Case Report

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Neisseria elongata prosthetic valve endocarditis: case report and literature review

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Introduction: *Neisseria elongata*, a Gram-variable, rod-shaped organism, was previously thought to be non-pathogenic. However, in recent years it has become increasingly recognized as a rare cause of infective endocarditis. Here, to the best of our knowledge, we describe the first case of bivalvular prosthetic valve endocarditis due to *N. elongata*.

Case Presentation: A 55-year-old Taiwanese man with history of *Streptococcus viridans* endocarditis status post prosthetic mitral and aortic valve replacements presented with a 2-week history of progressive fatigue and altered mental status. He presented with fever, lethargy and shock. He was intubated and started on vasopressors. A systolic murmur was noted with leukocytosis and acute renal failure. He was started on broad-spectrum antibiotics. An initial trans-oesophageal echocardiogram (TOE) did not reveal vegetation, but showed an elevated aortic valve gradient of 70 mmHg consistent with severe aortic stenosis. A repeat TOE revealed multiple mobile and immobile mitral and aortic valve vegetations with an abscess extending toward the aortic valve. Three sets of positive blood cultures from admission identified *N. elongata*. Antibiotics were tailored to ceftriaxone. He underwent urgent aortic and mitral valve replacement. He completed a 6-week course of ceftriaxone. At discharge, two-dimensional echo revealed normal heart function with normal prosthetic mitral and aortic valves.

Conclusion: *N. elongata* is an uncommon, but increasingly recognized, cause of infective endocarditis. It causes severe valvular destruction with systemic complications and often requires surgical intervention.

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Introduction

Neisseria elongata, a Gram-variable, rod-shaped member of the family *Neisseriaceae*, is a constituent of the normal human oropharyngeal flora (Grant *et al.*, 1990; Haddow *et al.*, 2004). It was previously thought to be non-pathogenic, but became increasingly recognized as a rare cause of infective endocarditis as well as osteomyelitis. It causes an acute, destructive endocarditis. Here, to the best of our knowledge, we describe the first case of bivalvular prosthetic valve endocarditis due to *N. elongata*.

Case report

A 55-year-old Taiwanese man with a history of *Streptococcus viridans* endocarditis status post prosthetic mitral and aortic valve replacements in 1999, with recurrent *S. viridans* endocarditis, presented with a 2-week history of progressive generalized weakness and altered mental status. He had a dental crown placed 3–4 months prior to admission without prophylactic antibiotics.

He presented to an outside emergency department with fever of 102 °F (39 °C) and shock. He was intubated and started on vasopressors. A systolic murmur was noted on exam. He was found to have marked leukocytosis (white blood cells 69 K/mcL with 17 % bands), thrombocytopenia (platelets 22 K/mcL), lactic acidosis (lactate 5.9 mg/dl) and acute renal failure. He was admitted to the intensive care unit, and started on vancomycin, cefepime, ampicillin and gentamicin.

Investigations

An initial trans-oesophageal echocardiogram (TEE) did not reveal any vegetation, but showed an elevated aortic valve gradient of 70 mmHg consistent with severe aortic stenosis. He was transferred to our institution for further management of his septic shock and severe aortic stenosis, with presumed endocarditis.

Given the strong clinical suspicion for endocarditis and the concern that the initial TEE may have been misinterpreted due to the presence of prosthetic valves, the TEE was repeated. The repeated TEE revealed multiple mobile and

Abbreviation: TEE, trans-oesophageal echocardiogram.

Fig. 1. TEE of the mitral valve vegetation in three dimensions.

immobile mitral valve vegetations with abscess extending toward the aortic valve (Fig. 1), and several small, mobile aortic valve vegetations.

A magnetic resonance imaging scan of the brain revealed multiple diffuse septic emboli. A computed tomography scan of the abdomen/pelvis revealed small, low-density lesions scattered throughout the spleen, consistent with splenic infarcts.

Diagnosis

Three sets of positive blood cultures from admission and another set of cultures from the second day identified *N. elongata* (Table 1). Antibiotics were tailored to ceftriaxone 2 g intravenously every 24 h.

Treatment

The patient underwent urgent repeat aortic and mitral valve replacement surgery. Intra-operatively, he was found to have vegetations on both prosthetic valves, which required extensive debridement.

Outcome

The post-operative course was complicated by congestive heart failure, cardiac tamponade, shock, respiratory failure and coagulopathy. The mitral and aortic valve surgical tissue Gram stain showed moderate white blood cells and no organisms. Surgical cultures were negative.

Table 1. MICs for *N. elongata* culture

Antibiotic	MIC (µg/ml)
Ceftriaxone	0.06
Ampicillin	<0.12
Amoxicillin/clavulanate	<2
Imipenem	<0.5
Levofloxacin	0.25
Meropenem	<0.6
Trimethoprim/sulfamethoxazole	>2/38
Penicillin	0.25
Cefuroxime	1

Based on the sensitivity results from the initial culture, the patient completed a 6-week course of ceftriaxone 2 g intravenously every 24 h. This treatment was compatible with previously described cases in the literature. Prior cases were treated with third-generation cephalosporin, benzylpenicillin or ampicillin/amoxicillin. Ceftriaxone is more convenient to administer than ampicillin or benzylpenicillin given its once-daily dosing requirement. Trans-thoracic echocardiogram prior to discharge revealed normal heart function with normal-appearing prosthetic mitral and aortic valves.

Discussion

N. elongata, first described in 1970, is an aerobic, Gram-negative coccobacillus within the family *Neisseriaceae*. The organism can occasionally be Gram-variable. It is considered to be a commensal of the human oropharynx, and is closely related to *Kingella*, *Eikenella* and *Moraxella* species, and Centers for Disease Control group EF4 (Hoshino *et al.*, 2005; Noheria *et al.*, 2010). *N. elongata* is a rare, but increasingly recognized cause of infective endocarditis. The species *N. elongata* includes three subspecies: *N. elongata* subsp. *elongata*, *N. elongata* subsp. *glycolytica* and *N. elongata* subsp. *nitroreducens* (formerly Centers for Disease Control group M-6). Various systemic infections have been reported, such as septicaemia, endocarditis and osteomyelitis. *N. elongata* subsp. *nitroreducens* has been most frequently linked to infective endocarditis (Hsiao *et al.*, 2008; Noheria *et al.*, 2010).

Risk factors include pre-existing valvular heart disease, preceding dental work, history of rheumatic heart disease and a prior history of endocarditis. The typical presentation is an acute, febrile, destructive endocarditis with large vegetations, often with systemic complications, such as congestive heart failure, perivalvular abscess (30 %), renal failure (30 %) or embolic phenomena (Struillou *et al.*, 1993; Hsiao *et al.*, 2008).

A review of the literature, including this case, revealed 24 cases of *N. elongata* endocarditis (Table 2). The reported age range was 7–82 years, with a mean of 49 years. All reported cases, including ours, involved the aortic or mitral valve (Hsiao *et al.*, 2008; Noheria *et al.*, 2010).

Table 2. *N. elongata* endocarditis literature review

Reference	Age (years)	Risk factor	Echo criteria	Duke criteria	Complication	Surgery
Meuleman <i>et al.</i> (1996)	74	Dental infection, bioprosthetic atrial valve	None	One major, two minor	None	None
Dominguez & Smith (1998)	50	Prosthetic aortic valve	Vegetation on atrial valve, subvalvular abscess	One major, four minor	Stroke, subarachnoid haemorrhage, subvalvular abscess	Atrial valve replacement
Picu <i>et al.</i> (2003)	79	Prosthetic atrial valve, infected teeth	None	One major, three minor	Renal failure	None
Cervera <i>et al.</i> (2004)	67	Prosthetic atrial valve	None	One major, two minor	Renal failure	None
Evans <i>et al.</i> (2007)	70	Klinefelter's syndrome and tissue atrial valve replacement	Thickened atrial valve	One major, three minor	Renal failure, atrial fibrillation	None
Noheria <i>et al.</i> (2010): case 1	65	Prosthetic atrial valve/mitral valve, pacemaker	Atrial valve collection, pacer lead density	Three minor	None	None
Noheria <i>et al.</i> (2010): case 2	60	Prosthetic atrial valve/mitral valve, dental infection	Atrial valve vegetation, increased gradient	One major, three minor	Renal failure	Atrial valve replacement
This case	55	Prosthetic atrial valve and mitral valve	Vegetation on the mitral and atrial valve	One major, three minor	Brain emboli	Mitral valve and atrial valve replacement
Perez (1986)	57	RHD: Rheumatoid Heart Disease, AR: Aortic Regurgitation, history of IE: Infective Endocarditis catheterization	None	One major, two minor	congestive heart failure	Atrial valve replacement
Simor & Salit (1983)	31	Dental procedure, mitral valve prolapse	Vegetation on mitral valve	Two major	Myocardial abscess, renal failure, congestive heart failure	Mitral valve replacement
Rose <i>et al.</i> (1990)	65	None	Atrial regurgitation, mitral regurgitation	Three minor	Thrombotic thrombocytopenic purpura, confusion, hemiparesis	None
Garner & Briant (1986): case 1	31	Mitral valve prolapse	Vegetation on mitral valve	One major, three minor	Stroke	Debridement
Garner & Briant (1986): case 2	25	None	Mitral regurgitation	Two major	Congestive heart failure, renal failure	Mitral valve replacement
Kaplan & Flaherty (1991)	82	Dental procedure, myxomatous mitral valve	Vegetation on mitral valve, mitral regurgitation	Two major	Congestive heart failure, renal failure	Mitral valve replacement
Kociuba <i>et al.</i> (1993)	33	Dental procedure, bicuspid atrial valve	Vegetation on atrial valve, atrial regurgitation, abscess	Two major	Myocardial abscess, systemic embolism	Atrial valve replacement
Struillou <i>et al.</i> (1993)	27	Mitral valve prolapse, dental infection	Mitral valve prolapse	One major, three minor	Splenic infarction, congestive heart failure	Mitral valve replacement
Andersen <i>et al.</i> (1995)	57	None	Vegetation on atrial valve	Two major	None	None
Imperial <i>et al.</i> (1995)	31	None	Vegetation on mitral valve	One major, two minor	None	None
Nawaz <i>et al.</i> (1996)	29	None	Vegetation on mitral valve, mitral regurgitation	Two major	Brachial pseudoaneurysm	Remove pseudoaneurysm
Hofstad <i>et al.</i> (1998)	30	Hypertrophic obstructive cardiomyopathy	None	One major, two minor	None	None
Apisarnthanarak <i>et al.</i> (2001)	65	None	Vegetation on mitral valve, mitral regurgitation	One major, two minor	None	None
Haddow <i>et al.</i> (2003)	54	Bicuspid atrial valve, dental procedure	Vegetation on atrial valve, abscess, atrial regurgitation	Two major	Congestive heart failure aortic root, myocardial abscess	Atrial valve replacement
Hoshino <i>et al.</i> (2005)	7	Transposition of the great artery s/p Rastelli repair, dental procedure	None	One major, two minor	None	None
Hsiao <i>et al.</i> (2008)	42	Dental cleaning	Mitral valve vegetation	Two major	Brain embolism and abscess	Mitral valve repair and vegetation resection

Of the 24 cases, 15 met the diagnosis of definite infectious endocarditis according to the modified Duke criteria and nine met criteria for possible endocarditis. Eight of the 24 cases (33 %) were in patients with prosthetic valves. To the best of our knowledge, this is the first reported case of *N. elongata* endocarditis involving both prosthetic mitral and aortic valves. The bivalvular involvement made surgical treatment more challenging as more extensive debridement had to be done to control the source of infection. Surgical treatment for multivalve endocarditis is associated with higher morbidity and mortality (Ota *et al.*, 2011).

N. elongata is susceptible to a wide range of antimicrobial agents, with variable susceptibility to penicillin. All cases were treated with a third-generation cephalosporin, benzylpenicillin or ampicillin/amoxicillin, usually combined with gentamicin in the initial phase. Duration of antibiotic therapy was usually 4–6 weeks (Struillou *et al.*, 1993; Hoshino *et al.*, 2005). Surgical valve replacement was required in 12 (50 %) of the 24 patients (Hsiao *et al.*, 2008; Noheria *et al.*, 2010).

N. elongata is an uncommon, but increasingly recognized, cause of infective endocarditis. It causes severe valvular destruction with systemic complications and often requires surgical intervention.

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