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

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Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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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 a 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

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/933750

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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 $4.8\text{-}10.8\times10^9$ K/uL), elevated

Table 1. Laboratory test results.

Test	Result	Reference range
WBC	12.7 *H	4.8-10.8 K/uL
RBC	3.69 *L	4.70-6.10 M/uL
HGB	9.7 *L	13.5-18.0 g/dL
HCT	29.3 *L	42.0-52.0%
MCV	79 *L	80-94 fL
MCH	26.2	25.2-34.5 pg
MCHC	33.0	33.0-37.0 g/dL
RDW	14.5	11.0-16.0%
PLT	254	130-400 K/uL
MPV	7.6	7.0-11.0 fL
NA	127 *L	136-148 mEq/L
K	4.0	3.5-5.0 mEq/L
CL	93 *L	96-112 mEq/L
CO2	26	23-30 mEq/L
ANION	8	3-11 mmol/L
BUN	6 *L	7-22 mg/dL
CREAT	0.79	0.5-1.2 mg/dL
eGFR	103	60-120 mL/min
eCRCL	137	97-137 mL/min
GLU	109 *H	70-100 mg/dL
CA	8.3 *L	8.7-10.7 mg/dL
BILIT	0.5	0.1-1.3 mg/dL
AST	86 *H	12-45 IU/L
ALT	72 *H	2-40 IU/L
ALP	70	41-133 IU/L
TP	6.6	6.0-8.0 g/dL
ALB	2.5 *L	3.5-4.8 g/dL
GLOB	4.1 *H	2.0-3.4 g/dL
AGRATIO	0.6	
SEDRT	39 *H	< 20 MM/h
CRP	24.70 *H	0.00-0.80 mg/dL
PROCAL	0.69 *H	0-0.5 ng/mL
POCUCOLOR	Yellow	YELLOW
POCUCLARITY	Clear	CLEAR
POCUPH	7.0	5.0-8.0
POCUSG	1.010	1.001-1.035
POCUPRO	Negative	Negative mg/dL
POCUGLU	Negative	Negative mg/dL
POCUKET	Negative	Negative mg/dL
POCUOCC	Large *H	Negative
POCUNIT	Negative	Negative
POCUBIL	Negative	Negative
POCUURO	0.2	0.2-1.0 mg/dL
POCULEU	Negative	Negative
URBC	12 *H	0-2/HPF
UWBC	1	0-2/HPF
UBACT	None	None

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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 0-0.5 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 thrombocytic 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.*

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Table 2. Definition of infective endocarditis according to the modified Duke criteria (adapted from Habib et al [8]).

Modified Duke Criteria – endocarditis diagnostic criteria Definitive IE = 2 Major Criteria and 0 Minor Criteria, or 1 Major Criteria and 3 Minor Criteria, or 0 Major Criteria and 5 Minor Criteria Possible IE = 1 Major Criteria and 1 Minor Criteria, or 3 Minor Criteria
Major Diagnostic Criteria
Positive blood culture for typical infective endocarditis organisms (*Streptococcus viridans* or bovis, HACEK organisms, *Staphylococcus aureus* without other primary site, Enterococcus), from 2 separate blood cultures or 2 positive cultures from samples drawn >12 h apart, or 3 or a majority of 4 separate cultures of blood (first and last sample drawn 1 h apart)
Single positive blood culture for *Coxiella burnetii* or anti-phase 1 IgG antibody titer >1: 800
Echocardiogram positive for IE: • Vegetation • Abscess, pseudoaneurysm or intracardiac fistula • Valvular perforation or aneurysm • New partial dehiscence of prosthetic valve
New valvular regurgitation (worsening or changing of pre-existing murmur not sufficient)
Abnormal activity around the site of a prosthetic valve detected by PET/CT assuming >3 months after surgery or radiolabeled leukocyte-SPECT/CT
Definite paravalvular lesions by cardiac CT
Minor Diagnostic Criteria
Predisposing heart condition or intravenous drug use
Temp >38°C (100.4°F)
Vascular phenomena (including those detected by imaging alone): arterial emboli, pulmonary infarcts, splenic infarction, mycotic aneurysms, intracranial bleed, conjunctival hemorrhages, Janeway lesions
Immunologic phenomena: glomerulonephritis, Osler nodes, Roth spots, rheumatoid factor
Microbiological evidence: positive blood cultures not meeting major criterion as noted above or serological evidence of active infection with organism consistent with endocarditis (excluding coag neg staph, and other common contaminants)

CT – computed tomography; HACEK – *Haemophilus* spp., *Aggregatibacter* spp., *Cardiobacterium hominis*, *Eikenella corrodens*, *Kingella* spp.; IE – infective endocarditis; IgG – immunoglobulin G; PET – positron emission tomography; SPECT – single-photon emission computed tomography.

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

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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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