Journal of Medical Microbiology (2005), **54**, 1103–1105 DOI 10.1099/jmm.0.46061-0

Case Report

Three cases of vertebral osteomyelitis caused by *Streptococcus dysgalactiae* subsp. *equisimilis*

Aravind Kumar,[1] Jonathan Sandoe[2] and Naresh Kumar[1]

[1]Department of Orthopaedics, Royal Wolverhampton Hospital NHS Trust, Wolverhampton WV10 0QP, UK

[2]Department of Microbiology, Leeds General Infirmary, Great George's Street, Leeds LS2 9JT, UK

Correspondence
Naresh Kumar
naresh@doctors.org.uk

Received 27 February 2005
Accepted 23 June 2005

Three cases of vertebral osteomyelitis caused by *Streptococcus dysgalactiae* subsp. *equisimilis* (*Strep. equisimilis*) are presented here. All three cases presented with fever, back pain, general malaise and weight loss for at least 4 weeks. Diagnosis was established by culture of a spinal biopsy and/or positive blood cultures together with radiological findings. In all three cases, 6–12 weeks of antibiotics were curative without recourse to surgery. The ability of *Strep. equisimilis* to cause vertebral osteomyelitis is highlighted. The need is emphasized for biopsy and microbiological investigation in patients presenting with back pain, fever, weight loss and evidence of a spinal lesion on imaging, even if neoplastic disease is suspected. Prolonged antibiotic therapy (at least 6 weeks) seems to be indicated.

Introduction

Vertebral osteomyelitis (VO) is an uncommon cause of back pain in adults, although the vast majority of patients with this condition will present with back pain (Carragee, 1997). Pyogenic VO usually results from haematogenous seeding of the bone. The organism most commonly incriminated in lumbar osteomyelitis is *Staphylococcus aureus* (Adeotoye & Kupfer, 1999; Bath & Pettingale, 1990; Carragee, 1997; Ullman *et al.*, 1988) but other organisms are occasionally implicated such as *Enterobacteriaceae*, enterococci, Lancefield group B streptococci, viridans streptococci and '*Streptococcus milleri*' (Adeotoye & Kupfer, 1999; Bath & Pettingale, 1990; Carragee, 1997; Ganapathy & Rissing, 1995; Ullman *et al.*, 1988).

Lancefield group C β-haemolytic streptococci are well-known pathogens in animals (Carragee, 1997). *Streptococcus dysgalactiae* subsp. *equisimilis* (*Strep. equisimilis*) is a large-colony-type ($\geq$ 0·5 mm) Lancefield group C β-haemolytic *Streptococcus* that can colonize healthy humans and has been implicated in various human infections including endocarditis, pneumonia and cellulitis (Carmeli & Ruoff, 1995; Carmeli *et al.*, 1995). *Strep. equisimilis* is a rare cause of bone infection in humans but has been described elsewhere as a cause of cervical spine osteomyelitis (Asplin *et al.*, 1979), lumbar spine osteomyelitis (Gomez-Rodriguez *et al.*, 1998; Richette *et al.*, 2001) and septic arthritis (Ike, 1990). We present the cases of three further patients with vertebral infection caused by *Strep. equisimilis*, including a case involving the thoracic spine. These patients presented over a period of 3 years at Leeds General Infirmary and Royal Wolverhampton Hospital NHS Trust. Diagnostic difficulties and antimicrobial therapy are discussed in relation to the previously reported cases.

Abbreviations: CRP, C-reactive protein; WCC, white cell count; VO, vertebral osteomyelitis.

Case 1

A 55-year-old fish merchant presented with a 4 week history of back pain and low-grade fever. There was no history of trauma or being otherwise unwell. He was followed up for 3 weeks, during which time he suffered from anorexia and weight loss but became afebrile and remained so. Admission was arranged for investigation of suspected spinal metastasis. Blood investigations revealed a white cell count (WCC) of $15{\cdot}1 \times 10^9$ l^{-1} but C-reactive protein (CRP) and blood cultures were not done. A week later he developed an abscess in the right sternoclavicular joint. Incision and drainage was performed but operative specimens did not grow any organisms and no bacteria were seen on microscopy. Empirical intravenous flucloxacillin (1 g 6-hourly) and benzylpenicillin (2·4 g 6-hourly) were commenced and continued for 3 weeks, to which the sternoclavicular infection appeared to respond. After stopping the antibiotics, the persistence of back pain and paraspinal spasm prompted further investigation. A bone scan, 5 weeks after initial presentation, revealed increased uptake in the upper lumbar region. Computerized tomography (CT) and magnetic resonance imaging (MRI) scans showed a small collection anterior to the first lumbar vertebra. MRI scans also showed increased signal in both L1 and L2 vertebrae and in the intervertebral disc on the T2 weighted images (Fig. 1). Gram

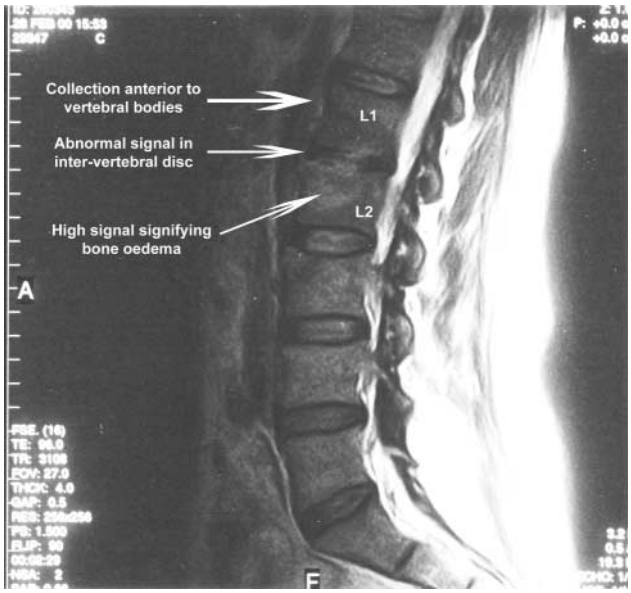

Fig. 1. T1 weighted MRI scan showing abnormal signal in the inter-vertebral disc between first and second lumbar vertebrae, increased signal signifying bone oedema in the adjacent vertebral bodies and a collection anterior to the vertebral bodies.

stain of biopsy material showed Gram-positive cocci in chains. Direct (and later enrichment broth) cultures grew *Strep. equisimilis* susceptible to penicillin. Echocardiography was unremarkable.

The patient was commenced on intravenous benzylpenicillin (2·4 g 6-hourly) and oral rifampicin (300 mg 12-hourly). Intravenous antibiotics were continued for a total of 3 weeks and then changed to a combination of clindamycin (300 mg 6-hourly) and oral rifampicin. Oral antibiotics were continued for a period of 9 weeks, giving a total duration of 12 weeks of antibiotic therapy. The acute inflammatory parameters settled and there was no relapse during the follow-up period.

Case 2

A 43-year-old man presented to hospital with high fever, confusion and weakness of the lower limbs. He had a history of back pain for 8 weeks, which followed a laceration on the thigh sustained on a piece of rusty metal. He also complained of weight loss and general malaise. On examination he was acutely unwell with a temperature of 39 °C and tachycardia. He exhibited erythema nodosum, splinter haemorrhages of the nails and grade 3/5 power in his lower limbs. His CRP level and WCC were elevated at 347 mg l^{-1} and $15{\cdot}8 \times 10^9$ l^{-1}, respectively. MRI scans showed areas of increased signal in T2 weighted scans at the L5–S1 intervertebral disc and adjacent vertebral bodies, which enhanced with injection of gadolinium. Echocardiography revealed severe aortic regurgitation with abscess formation. Blood cultures grew *Strep. equisimilis* that was susceptible to penicillin. A diagnosis of aortic valve endocarditis with VO was made.

A temporary pacemaker was inserted and aortic valve replacement was carried out. The patient improved with administration of intravenous benzylpenicillin (2·4 g 6-hourly) and gentamicin (80 mg 8-hourly) for 4 weeks. Oral penicillin V (1 g 6-hourly) was continued for a further 2 weeks. The back pain settled and the patient did not have any relapse of symptoms during the 2 year follow-up period.

Case 3

A 58-year-old man presented with an 8 week history of back pain, general malaise and fever. His CRP level was 50 mg l^{-1} and erythrocyte sedimentation rate was 63 mm h^{-1}. A bone scan showed intense uptake in the lower thoracic region and an MRI scan revealed bone oedema and discitis at the T11 and T12 level. There was also a large paravertebral inflammatory mass that enhanced with gadolinium injection. This was thought to suggest tuberculosis infection and he was commenced on anti-tuberculosis treatment.

Blood cultures taken at admission grew *Strep. equisimilis*, which was subsequently also cultured from a biopsy of the T11 body. A repeat bone biopsy from the T12 vertebral body grew the same organism, which was susceptible to penicillin. No drainage procedures were performed at this stage. A diagnosis of T11 and T12 VO with paravertebral abscess was made and the patient was commenced on intravenous benzylpenicillin (2·4 g 6-hourly) in addition to rifampicin. The anti-tuberculous treatment was discontinued. His condition improved and after 2 weeks he was discharged home with penicillin V (1 g 6-hourly) and oral rifampicin (300 mg 12-hourly) for 4 weeks. At follow-up 2 months later he remained well with no signs of relapse. An MRI scan at this stage showed collapse of T11 and T12 with obliteration of the disc space. A final follow-up at 2 years showed that the patient remained symptom-free.

Discussion

The incidence of VO in the UK is 1 in 250 000 people per year (Thompson *et al.*, 1988). Infection is believed to arise in most cases by haematogenous spread; two adjacent bony segments of vertebral bodies are supplied by arteries that bifurcate, resulting in disease affecting two adjacent vertebrae and the intervertebral disc. *Staph. aureus* is the most common causative organism but other Gram-positive bacteria such as β-haemolytic streptococci, viridans streptococci and '*Strep. milleri*' are occasional causes. On average, approximately 4 weeks of symptoms are experienced before patients with this infection present to healthcare professionals, making early diagnosis difficult (Carragee, 1997). The period between onset of symptoms and presentation was about 8 weeks in all three of the cases presented, suggesting that *Strep. equisimilis* may be less virulent than the usual causative organism, *Staph. aureus*.

Infective endocarditis occasionally presents as VO with back

pain (Barham *et al.*, 1990) as occurred in one of our patients. Hence, patients presenting with VO should have a careful cardiovascular examination in addition to blood cultures. Insidious presentation was misinterpreted as metastatic spinal disease in one of the cases and as tuberculosis in another. The insidious onset together with the picture of paravertebral abscess was thought to represent tuberculosis, which led to unnecessary anti-tuberculous therapy and a delay in instituting the correct antimicrobials. In contrast to the few cases of '*Strep. milleri*' VO, the reported *Strep. equisimilis* spinal infections have been more insidious in onset (Faraj *et al.*, 1996; Jacobs *et al.*, 1994; Meyes *et al.*, 1990). These cases also contrast with septic arthritis caused by *Strep. equisimilis*, which tends to be acute in presentation with high mortality and morbidity (Ike, 1990).

Instituting early and appropriate microbiological investigation of patients with spinal lesions and fever and/or raised inflammatory markers can reduce the possibility of diagnostic errors. It is noteworthy that an elevated WCC and fever are absent in approximately 50 % of cases (Mader & Calhoun, 2000) but the erythrocyte sedimentation rate or CRP level is usually elevated. A definitive microbiological diagnosis of VO can only be made by identification of the organism from bone following biopsy or intra-operative sampling (Mader & Calhoun, 2000). However, a presumptive microbiological diagnosis can be made in an appropriate clinical setting if blood cultures are positive. Blood cultures were positive in two of the cases reported herein and two of the three previous cases (Asplin *et al.*, 1979; Gomez-Rodriguez *et al.*, 1998; Richette *et al.*, 2001), highlighting the value of this investigation. If risk factors for endocarditis are present, then three sets of blood cultures should be taken from separate venipunctures. Biopsy material, ideally obtained before any antimicrobial therapy, should be processed for routine bacteriology as well as mycobacteria.

Initial treatment of VO generally requires intravenous antibiotics, primarily to ensure adequate bone levels. Oral antibiotics have been used to complete a course of therapy but the recommended duration of antimicrobials varies considerably: one source recommends 4–6 weeks (Mader & Calhoun, 2000). In retrospect we believe that the patient described in case 1 had VO at presentation and that the initial empirical treatment was appropriate; however, the duration of 3 weeks was clearly inadequate. A similar situation occurred in one of the previous cases, in which a 2 week course of amoxycillin and cloxacillin was prescribed before the correct diagnosis was made and also failed to eradicate infection (Asplin *et al.*, 1979). The total duration of antimicrobials used in the successful cure of these cases varied between 6 weeks (two cases) and 12 weeks, including 2–4 weeks initial intravenous therapy. The previous episodes of *Strep. equisimilis* VO were treated with intravenous antibiotics initially at least for a week and in total for a period of 37 days (Gomez-Rodriguez *et al.*, 1998) to 11 weeks (Richette *et al.*, 2001).

There is no good-quality evidence to support the addition of rifampicin in this clinical setting but combination therapy has been recommended for severe group C streptococcal infection on the basis of *in vitro* tolerance to penicillin and some retrospective clinical data. The addition of gentamicin to penicillin or the addition of rifampicin or gentamicin to vancomycin has produced a bactericidal effect against group C streptococci *in vitro*. We were reluctant to prescribe long-term aminoglycosides in cases 1 and 3, preferring to use rifampicin as a generally well-tolerated agent with activity against the causative organism and good bone penetration. The small number of cases presented precludes us from making any recommendations about appropriate therapy but in each case a combination of antimicrobial agents was used to achieve a cure.

References

Adeotoye, O. & Kupfer, R. (1999). *Streptococcus viridans* vertebral osteomyelitis. *J R Soc Med* **92**, 306–307.

Asplin, C. M., Beeching, N. J. & Slack, M. P. (1979). Osteomyelitis due to *Streptococcus equisimilis* (group C). *BMJ* **i**, 89–90.

Barham, N. J., Flint, E. J. & Mifsud, R. P. (1990). Osteomyelitis complicating *Streptococcus milleri* endocarditis. *Postgrad Med J* **66**, 314–315.

Bath, P. M. & Pettingale, K. W. (1990). Group B streptococcal osteomyelitis of the spine. *J R Soc Med* **83**, 188.

Carmeli, Y. & Ruoff, K. L. (1995). Report of cases of and taxonomic considerations for large-colony-forming Lancefield group C streptococcal bacteremia. *J Clin Microbiol* **33**, 2114–2117.

Carmeli, Y., Schapiro, J. M., Neeman, D., Yinnon, A. M. & Alkan, M. (1995). Streptococcal group C bacteremia. Survey in Israel and analytic review. *Arch Intern Med* **155**, 1170–1176.

Carragee, E. J. (1997). Pyogenic vertebral osteomyelitis. *J Bone Joint Surg Am* **79**, 874–880.

Faraj, A., Krishna, M. & Mehdian, S. M. (1996). Cauda equina syndrome secondary to lumbar spondylodiscitis caused by *Streptococcus milleri*. *Eur Spine J* **5**, 134–136.

Ganapathy, M. E. & Rissing, J. P. (1995). Group B streptococcal vertebral osteomyelitis with bacteremia. *South Med J* **88**, 350–351.

Gomez-Rodriguez, N., Ferreiro-Seoane, J. L., Ibanez-Ruan, J. & Sevillano-Castano, J. (1998). Spondylodiscitis caused by *Streptococcus equisimilis*. *Br J Rheumatol* **37**, 1030–1032.

Ike, R. W. (1990). Septic arthritis due to group C streptococcus: report and review of the literature. *J Rheumatol* **17**, 1230–1236.

Jacobs, J. A., Pietersen, H. G., Walenkamp, G. H., Stobberingh, E. E. & Soeters, P. B. (1994). Intervertebral infection caused by *Streptococcus milleri*. A case report. *Clin Orthop Relat Res* **302**, 183–188.

Mader, J. T. & Calhoun, J. (2000). Osteomyelitis. In *Principles and Practice of Infectious Diseases*, pp. 1182–1196. Edited by J. E. Bennett, R. Dolin & G. L. Mandell. Philadelphia: Churchill Livingstone.

Meyes, E., Flipo, R. M., Van Bosterhaut, B., Mouligneau, G., Duquesnoy, B. & Delcambre, B. (1990). Septic *Streptococcus milleri* spondylodiscitis. *J Rheumatol* **17**, 1421–1423.

Richette, P., Pizzuti, P., Quillard, A., Raskine, L., Naveau, B. & Liote, F. (2001). A definite case of spondylodiscitis caused by *Streptococcus equisimilis*. *Clin Exp Rheumatol* **19**, 587–588.

Thompson, D., Bannister, P. & Murphy, P. (1988). Vertebral osteomyelitis in the elderly. *Br Med J (Clin Res Ed)* **296**, 1309–1311.

Ullman, R. F., Strampfer, M. J. & Cunha, B. A. (1988). *Streptococcus mutans* vertebral osteomyelitis. *Heart Lung* **17**, 319–321.