ostéoclastes et peut être confondu avec une tumeur musculo-squelettique. L'infection à *P. multocida* doit éveiller de forts soupçons et être envisagée lors de blessures infligées dans le contexte d'un travail agricole auprès des animaux, même s'il n'y a aucun signe de contact animal direct.

Pasteurella multocida is a Gram-negative nonsporulating bacillus which is a commensal organism in dogs, cats, fowl, swine, rats, sheep, cattle and horses (1). In these animals it may cause hemorrhagic septicemia, chronic pulmonary infiltrates and several other animal diseases and may thereby have significant economic consequences in the animal industries. Human infection with *P multocida* is rare, but may occur following a dog or cat bite, scratch or other contact (2-4). Such an infection is characterized by local wound infection, cellulitis and suppuration (2). Infections are usually associ-

ated with leukocytosis. Bacteremia with fever, chills and adenitis may occur, and meningitis, brain abscess, pyogenic arthritis, endocarditis and pyelonephritis have been described as infrequent complications. *P multocida* has also been isolated from the nasopharynx of asymptomatic individuals who have been colonized with the organism as a result of exposure to animals; it has also been isolated from the sputum of asymptomatic animal workers with bronchiectasis (5). The present case of *P multocida* infection illustrates an unusual presentation and osseous involvement.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article

Musculoskeletal Oncology Unit and Division of Orthopaedic Surgery, Mount Sinai Hospital and The University of Toronto, Toronto, Ontario
Correspondence and reprints: Dr HP von Schroeder, Division of Orthopaedics, Mount Sinai Hospital, 600 University Avenue, Suite 476A, Toronto, Ontario M5G 1X5. Telephone 416-767-5166, fax 416-813-6414

Received for publication May 24, 1995. Accepted August 31, 1995

Figure 1) Computed tomography of a patient with *Pasteurella multocida* osteomyelitis of the left tibia. Arrow indicates ill-defined permeative changes and a soft tissue mass

CASE PRESENTATION

A 35-year-old male blacksmith employed at a horse farm was admitted to hospital with a painful mass on his left shin. He had fallen off a tractor at work five months previously and sustained an abrasion to his shin. There was no direct contact between the abrasion and any farm or domestic animal (including his two dogs), animal saliva or his own saliva. The abrasion resolved quickly and he was completely asymptomatic until three months later, when he developed a painful, slightly erythematous mass in the region. Radiographs and a computed tomography scan (Figure 1) revealed a soft tissue mass and diffuse permeative changes in the tibial diaphysis. Technetium bone scan showed intense uptake in both dynamic and pool phases, which extended into the inner cortex of the tibia at the affected site. Gallium scan also showed high activity indicative of an inflammatory process. He was treated with analgesics and did not receive any empirical antibiotics. Two months later he was admitted to hospital for biopsy; differential diagnosis included bone sarcoma and infection. On admission, the patient was afebrile and appeared reasonably well. Ambulation caused severe pain necessitating use of a cane. A 3x3 cm firm lesion was noted over the tibia. Chest x-ray was normal, there was no lymphadenopathy and his white blood cell count was $7.2 \times 10^9/L$ with a normal differential. At biopsy, purulent and suppurative tissue was noted. Aerobic and anaerobic cultures taken at the time of biopsy both revealed *P. multocida*. The organism was sensitive to penicillin, ampicillin, cefazolin, ceftazidime, ceftriaxone, ciprofloxacin, co-trimoxazole, gentamicin and tobramycin.

Following the biopsy, the patient received intravenous cloxacillin for two days until cultures were available; therapy was then changed to intravenous ceftriaxone for six days, followed by oral ciprofloxacin (750 mg twice daily) for two weeks. He was then maintained on amoxicillin (500 mg three

Figure 2) Following four weeks of antibiotic therapy, only residual signs of the infection were seen on the radiograph of the left tibia (arrow)

times daily) for five months. Follow-up at one month revealed only residual symptoms and improvement of radiographic findings (Figure 2). At seven months the patient was symptom-free with the exception of a mild throbbing sensation associated with changes in the weather.

DISCUSSION

The family Pasteurellaceae contains Gram-negative, facultatively anaerobic and fermentative bacteria of the genera *Pasteurella*, *Haemophilus* and *Actinobacillus*. Over 30 different species of the genus *Pasteurella* have been identified by phenotypic and genetic techniques. In addition to being commensal flora in animals, *P. multocida* is one of the most prominent pathogens in domestic animals (1) and is a leading cause of animal bite wound infection in humans. However, as in the case presented, not all *P. multocida* infections occur after animal bites and transmission may occur with minimal animal contact (3,4). Furthermore, the organism may be transmitted via aerosols and fomites (6), and has been isolated in 19 different body specimens, most often from the sputum (48.5%), but also from the urine (7). This raises an unresolved question of mechanism of infection in the case presented. Was the wound inoculated with the organism at the time of the origi-

nal injury (which would imply a quiescent phase for three months) or did the infection occur months later at the time of presentation by an opportunistic organism upon encounter with devitalized tissue? It is also possible that the wound was licked by a domestic animal or, if the patient was an asymptomatic carrier, he may have inoculated himself with saliva on his hand. However, the patient denied any direct animal contact or contact of the wound with his own saliva.

Due to the ubiquitous nature of *P multocida* in animals, infection with this organism probably occurs more frequently than is usually appreciated. A high index of suspicion and early diagnosis, especially in immunocompromised patients, are necessary because the disease is potentially life threatening (8). The infection is readily treatable and, as demonstrated by sensitivity testing in the case presented, it is susceptible to many antibiotics. However, *P multocida* is typically not sensitive to cloxacillin, some first-generation cephalosporins, erythromycin, clindamycin and vancomycin, which are frequently used to treat soft tissue and bone infections. Furthermore, an infection following animal bite or other animal contact or farm-related injury will initially require a flexible antibiotic approach due to the nonspecific clinical presentation and wide variety of possible pathogens. *P multocida* infections do not have any unique characteristics and may resemble staphylococcal, streptococcal, cat-scratch fever or tularemia infections (9). Although empirical antibiotic ther-

apy may be the initial step, once culture and sensitivity results are available, specific therapy should be started. Less expensive antibiotic regimens, such as intravenous penicillin or ampicillin followed by oral amoxicillin, may be effective against *P multocida* infections provided appropriate antibiotic levels can be attained in the target tissues.

Orthopedic infections caused by *P multocida* following animal-related injuries include septic arthritis (10,11), tenosynovitis (12) and infection of total joint replacements (13-15). Osteomyelitis following penetrating inoculation from a dog or cat bite is classically described (10); however, osteomyelitis without such direct inoculation, as in our case, has not been previously reported. The permeative radiographic changes may have been a result of bone resorption due to the activation of osteoclast activity by the *P multocida* toxin. Osteoclast stimulation has been described in vitro (16,17) and provides a novel potential mechanism for bacterial migration and virulence.

The bone resorption and soft tissue mass represent the unusual features by which this case was originally diagnosed as a tumour. Presentation several months after a trivial abrasion in a healthy individual with no systemic symptoms further illustrate the atypical features of this case. This case demonstrates that *P multocida* infection should be considered in cases of farm- or animal-related injuries even if there is no history of direct animal contact.

REFERENCES

1. Confer AW. Immunogens of *Pasteurella*. *Vet Microbiol* 1993;37:353-68.
2. Murray PF. Infections caused by miscellaneous Gram-negative aerobic bacteria. In: Balows A, Hausler WJ Jr, Ohashi M, Turano A. *Laboratory Diagnosis of Infectious Diseases Principles and Practice*, vol 1. New York: Springer Verlag, 1988:291-2.
3. Roloff J, Johansson PJ, Holst E. Severe *Pasteurella multocida* infections in pregnant women. *Scand J Infect Dis* 1992;24:453-6.
4. Unchitti K, Wongsawang S, Saitanu K, Thoongsuwan S. Characteristics of *Pasteurella multocida* isolated from humans, swine and poultry in Thailand. *Southeast Asian J Trop Med Public Health* 1992;23:520-5.
5. Watanabe Y. Five cases of respiratory infection due to *Pasteurella multocida*. *Kansenshogaku Zasshi* 1993;67:1228-32.
6. Thomson CM, Chanter N, Wathes CM. Survival of toxigenic *Pasteurella multocida* in aerosols and aqueous liquids. *Appl Environ Microbiol* 1992;58:932-6.
7. Arashima Y, Kumasaka K, Tsuchiya T, Kawano K, Yamazaki E. Current status of *Pasteurella multocida* infection in Japan. *Kansenshogaku Zasshi* 1993;67:791-4.
8. Hombal SM, Dincsoy HP. *Pasteurella multocida* endocarditis. *Am J Clin Pathol* 1992;98:565-8.
9. von Schroeder HP, McDougall EP. Ulceroglandular and pulmonary tularemia: a case resulting from a cat bite to the hand. *J Hand Surg* 1993;18A:132-4.
10. Chevalier X, Martigny J, Avouac B, Larget-Piet B. Report of 4 cases of *Pasteurella multocida* septic arthritis. *J Rheumatol* 1991;18:1890-2.
11. Ewing R, Fainstein V, Musher DM, Lidsky M, Clarridge J. Articular and skeletal infections caused by *Pasteurella multocida*. *South Med J* 1980;73:1349-52.
12. Fahmy FS, Morgan MS, Saxby PJ. *Pasteurella* tenosynovitis following a dog bite. *Injury* 1994;25:262-3.
13. Braithwaite BD, Giddins G. *Pasteurella multocida* infection of a total hip arthroplasty. A case report. *J Arthroplasty* 1992;7:309-10.
14. Gabuzda GM, Barnett PR. *Pasteurella* infection in a total knee arthroplasty. *Orthop Rev* 1992;21:601-5.
15. Guion TL, Sculco TP. *Pasteurella multocida* infection in total knee arthroplasty. Case report and literature review. *J Arthroplasty* 1992;7:157-60.
16. Felix R, Fleisch H, Frandsen PL. Effect of *Pasteurella multocida* toxin on bone resorption in vitro. *Infect Immun* 1992;60:4984-8.
17. Martineau-Doize B, Caya I, Gagne S, Jutras I, Dumas G. Effects of *Pasteurella multocida* toxin on the osteoclast population of the rat. *J Comp Pathol* 1993;108:81-91.