Rat bite fever without the bite

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Abstract

The case is reported of a patient who developed an acute arthropathy, which was initially diagnosed as acute septic arthritis. The true diagnosis of rat bite fever due to *Streptobacillus moniliformis* was delayed because of difficulty in growing the organism, which has fastidious growth requirements. The patient had no history of rat bite, which is the usual form of transmission of this disease.

Rat bite fever presents as an acute or chronic illness characterised by polyarthralgia or polyarthritis affecting the knees, shoulders, elbows, wrists, and hands. Other features are cough, malaise, rash, chills, and fever.¹ The condition is due to infection by *Streptobacillus moniliformis* or, less commonly, by *Spirillum minus*.² The mode of transfer is by a bite from an infected rat, mouse, or similar rodent³ or ingestion of food or milk⁴ or water contaminated by rat excreta.⁵ Characteristically, the area of the bite seems to be healing at the time of development of severe myalgia and arthralgia and at that stage the bite becomes inflamed and there is local lymphadenopathy.² In the chronic form recurrent bouts of fever occur lasting for several days at a time and often associated with rigor, nausea, and headache. The rash is characteristically erythematous, sometimes pustular, and petechial haemorrhages may also occur.⁶ (In spirillum infection lymphadenopathy and splenomegaly may occur.) Rarely, myositis, endocarditis abscesses, splenic and renal infarctions may complicate the course of the illness.²⁻³

Case history

A 63 year old pig farmer was admitted with a five day history of malaise and anorexia. Three days before admission he had developed painful swelling of the ankles and a petechial rash over the feet and had been febrile with rigors. On admission he had joint effusions affecting both knees and right wrist. Cervical spinal movements were restricted and very painful. He had a temperature of 38.9°C and there was a petechial rash affecting the dorsum of both feet. There were expiratory crackles throughout both lung fields. There was a small pustule over the right olecranon.

Investigations showed a plasma viscosity of 1.87 mPa.s; haemoglobin 120 g/l, later falling to 106 g/l; white cell count $13.2 \times 10^9/l$, rising to $18.5 \times 10^9/l$; platelets $339 \times 10^9/l$, rising to $631 \times 10^9/l$. Liver function tests showed alanine

transaminase 48 IU/l; γ -glutamyltransferase 134 IU/l; and bilirubin 34 $\mu\text{mol/l}$, rising to 49 $\mu\text{mol/l}$; alkaline phosphatase 210 IU/l. Chest radiography showed basal pneumonic changes.

A diagnosis of septic arthritis was made and the right knee was aspirated. Purulent synovial fluid (10 ml) was withdrawn, and on direct film a cluster of cocci, loosely arranged 'like a bunch of grapes', was seen. The organisms were identified as 'probably *Staphylococcus aureus*'. He was treated with flucloxacillin 1 g four times a day and sodium fusidate 500 mg three times a day, both given intravenously. Over the course of the next six days he developed a widespread morbilliform rash, thought to be induced by the antibiotics. Flucloxacillin was stopped and treatment was started with intravenous vancomycin 1 g twice a day.

Twelve days after admission the synovial fluid bacteriological report showed 'Gram negative bacillus present throughout the enrichment'. Two weeks after admission the organism was identified as *Streptobacillus moniliformis* and was found to be 'very sensitive to penicillin'. At this stage the patient had a normal temperature, his joints had completely returned to normal, and the chest radiograph had cleared. He was discharged a few weeks after admission, and on review 10 weeks later the patient had no residual joint signs other than bilateral quadriceps wasting.

Discussion

Both *Streptobacillus moniliformis* and *Spirillum minus* have worldwide distribution. *Streptobacillus moniliformis* is responsible for most of the rat bite fever recorded in America. Its natural habitus is the rat respiratory tract, being present in up to 50% of healthy rats,⁷ and is rarely transmitted to humans.⁸

Streptobacillus moniliformis is extremely difficult to identify because of its fastidious growth requirements and variable staining and morphology.⁹ It is classified as a Gram negative rod but may retain the Gram stain and adopt coccal forms (McKay-Ferguson E, personal communication).

Because of the difficulty in culturing the organism the diagnosis was delayed for two weeks. The organism was cultured eventually from an enrichment culture (Robertson's cooked meat medium). Sodium polyanethol sulphonate, which is present in many blood culture systems as an anticoagulant, might have contributed to the delay, and this has been shown to inhibit growth of some strains of *Streptobacillus moniliformis*.¹⁰⁻¹¹

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The initial choice of treatment with flucloxacillin was satisfactory, as was subsequent treatment with Vancomycin, and disc diffusion tests confirmed both antibiotics to have been appropriate. Both penicillin and vancomycin act by interfering with bacterial cell wall synthesis and are much more active against Gram positive than Gram negative bacteria (with the exception of certain Gram negative cocci such as neisserias). The satisfactory clinical outcome in this case supports the conclusion that *Streptobacillus moniliformis* should properly be regarded as a Gram positive organism.

There was no history of rat bite, but, possibly, inhalation or gastrointestinal absorption of excreta might have been the portal of entry. The piggery had been infested with rats and the patient remembered numerous episodes of grazing the skin of both elbows on the sides of the pig pens. It is possible, therefore, that inoculation of this organism might have occurred through this route. Two recent reports from America also note streptobacillus infections which occurred without a history of rat bites: a 48 year old warehouse fork-lift operator who had a three month history of gradually increasing symptoms before diagnosis, and a 59 year old alcoholic man who had a one month history of arthritic symptoms before diagnosis. In neither of these cases had any recollection of contact with rats or of a rat bite been noted.^{12 13}

The differential diagnosis in this case would include other causes of septic arthritis, such as Lyme disease and gonococcal arthritis and brucella, as well as other non-infectious inflammatory polyarthropathies, including rheumatoid arthritis.¹³

Presentation with fever and rash may mimic systemic lupus erythematosus, drug reactions, viral infections, rickettsial infections, and secondary syphilis.

Of cases of septic arthritis in adults, up to 60% are due to staphylococci, with streptococci also being prominent.¹⁴ Gram negative infections are mainly restricted to the immunocompromised and the elderly. Infection with anaerobes mainly occurs in those with postoperative

infection. Treatment with penicillins, which will eradicate the organism causing septic arthritis, will usually be effective in rat bite fever, Lyme disease, and gonococcal arthritis.

Our patient presented with a short history of arthralgia and subsequently arthritis associated with rigors and rash. The absence of readily available serological tests for this organism and lack of any clear history of origin for the infection retarded the correct diagnosis being made. We would like to draw attention to the possibility of rat bite fever as a cause of pyogenic arthritis, particularly where initial microbiological analysis has been unrevealing.

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