Case Report: Infective Endocarditis of Mechanical Aortic Valve Due to *Neisseria elongata* Bacteremia

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**Financial support:** None declared

**Conflict of interest:** None declared

**Patient:** Female, 53-year-old

**Final Diagnosis:** Infective endocarditis of mechanical aortic valve

**Symptoms:** Relapsing fevers with night sweats and generalized weakness

**Medication:**

**Clinical Procedure:**

**Specialty:** Infectious Diseases

**Objective:** Unknown etiology

**Background:** *Neisseria elongata* is an infrequent cause of infective endocarditis (IE). Although considered a commensal bacterium of the human nasopharynx, *N. elongata* has been shown to be the cause of significant disease in humans, namely endocarditis, osteomyelitis, and septicemia.

**Case Report:** We report the case of a 53-year-old man with a past medical history of mechanical aortic valve who presented to the hospital for evaluation of eleven days of recurrent and relapsing fevers and was admitted for severe sepsis with concern for endocarditis. Blood cultures revealed *N. elongata* bacteremia, and an echocardiogram did not show any vegetations, although it was limited by mechanical aortic valve shadowing. The patient recovered after six weeks of treatment with intravenous ceftriaxone and oral ciprofloxacin.

**Conclusions:** Clinicians should be aware of the possibility of the previously considered non-pathogenic *N. elongata* as a source of IE caused by gram-negative organisms, as it can potentially cause severe disease and multiple complications. Our case additionally highlights that IE has highly variable clinical presentations. Thus, it is essential to utilize the Duke criteria as only a clinical guide for the diagnosis of IE rather than a substitute for clinical judgment and the decision to treat a patient with suspected IE.

**Keywords:** *Neisseria elongata* • Bacteremia • Infective Endocarditis • Sepsis/Septicemia • Mechanical Heart Valve

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Background

A literature review revealed only a few reported cases of infective endocarditis due to *Neisseria elongata*, a nonmotile, aerobic, catalase-negative, oxidase-positive, and urea-negative bacterium [1]. Although considered to be a commensal bacterium of the human nasopharynx, *N. elongata* has been shown to be the cause of significant disease in humans, namely endocarditis, osteomyelitis, and septicemia [2].

Case Report

A 53-year-old man presented to the Emergency Department for eleven days of recurrent, relapsing fevers with night sweats and generalized weakness. His past medical history was significant for an aortic aneurysm, which required repair, and a mechanical aortic valve. Additional pertinent history was obtained and was negative for recent surgeries, recent travel, previous intravenous (i.v.) drug use, and recent dental infection or treatment.

On physical examination, the patient had a temperature of 38.3°C, a heart rate of 105 beats/min, blood pressure of 116/72 mmHg, and a respiratory rate of 22 breaths/min. On cardiovascular examination, a 3/6 blowing systolic murmur with a click was heard best at the right and left upper sternal border. There was no evidence of cardiac failure, and there were no peripheral stigmata of IE. His respiratory, abdominal, musculoskeletal, and neurologic examinations were normal. Urinalysis revealed large amounts of blood but was otherwise negative. Laboratory tests showed (Table 1) an elevated white blood cell count (12.7×10^9; reference range 4.8-10.8×10^9 K/uL), elevated for an aortic aneurysm, which required repair, and a mechanical aortic valve. Additional pertinent history was obtained and was negative for recent surgeries, recent travel, previous intravenous (i.v.) drug use, and recent dental infection or treatment.

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| Test  | Result | Reference range |
|-------|--------|----------------|
| WBC   | 12.7×10^9 | 4.8-10.8×10^9 K/uL |
| RBC   | 3.69×10^12 | 4.70-6.10 M/uL |
| HGB   | 9.7 g/dL | 13.5-18.0 g/dL |
| HCT   | 29.3 % | 42.0-52.0% |
| MCV   | 79 fl | 80-94 fl |
| MCH   | 26.2 pg | 25.2-34.5 pg |
| MCHC  | 33.0 g/dL | 33.0-37.0 g/dL |
| RDW   | 14.5 ! | 11.0-16.0% |
| PLT   | 254 K/uL | 130-400 K/uL |
| MPV   | 7.6 | 7.0-11.0 fl |
| NA    | 127 MEq/L | 136-148 MEq/L |
| K     | 4.0 mEq/L | 3.5-5.0 mEq/L |
| CL    | 93 MEq/L | 96-112 MEq/L |
| CO2   | 26 | 23-30 mEq/L |
| ANION | 8 mmol/L | 3-11 mmol/L |
| CREAT | 0.79 mg/dL | 0.5-1.2 mg/dL |
| eGFR  | 103 mL/min | 60-120 mL/min |
| eCRCL | 137 mL/min | 97-137 mL/min |
| GLU   | 109 mg/dL | 70-100 mg/dL |
| CA    | 8.3 mg/dL | 8.7-10.7 mg/dL |
| BILIT | 0.5 mg/dL | 0.1-1.3 mg/dL |
| AST   | 86 IU/L | 12-45 IU/L |

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| Test  | Result | Reference range |
|-------|--------|----------------|
| ALT   | 72 IU/L | 2-40 IU/L |
| ALP   | 70 IU/L | 41-133 IU/L |
| TP    | 6.6 g/dL | 6.0-8.0 g/dL |
| ALB   | 2.5 g/dL | 3.5-4.8 g/dL |
| GLOB  | 4.1 g/dL | 2.0-3.4 g/dL |
| AGAROTIO | 0.6 | |
| SEDRT | 39 ! | <20 MM/h |
| CRP   | 24.70 mg/dL | 0.00-0.80 mg/dL |
| PROCAL | 0.69 mg/dL | 0.0-0.5 mg/dL |
| POCUCCOLOR | Yellow | |
| POCUCUCLRITY | Clear | CLEAR |
| POCUPH | 7.0 | 5.0-8.0 |
| POCUSG | 1.010 | 1.001-1.035 |
| POCUPRO | Negative | Negative mg/dL |
| POCULGLU | Negative | Negative mg/dL |
| POCUKET | Negative | Negative mg/dL |
| POCUOCC | Large | Negative |
| POCCUBIL | Negative | Negative |
| POCUERUO | 0.2 | 0.2-1.0 mg/dL |
| POCUELEU | Negative | Negative |
| URBC | 12 ! | 0-2/HPF |
| UWBC | 1 | 0-2/HPF |
| UBACT | None | None |
erythrocyte sedimentation rate (ESR) (39; reference range <20 MM/h), elevated C-reactive protein (CRP) (24.7; reference range 0.00-0.80 mg/dL), and elevated procalcitonin (0.69; reference range 0.00-0.5 ng/mL). He additionally was found to have low hemoglobin of 9.7 g/dL. A chest X-ray performed at that time was unremarkable. A transthoracic echocardiogram (TTE) showed an ejection fraction of 60% to 65% and mild left ventricular hypertrophy with grade II diastolic dysfunction but no obvious severe valvular abnormalities.

The patient was admitted for severe sepsis with concern for possible endocarditis of his mechanical aortic valve. Two blood cultures were drawn on admission, and empiric antibiotic therapy was started with intravenous vancomycin and cefepime. Both blood cultures from admission returned two days later growing gram-negative rods. The results were discussed with the hospital’s laboratory staff, revealing the organism was likely *N. elongata*, and the culture was sent to an outside laboratory for verification. At that time, vancomycin was discontinued. Owing to continued high clinical suspicion for IE, a transesophageal echocardiogram (TEE) was then performed, which did not reveal any apparent vegetations, although evaluation of the mechanical aortic valve was limited due to acoustic shadowing. Possible alternate sources of *N. elongata* bacteremia were subsequently ruled out by computed tomography (CT) of the abdomen and pelvis and a whole-body white blood cell scan.

The patient quickly improved, remaining afebrile throughout his hospital course on antibiotics. Repeat blood cultures from hospital day three onward were negative. Once final identification of the gram-negative rod bacteremia and its sensitivities returned on hospital day seven to confirm *N. elongata*, the decision was made to discharge the patient on i.v. ceftriaxone and oral ciprofloxacin for six weeks to protect the mechanical aortic valve. Recommendations were made for the patient to see a dentist for a detailed dental examination to evaluate the bacteremia as an outpatient.

To date, three and a half months after the completion of antibiotics, the patient remains afebrile and is doing well clinically, with no evidence of infection recurrence. A detailed dental examination performed outpatient was negative, as was a CT scan of the neck.

**Discussion**

*N. elongata* was first described by Bovre and Holten in 1970 as a gram-negative rod-shaped bacterium native to the oral bacterial flora of the human pharynx and throat [3]. It is unusual among *Neisseria* species because it is rod-shaped compared to other *Neisseria* spp., which are diplococci. *N. elongata* consists of three subspecies, *elongata*, *glycolytica*, and *nitroreducens*, separated based on their biochemical differences [4]. Although previously believed to be non-pathogenic to humans, all 3 subspecies have been associated with endocarditis, osteomyelitis, and septicemia in recent case studies [2]. Among the few case reports identifying these *N. elongata* infections, the subspecies *nitroreducens* are most frequently reported to be associated with endocarditis [5].

The primary risk factors for *N. elongata* IE are i.v. drug use, valvular disease, including prosthetic valves, mitral valve prolapse, and bicuspid aortic valve, and recent dental infection or treatment [6]. Most cases present with the typical symptoms of IE, including malaise, fever, arthralgia, headache, and weight loss. Reported complications have included heart failure, localized abscess formation, central embolization, acute renal failure, and thrombocytopenic purpura [7].

Delay in diagnosis is common and likely due to the absence of murmur at presentation or difficulty identifying the organism [6]. Non-specific symptoms of IE, as mentioned above, should raise suspicion for IE. Additionally, fever in the context of a new murmur is considered IE until proven otherwise. Work-up should begin with obtaining a detailed history to identify possible predisposing conditions discussed above, performing a comprehensive physical examination to assess the patient’s vital signs and overall toxicity, and identifying any new cardiac murmurs and vascular or immunological phenomena. Frequent cardiac examinations should be performed throughout the hospital stay to evaluate for a changing murmur or signs of congestive heart failure. Basic laboratory tests and imaging studies should be obtained, including a complete blood count with differential, comprehensive metabolic panel, ESR, CRP, lactate, electrocardiogram (EKG), and chest X-ray.

Most importantly, it is imperative on admission to obtain three sets of blood cultures from different sites, ideally spaced more than one hour apart, before the initiation of antibiotics. After appropriate antibiotics have been initiated, at least two blood cultures should be obtained daily until negative to document clearance. A TTE should also be performed on all patients upon admission to identify possible vegetations. If TTE is non-diagnostic, TTE is negative, but clinical suspicion remains high, the patient is high-risk, or a progressive or invasive infection is suspected, a TEE should be obtained. Definitive diagnosis is made according to the modified Duke criteria (Table 2), which is highly sensitive for IE disease detection [8]. Both major, 1 major, and 3 minor, or all 5 minor criteria are necessary for a definite diagnosis.

Treatment involves extended antibiotics, usually of 4 to 6 weeks’ duration, and early surgical evaluation. Studies have shown that *N. elongata* isolates are usually fully susceptible to amoxicillin, gentamicin, cephalosporins, and ciprofloxacin [9]. Most N.
elongata IE cases reviewed in the literature were treated with ampicillin or a third-generation cephalosporin, often in combination with gentamicin, for 6 weeks [7]. In selected cases of N. elongata IE, treatment with oral ciprofloxacin is a highly effective option [10]. Despite extended antibiotic therapy, many reported cases in the literature required valvular surgery for complications, including heart failure, abscess, and embolic event, thus indicating the importance of additional early surgical evaluation in all cases of N. elongata IE [9].

Classifying our patient with IE revealed that extending the modified Duke criteria to the clinical practice can be difficult. Our patient technically met the Duke criteria for possible and rejected IE. He met possible IE by fulfilling at least 3 minor criteria: predisposing heart condition (mechanical valve replacement), fever, microbiological evidence not meeting significant criteria (positive blood cultures for N. elongata), and immunologic phenomena (hematuria possibly associated with glomerulonephritis). However, he also met the criteria for rejected IE based on the resolution of clinical manifestations after ≤4 days of antibiotic therapy. Because the Duke criteria are meant to be only a clinical guide for diagnosing IE [11], clinical suspicion remained high, so the decision was made to treat him.

Conclusions

Clinicians should be aware of the possibility of the previously considered non-pathogenic N. elongata as a source of IE caused by gram-negative organisms, as it can potentially cause severe disease and multiple complications. Treatment involves an extended duration of antibiotics as well as surgical intervention in most cases. Our case additionally highlights the heterogeneity of IE and its highly variable clinical presentations, underlining...
that the use of criteria alone will not suffice. It is essential to use the Duke criteria as only a clinical guide for diagnosing IE and not for replacing clinical judgment, which remains crucial in evaluating patients with suspected IE. Clinicians should decide whether or not to treat a patient on an individual basis, using appropriate clinical judgment, regardless of whether the patient meets or fails to meet the criteria of “definite” IE by the Duke schema.

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