Infective endocarditis due to *Eikenella corrodens*: Case report and review of the literature

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ABSTRACT: *Eikenella corrodens* is an uncommon cause of bacterial endocarditis. In the 11 reported cases in the literature, the disease was associated with predisposing factors and was clinically indolent or subacute. A case is reported which in contrast to the reported literature was acute in onset with severe heart failure, requiring urgent valve replacement. **Can J Infect Dis 1990;1(4):139-142**

Key Words: *Acute endocarditis*, E corrodens *endocarditis*, Eikenella corrodens, *'HACEK'*

EIKENELLA CORRODENS IS AN UNCOMMON PATHOGEN that belongs to the so-called 'HACEK' group, which includes *Haemophilus* species, *Actinobacillus actinomycetemcomitans*, *Cardiobacterium homini*, *E corrodens* and *Kingella* species. These organisms are fastidious Gram-negative bacteria, reported to be unusual causes of subacute endocarditis (1,2). There are 11 reported cases of *E corrodens* endocarditis in the English language literature. In this paper the first case of acute endocarditis due to *E corrodens* is reported.

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CASE PRESENTATION

A 25-year-old male developed fever, sweating and headache one month prior to his admission to hospital. He was treated with antibiotics for 10 days and his condition improved for two weeks. He then developed night sweats, dyspnea, anorexia, nausea and fever which progressively worsened. He had no history of heart murmur, intravenous drug abuse or immunosuppression. He presented to his local hospital where a chest x-ray showed pulmonary edema with a right pleural effusion.

Upon transfer to the authors' facility, he was febrile (temperature 38.9°C) and in acute pulmonary edema. Aortic and mitral regurgitation murmurs were heard. There was no peripheral sign of endocarditis. White blood cell count was 17.7×10^9/L with 88.5% granulocytes, hemoglobin 9.9 g/L with normochromic, normocytic indices and erythrocyte sedimentation rate elevated (55 mm/h). The serum creatinine was 124 μmol/L and the urinary sediment showed five

to 10 red blood cells per high power field. The admitting diagnosis was probable acute bacterial endocarditis and he was treated with intravenous vancomycin, tobramycin, furosemide and digoxin.

An echocardiogram showed a large vegetation on a bicuspid aortic valve. Gross aortic insufficiency, mild mitral regurgitation and left ventricular dilation were also detected.

Due to severe congestive heart failure, emergency valve replacement was performed on the second hospital day. The vegetation, measuring 1.5 cm in diameter, was seen on the free edge of the right cusp of the bicuspid aortic valve. An abscess was found beginning close to the origin of the right coronary artery and extending down the septum. The abscess was drained and sutured from within and the valve replaced with a bioprosthesis.

One set of blood cultures collected in the emergency department and three from the first hospital day were subcultured 'blindly' following 18 h incubation at 35°C on 5% sheep blood agar and chocolate agar. After 48 h at 35°C, all plates grew small colonies of tiny pleomorphic Gram-negative bacilli. Morphologically similar organisms were seen by direct microscopy of aortic valve tissue and culture was positive for the same Gram-negative organisms.

Growth on chocolate agar was more luxuriant than that on blood agar and the organisms produced larger colonies under 5% carbon dioxide incubation than when grown in ambient air or under anaerobic conditions. No growth was noted on MacConkey agar. Colonies produced pitting of agar, showed a faint yellow pigment, produced greening of the surrounding medium and had an odour similar to that of hypochlorite bleach.

All isolates were identified as *E corrodens* on the basis of microscopic and colony morphology and on the following additional criteria: production of cytochrome oxidase, reduction of nitrate to nitrite without gas production, lack of motility and failure to produce catalase, urease, indole or acid from dextrose. The organism was further characterized by susceptibility to ampicillin and cefotaxime, intermediate susceptibility to tobramycin and resistance to clindamycin.

Due to failure to grow the pathogen in the septor system (Becton Dickinson Diagnostic Instrument Systems, Towson, Maryland) minimal inhibitory concentrations were not available.

The patient was treated with ampicillin 1.5 g and cefotaxime 2 g intravenously every 4 h. During the next five weeks he developed progressive dehiscence of the valvular prosthesis and consequently severe aortic insufficiency requiring a second aortic valve replacement (with a mechanical disc valve).

Surprisingly the excised valvular prosthesis grew *Staphylococcus aureus* after 48 h incubation in thioglycolate broth. Antibiotics were changed to 2 g ampicillin and 2 g cloxacillin intravenously every 4 h. On this regimen, the patient had an otherwise uneventful hospital course and was discharged after four weeks of therapy. Three additional sets of blood cultures collected in hospital and four collected after discharge yielded no growth. The patient did very well on follow-up at three, seven and 13 months after discharge.

DISCUSSION

E corrodens is a small nonsporeforming, microaerophilic Gram-negative coccobacillus that usually fails to grow on MacConkey agar or other selective media. In air, *E corrodens* grows slowly on hemin-containing media but growth is enhanced in a 5 to 10% carbon dioxide-containing atmosphere (3).

E corrodens is the accepted designation for the bacterium which was first described by Eiken in 1958 (4) as *Bacteroides corrodens* and by King and Tatum as HB-1 in 1962 (5). The present nomenclature was proposed by Jackson and Goodman in 1972 (6) when they demonstrated that two distinct organisms were being included under the designation *B corrodens*. One was strictly an anaerobe and urease positive, while the other was a facultative anaerobe and urease negative. They proposed that the latter be reclassified as *Eikenella corrodens* while the former remain under the designation *B corrodens* (6). *B corrodens* has now been renamed *B ureolyticus* (7).

E corrodens is a ubiquitous organism that resides in the oropharyngeal cavity. Khairat in 1967 (8) isolated *E corrodens* from 16 of 100 blood cultures taken 1 min after dental extraction, indicating this organism's potential to invade the blood. Since 1974, 12 cases of *E corrodens* endocarditis were reported in the English language literature. One case described by Sapico (9) should probably be excluded, as the description of the pathogen suggests more *B ureolyticus* than *E corrodens*.

The endocarditis associated with *E corrodens* is described as subacute or indolent (10-19). The time for diagnosis has varied from one to four months.

Table 1 summarizes the 11 cases in the literature and includes the case reported in this article. There were two deaths, one following an intracerebral bleed associated with leukemia and the other after complications of acute myocardial infarction (11,12). Neither death was directly attributable to the endocarditis. The blood cultures were positive after three to 17 days of incubation.

TABLE 1
Summary of reported cases of *Eikenella corrodens* endocarditis

Reference	Age (years)	Sex	Predisposing features	Coinfecting organisms	Time to positive culture (days)	Treatment	Outcome
11	52	M	Aortic stenosis	—	17	Ampicillin	Death
12	26	M	Acute leukemia	—	n/a	Ampicillin	Death
13	31	M	IV amphetamine	Group A streptococci	n/a	Clindamycin	Cure
14	38	M	Abnormal valve/ dental procedure	—	n/a	Ampicillin	Cure
15	41	F	Abnormal valve/ dental procedure	Group B beta-hemolytic streptococcus	3	Penicillin/ streptomycin	Cure
16	20	M	Abnormal valve/ amphetamine abuse	Anaerobic streptococci	3	Penicillin/ streptomycin	Cure
17	56	M	Prosthetic valve	—	3	Streptomycin Chloramphenicol	Cure
	72	M	Abnormal valve	—	3-12	Penicillin G	Cure
18	58	M	Prosthetic valve/ dental procedure	—	14	Penicillin/ tobramycin	Cure
19	26	F	IV amphetamine	*Staphylococcus aureus*	3	Penicillin	Cure
	29	M	IV amphetamine	*Streptococcus* species	n/a	Penicillin/ gentamicin	Cure
*	25	M	Abnormal valve	—	2	Cefotaxime Ampicillin Valve replacement	Cure

**Reported in this article. M Male; F Female; IV Intravenous; n/a Not available*

In the nine survivors, the infection was cured with antimicrobial therapy alone, and none of these patients required valve replacement. *E corrodens* has been isolated as the sole pathogen in six cases, while in others it was associated with different streptococci and on one occasion with *Staph aureus*.

The classification of infective endocarditis as 'acute' or 'subacute' is now of historical interest and was based on the progression of untreated disease with the acute form presenting with high fever, systemic toxicity, leukocytosis and death occurring several days to less than six weeks later (20). Compared to the 11 cases of *E corrodens* endocarditis published, the present case differs in clinical presentation. The patient was admitted to hospital with acute sepsis and secondary fulminant congestive heart failure. Although usually described as fastidious, *E corrodens* was isolated within 48 h from all specimens. As in the cases reported in the literature the patient had a bicuspid aortic valve as a predisposing factor.

The association of *E corrodens* endocarditis with oral infection and/or surgical procedure in the oral cavity is easily explained by the fact that this organism is a usual inhabitant of the oropharynx. *E corrodens* bacteremia associated with intravenous drug abuse has been described by Silpa and D'Angelo (13). Their patients crushed pills in their mouths before injection or 'cleaned' the injection site with saliva.

The antibiotic sensitivities of this organism have been performed by Goldstein (21-23) who reported minimal inhibitory concentrations (MICs) of 28 isolates for 13 antibiotics. The MIC_{90}s were as follows: penicillin 2 mg/mL, ampicillin 4 mg/mL, cefoxitin 0.5 mg/mL, cefotaxime 0.5 mg/mL and imipenem 0.25 mg/mL. *E corrodens* is, however, completely resistant to metronidazole, first generation cephalosporins and clindamycin. The MIC_{90}s for clindamycin and cefadroxil were 64 and 128 mg/mL, respectively. Based on this information, penicillin, ampicillin cefoxitin or third generation cephalosporins are the recommended antibiotics for therapy of *E corrodens* infection (24). The authors are not aware of any synergistic antimicrobial combination for the treatment of severe *E corrodens* infection. Recently two beta-lactamase-producing strains have been reported (25). If such strains of *E corrodens* become more frequently isolated, beta-lactamase-stable antimicrobial agents like the cephalosporins should become the agents of choice for the treatment of *E corrodens* infection.

CONCLUSION

The present case demonstrates that *E corrodens* endocarditis is associated with a broader spectrum of clinical features than previously recognized. The most common presentation is an indolent or subacute endocarditis cured with a course of intravenous antibiotics. Less common is

an acute clinical presentation with perivalvular abscess and rapid hemodynamic deterioration necessitating emergency valve replacement.

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