CASE STUDY

Staphylococcus capitis endocarditis: two cases and review of the literature

J A T Sandoe, K G Kerr, G W Reynolds, S Jain

Abstract

Coagulase negative staphylococci are the principal cause of prosthetic valve endocarditis but are a rare cause of native valve infections. However, the incidence of native valve endocarditis is increasing. *Staphylococcus capitis* is a coagulase negative staphylococcus with the capacity to cause endocarditis on native heart valves. Two cases of native valve endocarditis caused by *S capitis* are presented; both in patients with aortic valve disease. The patients were cured with prolonged intravenous vancomycin and rifampicin and did not need surgery during the acute phase of the illness. Five of the six previously described cases of endocarditis caused by this organism occurred on native valves and responded to medical treatment alone. (Heart 1999;82:e1)

Keywords: *Staphylococcus capitis*; endocarditis; valvar disease; coagulase negative staphylococci

Coagulase negative staphylococci (CoNS) are the most common cause of prosthetic valve endocarditis but are responsible for only 10% of native valve infections.¹ However, the incidence of CoNS native valve infection seems to be increasing.¹ *Staphylococcus epidermidis* is the species most frequently associated with native valve endocarditis; one recent series reported it as the cause of 91% of cases studied.¹ Nevertheless, endocarditis associated with other species of CoNS is well documented. We report two cases of native valve endocarditis caused by *Staphylococcus capitis* in patients with aortic valve disease, and review six previously published cases of both native and prosthetic valve infection with particular reference to medical and surgical management and outcome.

Case 1

A 46 year old man presented with acute ischaemia of the right foot. He was in end stage renal failure, secondary to chronic glomerulonephritis, and was being treated with continuous ambulatory peritoneal dialysis. The patient was also known to have mild aortic stenosis and paroxysmal atrial fibrillation. On examination, he had an intermittent low grade fever but was haemodynamically stable (pulse

80 beats/min, sinus rhythm; blood pressure 140/100 mm Hg). Auscultation revealed an ejection systolic murmur which was heard throughout the precordium. There were multiple splinter haemorrhages and digital ischaemia of the left hand and a pregangrenous appearance in the right forefoot. Haemoglobin was 144 g/l; white cells $9.1 \times 10^9/l$; platelets $296 \times 10^9/l$; and C reactive protein (CRP) 329 mg/l. Blood urea and creatinine were 18.1 mmol/l and 1094 $\mu\text{mol/l}$, and serum sodium was 131 mmol/l, potassium 2.8 mmol/l, chloride 90 mmol/l, and bicarbonate 28 mmol/l. Blood cultures (two of six sets) grew a Gram positive coccus, identified as *S capitis* by the Staphylococcus Reference Laboratory of the Central Public Health Laboratory. Disc diffusion testing revealed the isolate to be susceptible to vancomycin, flucloxacillin, and rifampicin. Echocardiography revealed a large (2×1 cm) vegetation on the non-coronary cusp of the aortic valve with no significant aortic incompetence. There was a 40 mm Hg gradient across a calcified aortic valve with hypertrophy but good left ventricular function. Endocarditis was diagnosed and treatment was started with intravenous vancomycin hydrochloride and oral rifampicin. We discussed the possibility of early aortic valve surgery because of the vegetation and previous embolic event but we decided to treat medically. On day 6, repeat echocardiography showed the vegetation to have vanished. This was not associated with a clinical embolic event.

Despite prostaglandin infusion the patient developed increasing pain in his right foot, which subsequently became gangrenous and required amputation. After a six week course of antimicrobial agents he had no fever, CRP was 16 mg/l, and repeat echocardiography showed no vegetation on the aortic valve and no change in valve appearance. There was no evidence of recurrent infection 10 months after discharge.

Case 2

A previously healthy 35 year old man presented with pleuritic-type retrosternal chest pain radiating to the left scapular region. In the preceding two weeks he had increasing arthralgia, night sweats, and lethargy. On examination he was afebrile but pale and in obvious discomfort. Two splinter haemorrhages on his left index finger were noted, but no other stigmata

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Table 1 Summary of the data on published episodes of *Staphylococcus capitis* endocarditis

Case (reference)	Age (years)	Previous cardiac pathology	Associated conditions	Valve(s) involved	Preceding dental treatment	Surgery during acute phase	Antibiotics	Outcome
1 ⁴	72	NS	Peripheral vascular disease, CVA	Mitral	NS	No	28 days iv vancomycin + iv gentamicin	Survived
2 ⁵	53	Mitral valve prolapse	None	Mitral	No	No	14 days iv amoxycillin + iv netilmicin followed by 30 days iv ceftriaxone	Survived
3 ⁶	63	Ventricular septal defect, previous endocarditis	None	Tricuspid	Yes	No	Cloxacillin (duration not stated)	Survived
4 ⁷	29	Mitral insufficiency	None	Mitral	NS	No	40 days iv benzylpenicillin + iv gentamicin	Survived
5 ⁷	62	Mitral valve prolapse with insufficiency	None	Mitral	Yes	No	Initially iv vancomycin + gentamicin, followed by 21 days iv benzylpenicillin + gentamicin, followed by 14 days po pefloxacin + rifampicin	Survived
6 ⁸	65	Mitral valve replacement (x 3)	NS	Mitral	No	Yes	42 days iv imipenem + iv vancomycin	Survived
7	46	Aortic stenosis	ESRF	Aortic	No	No	42 days iv vancomycin + po rifampicin	Survived
8	35	Bicuspid aortic valve	None	Aortic	No	No	28 days iv vancomycin + po rifampicin	Survived

NS, not stated; CVA, cerebrovascular accident; ESRF; end stage renal failure

of endocarditis were observed. Cardiovascular examination revealed murmurs of mixed aortic valve disease with a collapsing pulse (66 beats/min; blood pressure 95/45 mm Hg). Electrocardiography indicated left ventricular hypertrophy with first degree heart block and chest radiography showed cardiomegaly. Haemoglobin was 104 g/l, CRP 59 mg/l, and blood urea 7.6 mmol/l. Serum electrolytes, creatinine, and liver function tests were all within their respective reference ranges. Fourteen sets of blood cultures all grew a CoNS which was identified as *S. capitis*. This isolate was susceptible to vancomycin, flucloxacillin, and rifampicin on disc diffusion testing. Transoesophageal echocardiography showed a bicuspid aortic valve with a posterior perforation, moderate aortic regurgitation, and probable aortic vegetation. Because of a well documented history of penicillin hypersensitivity, the patient was treated with intravenous vancomycin hydrochloride and oral rifampicin. There was a rapid clinical response. On day 27 fever recurred in association with raised concentrations of liver enzymes and a decision was made to stop antibiotic treatment on day 30. However, within two days the fever resolved, CRP was normal, and blood cultures yielded no bacterial growth. The patient remained well on follow up six months later but because of significant aortic regurgitation is to undergo elective valve replacement.

Discussion

CoNS account for up to 60% of cases of prosthetic valve endocarditis²; however, they are a much less frequent cause of native valve endocarditis. Coagulase negative staphylococci used to be called *Staphylococcus albus*, and more recently *Staphylococcus epidermidis*, but are currently recognised to comprise a heterogeneous group of approximately 30 distinct species. *Staphylococcus epidermidis* is the name currently used to describe the species of CoNS most frequently associated with endocarditis. Another species, *S. capitis*, forms part of the normal microflora of the human scalp, face, neck, and

ears.³ As with other CoNS it is known to cause infection around prosthetic devices, but is rarely recognised as causing endocarditis; our cases bring the total number of reported cases to eight. An underlying cardiac abnormality which may have predisposed the patient to infection was reported in seven of the eight cases (table 1). The patient in case 2 had a congenitally bicuspid valve which was only diagnosed after the patient presented with endocarditis.⁵ Although the mitral valve was most commonly infected (five of eight cases) it is difficult to infer a tropism for a particular valve because of the small number of cases described. All but one case involved native valves, which contrasts with the widely held view that CoNS endocarditis is primarily an infection involving prosthetic valves. Data from this small series suggest that, in order to cause disease, *S. capitis* requires the presence of an underlying valvar anomaly. In our laboratory, we have found that *S. capitis* produces DNase with extended incubation (JAT Sandoe, unpublished data, 1997). This enzyme is a recognised virulence factor of *Staphylococcus aureus* and could play a role in the pathogenesis of cardiac infection. It is noteworthy that in two of the six cases where the history was recorded, the patients had had dental work before the development of endocarditis. However, as *S. capitis* is not known to be part of the normal oral microflora, these may be coincidental findings.

Methicillin resistance (and thus flucloxacillin resistance) is uncommon among *S. capitis* isolates but has been reported in one community acquired case of native valve endocarditis and one hospital acquired case of prosthetic valve endocarditis.^{4,8} A variety of antibiotic regimens has been used successfully in the management of *S. capitis* endocarditis. In the five cases in which duration of treatment is given, antimicrobial agents were administered for between four and six weeks. All patients survived, although one individual required valve replacement during the acute phase of the illness. Of particular interest are reports of two

cases which, despite major embolic events, were managed successfully with medical treatment, without recourse to valve replacement. Commercially available kits for the identification of CoNS are available but they are relatively expensive and time consuming to use. Although such bacteria are frequently isolated in the diagnostic microbiology laboratory, many of the isolates are thought to be contaminants which have been introduced during specimen collection or processing in the laboratory. Accordingly, it has not been routine laboratory practice to identify CoNS to species level and, therefore, these isolates may be labelled as *Staphylococcus epidermidis* (*sensu lato*). Consequently, infection which is associated with non-epidermidis species may be underrecognised and underreported.

This review highlights the potential for *S capitis* to cause serious native heart valve infections in immune competent patients with valvar disease. Although the number of cases in this series is small, the data suggest that a four week course of antimicrobial agents may be sufficient to treat *S capitis* endocarditis provided that the patient has a sustained clinical response and that inflammatory markers return to within normal limits. Native valve endocarditis due to *S capitis* has a favourable

prognosis and may respond to medical treatment alone even in the presence of a major embolic phenomenon. Species identification of CoNS is important to establish the natural history of endocarditis caused by individual species, and thus help in the decision to manage the disease with medical or combined medical and surgical treatment.

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