Infections due to *Actinobacillus actinomycetemcomitans*

A report of 3 cases

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Summary

Three cases are described which show the typical range of infections which may be caused by *Actinobacillus actinomycetemcomitans*, namely an actinomycosis-like infection, a prosthetic cardiac valve endocarditis and a post-traumatic soft-tissue infection. Cultural studies are detailed, and a short review of the disease-producing potential of this organism and its treatment is presented.

S Afr Med J 1983; **63**: 580-581.

Actinobacillus actinomycetemcomitans, a Gram-negative bacillus, was first isolated and identified in 1912 by Klinger.[1] It was so named because of its consistent association with *Actinomyces israelii* in actinomycotic infections. In 1934 Klaber[2] reported that this organism occurred only in association with *A. israelii*. However, King and Tatum[3] in 1962 reported 32 instances of infection with *Act. actinomycetemcomitans* unconnected with diagnosed actinomycosis. The clinical histories of these cases were subsequently reviewed by Page and King,[4] who noted that 23 of the 32 cases were consistent with the diagnosis of bacterial endocarditis and 7 with soft-tissue infections. Pulverer and Ko[5] isolated 465 strains, of which 448 were isolated in combination with *A. israelii* from patients with clinical actinomycosis. The remaining 17 strains were isolated from patients in whom the evidence for infection with *A. israelii* was inconclusive. They concluded that *Act. actinomycetemcomitans* must be considered a pathogen by itself.

This organism is found as part of the normal indigenous microflora of the oral cavity, but its presence is also related to periodontal inflammation, particularly in juvenile periodontitis.[6] In most instances of *Act. actinomycetemcomitans* infection the oral cavity is therefore presumably the source of infection.

Apart from its frequent association with *A. israelii* it is also a rare cause of infective endocarditis. In 1980, Geraci *et al.*[7] reported 4 cases which brought the total number of cases reported in the English literature to 49. Three of the infections previously reported on involved prosthetic cardiac valves. *Act. actinomycetemcomitans* has also been reported to be the sole infecting agent in a brain abscess,[8] a thyroid gland abscess,[9] a urinary tract infection[10] and a case of vertebral osteomyelitis.[11] Human infections due to *Act. actinomycetemcomitans* have not been previously reported from the RSA. We have recently isolated this organism from 5 patients and describe 3 of the cases which demonstrate the typical range of infections caused by *Act. actinomycetemcomitans*.

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Date received: 7 July 1982.

Case reports

Case 1

After an assault this adult patient had a tooth embedded in his hand. The tooth was removed and the laceration treated with a topical preparation which included an antibiotic. During the following 6 months recurrent abscesses developed at the original site of trauma. Chronic osteitis of the fifth metacarpal bone developed, with an associated drainage sinus. No fracture was detected. Specimens of pus from the sinus yielded a pure and profuse growth of an organism identified as *Act. actinomycetemcomitans*. Neither *A. israelii* nor any other anaerobe was isolated. The bone abscess was incised and drained, ampicillin was prescribed, and the patient made a complete recovery.

Case 2

A 14-year-old Coloured girl had an aortic valve replacement for congenital aortic stenosis. She was admitted 18 months later with classic signs of infective endocarditis, and four successive blood cultures yielded a pure growth of *Act. actinomycetemcomitans*. There was no history of a recent dental or any other oral surgical procedure. This patient was treated with high doses of intravenous penicillin and gentamicin and made a complete and uneventful recovery.

Case 3

A 36-year-old male was admitted to hospital because of progressive paraplegia. Some 2 years previously he had suffered spontaneous loss of a molar tooth with subsequent sepsis of the jaw. About 6 months later he had started coughing and had noticed the spontaneous appearance of drainage sinuses on the front and back of the chest, the right shoulder, the left groin and, at the time of admission, the right elbow. Radiographs of his chest showed fibrotic changes at the left apex, thought not to be tuberculosis. There were no enlarged hilar lymph nodes. There was erosion of the ribs on the left side at T5, T6 and T7. The radiographs as well as the bone scans showed no abnormality of the spine. Two samples of pus obtained from the drainage sinuses yielded a profuse growth of *Act. actinomycetemcomitans*, and anaerobic cultures yielded a profuse growth of *Bifidobacterium eriksonii*. A diagnosis of thoracic actinomycosis with paravertebral abscess was made and high-dose intravenous penicillin therapy was given for 6 weeks, followed by a long-term course of oral penicillin and probenecid. The patient has made good progress and is regaining the use of his legs.

Culture of organisms

The three isolates grew poorly under aerobic conditions but produced small colonies of a Gram-negative coccobacillus after 48 hours' incubation in the presence of CO_2. There was no growth on MacConkey's agar and only poor growth on Kligler's iron agar. The isolates showed the following biochemical reactions: catalase-positive, oxidase-negative, nitrate-positive, aesculin-negative, lysine and ornithine decarboxylase-negative. Carbohydrate fermentation studies showed acid production from glucose, mannitol and maltose, but not from lactose and sucrose. *Act. actinomycetemcomitans* closely resembles *Haemophilus aphrophilus*,[3,4] from which it can be distinguished by its positive catalase reaction and its inability to ferment lactose and sucrose.

Discussion

The 3 cases demonstrate the wide range of infections which may be caused by this organism. The 2nd patient presents the classic infection caused by *Act. actinomycetemcomitans*, infective endocarditis, in this case involving a prosthetic cardiac valve. Most patients with infective endocarditis caused by *Act. actinomycetemcomitans* have been treated with combined antibiotic therapy, with a cure rate of 80%.[7] Our patient responded well to penicillin and gentamicin therapy.

The 1st case is more unusual because the patient's soft-tissue infection of the hand followed a laceration caused by a tooth. Since the oral cavity is the usual source of infection with *Act. actinomycetemcomitans*, the tooth was the likely source of the infecting agent. Although infection with *A. israelii* can never be adequately excluded from the diagnosis without biopsy, this case probably represents an infection with *Act. actinomycetemcomitans* by itself.

The 3rd case presents a most interesting association of *B. eriksonii* (rather than *A. israelii*), known to cause an actinomycosis-like infection,[12] with *Act. actinomycetemcomitans*. In this patient *Act. actinomycetemcomitans* may only have been of secondary importance.

Holm[13] described in detail the case histories of 2 patients with actinomycosis treated with penicillin, in whom the *A. israelii* disappeared, but who remained ill with clinical symptoms resembling those of actinomycosis. From both these patients *Act. actinomycetemcomitans* was isolated before and after treatment, suggesting that the continuation of the disease was owing to the persistence of the organism. Holm concluded from these and other cases that *Act. actinomycetemcomitans* alone was at least capable of maintaining the disease. Slots *et al.*[14] showed that some strains were clearly resistant to penicillin. They also quoted cases of actinomycosis-like infections which were not cured by penicillin because of the persistence of a penicillin-resistant strain of *Act. actinomycetemcomitans*.

In soft-tissue infections the isolation of *Act. actinomycetemcomitans* alone should always induce a careful microbiological search for *A. israelii*. Failure to isolate *A. israelii* from such lesions may well reflect infection due to *Act. actinomycetemcomitans* alone. When infections apparently due to *Act. actinomycetemcomitans* alone are treated, however, penicillin should always be added to the antibiotic regimen to eliminate any possible associated infection with *A. israelii*.

The three isolates were kindly confirmed by Dr R. E. Weaver, Center for Disease Control, Atlanta, Georgia, USA. We wish to thank Dr D. Hanslow for permission to publish the clinical details of case 2.

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