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Infective endocarditis due to *Neisseria elongata*: A case report and literature review

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Abstract

Introduction: *Neisseria elongata* (NE), a Gram-negative, 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, we report a case of NE infective endocarditis and a review of literature.

Objectives: To describe a case of NE endocarditis, and to review the literature for any similar cases of this rare condition.

Case report : Our patient is a 77 year-old healthy female patient who was found to have a mitral valve endocarditis with valve regurgitation.

Discussion : NE endocarditis is a rare condition which typically affects the left cardiac chambers and is associated with high risk of embolization. A literature review retrieved 35 other cases.

Conclusions : Our report shows the rarity of NE endocarditis as only few cases have been reported. The bacterium has similarity with the HACEK group organisms and can potentially causes infective endocarditis.

Keywords: Infective endocarditis, mitral valve, *Neisseria elongata*, Gram-negative bacterial infection, *Neisseria* species

Introduction

N. elongata is an aerobic Gram-negative organism. While ordinarily a commensal organism of the human oropharyngeal flora, it has been recognized lately as an important pathogen responsible for serious infections including infective endocarditis(1).

We report a case of *N. elongata* native mitral valve endocarditis complicated by systemic embolization and a review of the relevant literature.

Case report

This is a case of a 77-year-old-female patient who presented to the outpatient clinic of internal medicine department with a history of a fever up to 40°C, a dyspnea and a neck pain. Her previous medical and surgical history were irrelevant, and she did not take any chronic medication. Due to the persistence and worsening of her symptoms, she was admitted to the medical ward for further investigation.

Physical examination revealed a systolic murmur at the mitral area without any signs of heart failure. She suffered from worsening mechanical cervical pain.

Laboratory tests demonstrated a leukocytosis (15,420/L, 13,140G/L neutrophils) and elevation of inflammatory markers (C Reactive Protein 123 mg/ml, Procalcitonin 2.8ng/mL) along with anemia (hemoglobin 7.5 g/dl). Hepatic and renal functions were within normal range. Four sets of blood cultures were obtained on admission, all of which came back positive the same day on direct microscopic examination with Gram negative bacteria and grew a *Neisseria elongata* (Fig.1). Due to technical issues, we could not identify the subspecies of our patient. Transthoracic and transesophageal echocardiography showed

vegetation of 10 mm at the posterior leaflet of the mitral valve with mild regurgitation (3/4) and posterior valve prolapse. No abscess was seen.

Piperacillin/tazobactam 4g IV every 6h and amikacin (total of 4 injections at 25mg/kg) were started after obtaining blood cultures results and the treatment was adapted with the association of Cefotaxime and Levofloxacin.

Total body computerized tomography scan showed splenic infarcts in subcapsular region. Cerebral and cervical Magnetic resonance imaging showed inflammatory infiltration in the peri-vertebral area without any collection or signs of spondylodiscitis and subarachnoid hemorrhage. A cerebral arteriography was performed and eliminated the presence of mycotic aneurysms. Follow-up cardiac ultrasound after one month was stable. Dental exam revealed the existence of 7 infected teeth which were treated accordingly. Endocarditis was cured and no relapse appeared after 18 months of follow-up.

We reviewed PubMed[®] for cases of NE endocarditis using keywords like endocarditis, aortic valve, mitral valve, *Neisseria elongata* and Gram-negative bacterial infection. The articles were reviewed to gather information about patients' demographics, preexisting heart diseases, and treatment options. A total of 36 reported cases, including our case, were identified. All cases were analyzed (Table 1) (2-35). The reported age was in median 52 years (range 7–82 years). All cases involved the aortic or mitral valve except for one case which involved the tricuspid valve (3). Of the 36 cases, 19 (52%) had a preexisting valve condition including prosthetic valves. 11 of the 36 cases (30.5%) had a dental procedure preceding the infection. The most common subspecies was *nitroreducens*, including 7 cases of CDC group M-6, accounting for 70% of cases. Surgical valve replacement was required in 15 (41 %) of 36 patients. *N. elongata* is susceptible to a wide range of antimicrobial agents, with variable susceptibility to penicillin. Although fluoroquinolones were used in 6 cases, the vast majority

of patients were treated with a third-generation cephalosporin, benzylpenicillin or ampicillin/amoxicillin, usually combined with gentamicin in the initial phase. Despite the presence of embolic complications in one third of patients, most of them had a favorable outcome.

Discussion

Neisseria elongata was described by Bøvre and Holten in 1970 as a rod-shaped member of the family Neisseriaceae. Later workers reported isolates of CDC group M-6, now known as *N. elongata* subsp. *nitroreducens*, as early as 1964(2). It now contains three subspecies, *N. elongata* subsp. *elongata*, *N. elongata* subsp. *glycolytica*, and *N. elongata* subsp. *nitroreducens*. Of these, *N. elongata* subsp. *nitroreducens* is most frequently associated with invasive disease. This organism is non-motile, oxidase positive, catalase negative, and reduces nitrates which make it different from the other two subspecies.

Our report demonstrates a rare causative microorganism of infective endocarditis of a native mitral valve with *N. elongata*. *Neisseria* sp. endocarditis usually results in acute febrile illness with large valvular vegetations, severe cardiac and systemic complications such as systemic embolization, heart failure and myocardial abscesses (4,5). It is of interest that *N. elongata* endocarditis has been reported to cause frequent systemic embolization and valve destruction (5).

Mycotic aneurysms and septic embolism are well-known complications of infective endocarditis including those caused by many species of *Neisseria*. In a review of the literature on *N. mucosa* endocarditis, Ingram et al. found that 7 of 13 patients (54%) had major embolic events(6). Similarly, another study analyzed 40 well-documented cases of gonococcal

endocarditis and found evidence of major systemic embolization in 9 patients (22%), including emboli to cerebral, splenic, and femoral vessels (7). *Kingella* species, which belong to the family *Neisseriaceae* and are closely related to *N. elongata* subsp. *nitroreducens*, cause endocarditis that is associated with vascular complications in about half of the patients, including strokes in a quarter of them (7). In our review, about one third of cases (n=12), a systemic embolism occurred with cerebral and splenic emboli accounting for most cases.

Neisseria elongata is similar to the HACEK group organisms (*Haemophilus*, *Aggregatibacter*, *Cardiobacterium*, *Eikenella*, and *Kingella*) that are also gram-negative coccobacillary organisms found in normal oropharyngeal flora, grow slowly, and have an enhanced propensity to cause endocarditis. *Neisseria elongata* can be easily mistaken for *Kingella* sp. and occasionally *Eikenella* sp. in the preliminary microbiologic reports but can be distinguished on full biochemical profile and rDNA sequencing. Similar to infective endocarditis with the HACEK organisms, *N. elongata* endocarditis presents as a subacute course and is often cured with intravenous antibiotics alone. It has a significant embolic risk and is associated with low mortality.

Conclusion:

N. elongata endocarditis is rarely reported. Our report expands the range of infection caused by this organism. *Nitroreducens* is the most common subspecies. It has similarity with the HACEK group organisms and should be considered in IE caused by gram-negative organisms as it can potentially causes a severe disease with multiple complications.

Declarations

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Declarations of interest: none.

Availability of data and material: NA

Code availability: NA

Ethical Approval: ethics approval was not required for this systematic review.

Consent to Participate: Written informed consent was obtained from the patient for publication of this case report.

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