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## CASE REPORT

# Bacteremia Caused by Neisseria elongata in an Infective Endocarditis Patient: Case Report and Review of Literature

Yili Chen [1], Xiaochen Liu [2], Lu Ai [1], Penghao Guo [1], Han Huang [1]

[1] *Department of Laboratory Medicine, The First Affiliated Hospital of Sun Yat-sen University, Guangzhou, Guangdong, China*
[2] *Department of Laboratory Medicine, Sun Yat-sen University, Guangzhou, Guangdong, China*

### SUMMARY

***Background:*** ***Neisseria elongata*** **(*N. elongate*) is a strictly aerobic and gram-negative rod bacterium which is a constituent of the commensal bacterial flora in the pharynx. Infection caused by *Neisseria elongata* is rarely reported. Here we describe a case of endocarditis in a patient after aortic mechanical valve replacement caused by *N. elongate* in China.**
***Method:*** **A 30-year-old man suffered infective endocarditis after aortic mechanical valve replacement. Blood cultures were positive and the organism was identified as *Neisseria elongata* by MALDI-TOF MS as well as the 16S rRNA sequencing.**
***Result:*** **The patient was treated with ofloxacin and meropenem. He was successfully treated with the 6-week course of antibiotic therapy.**
***Conclusions:*** ***N. elongate*** **endocarditis is rarely reported. Our report expands the range of infection caused by *N. elongate.***
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**Correspondence:**
Han Huang
Department of Laboratory Medicine
The First Affiliated Hospital of
Sun Yat-sen University
510000 Guangzhou
Guangdong
China
Phone: +86 020-87332200-8461
Fax: +86 020-87332200
Email: 13570260173@163.com

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### KEY WORDS

*Neisseria elongata,* infective endocarditis, bacteremia

### LIST OF ABBREVIATIONS

*N. elongata* - *Neisseria elongate*
IE - infective endocarditis
MALDI-TOF MS - Matrix-Assisted Laser Desorption/ Ionization Time of Flight Mass Spectrometry

### INTRODUCTION

*Neisseria elongata* is a strictly aerobic, rod-shaped, Gram-negative, non-motile, oxidase positive, and catalase negative bacterium which is a constituent of the commensal bacterial flora in the pharynx [1-3]. Infection caused by *Neisseria elongata* is rarely reported. A total of 19 cases of *N. elongata*-related infective endocarditis have been reviewed in earlier studies by Hsiao et al. in 2002 and Mohammed Samannodi et al. in 2016

[1, 4]. Most reported cases are due a dental procedure or are associated with previous heart diseases and cardiac valve replacement. Additionally, *N. elongata*-related infections tend to occur in those whose immune systems are compromised [1,4]. In this article, we report a case of bacteremia caused by *Neisseria elongata* in an infective endocarditis patient and summarize some other diseases caused by Neisseria elongata.

## CASE PRESENTATION

A 30-year-old Chinese man who had repeated erythema on his feet for six years, was admitted due to fever with chills for two weeks, cough, diarrhea and vomiting for a week. The patient's medical history showed that he had been suffering from congenital heart disease and he had had aortic mechanical valve replacement, ascending aorta and total aortic arch replacement.

Upon physical examination, his temperature was 39.5°C, heart rhythm was neat, heart sound was strong, systolic ejection murmurs (class 3) could be heard in every valve area. His abdomen was soft, no tenderness and rebound tenderness. Pale red spot with a diameter of 1 cm could be seen on each sole of his feet.

Laboratory examination showed the white blood cell (WBC) count of 14.37 x $10^9$/L with 86.8% neutrophils. The hemoglobin was 86 g/L. C-reactive protein was 128.91 mg/L and serum procalcitonin (PCT) was 1.16 ng/mL. The results of the analysis of the blood chemistry were as follows: serum albumin 33.5 g/L, serum calcium 2.01 mmol/L, serum phosphate 0.79 mmol/L. Chest CT showed that both lungs were inflamed sporadically and a small amount of fluid accumulated in the bilateral thorax.

Specimens for blood culture were taken, and the patient was started on an empiric antibiotic treatment with intravenous drip of ofloxacin 0.5g each day, based on a presumptive diagnosis of respiratory or digestive tract infections. Blood cultures presented positive and the blood smear showed gram-negative rod two days later. Given the septicemia and pneumonia, the patient was transitioned to imipenem and cilastatin sodium by injection 1.0 g every 8 hours. Blood samples were then subcultured onto 5% sheep blood agar. Small light yellow translucent round colonies appeared which were 1 to 2 mm in diameter 24 hours later. Finally, the organism was identified as *Neisseria elongata* by matrix-assisted laser desorption ionization time-of-flight mass spectrometry with a 99.0% identifying accuracy. To confirm the identity of the isolate, a fragment of the 16S rRNA gene was amplified using primer sets 16S-forward (5′-AGA GTT TGA TCC TGG CTC AG-3′) and 16S-reverse (5′-ACG GCT ACC TTG TTA CGA CTT-3′) by polymerase chain reaction, and the resultant polymerase chain reaction product was sequenced. The sequencing data were queried against the GenBank 16S rRNA gene database. The best match returned was the *Neisseria elongata subsp. elongata*, ATCC 25295 type strain, with 99.0% identity.

In view of the surgical history of aortic mechanical valve replacement, ascending aorta and total aortic arch replacement and the pathogen identification results, the patient was highly suspected of suffering from infective endocarditis. In addition, the drug susceptibility results of *N. elongata* showed sensitivity to moxifloxacin, ciprofloxacin and tetracycline *in vitro* while showing resistance to ceftriaxone and cefepime (Table 1). Then the patient was switched to a combination of ofloxacin 100 mL iv drip and meropenem 1.0 g iv drip for four weeks. The patient showed improvement of the clinical symptoms and the follow-up blood cultures presented negative through treatment. He was then discharged with the prescription of cefixime 100 mg twice a day and moxifloxacin 0.4 g once a day for another two weeks.

**Table 1. Drug susceptibility of the recovered organism.**

| Antibiotic | Inhibitor diameter (mm) |
|---|---|
| Ciprofloxacin | 18 |
| Ceftriaxone | 40 |
| Cefepime | 36 |
| Penicillin | 30 |
| Tetracycline | 15 |
| Moxifloxacin | 6 |
| Trimethoprim | 32 |

## DISCUSSION

Infective endocarditis (IE) is caused by damage to the endocardium of the heart followed by microbial, usually bacterial, colonization. About 80% of IE cases were caused by streptococci and staphylococci. Infections involving Gram-negative and fungal pathogens in IE are rare [5]. So, in this case, IE caused by *N. elongate* is uncommon and worthy of attention.

*N. elongata* belongs to the genus *Neisseria* and it now contains three subspecies, *N. elongata subsp. elongata, N. elongata subsp. glycolytica, and N. elongata subsp. nitroreducens*. Unlike most of the *Neisseria*, *N. elongate* is a Gram-negative rod rather than a coccus [6]. *N. elongata* constitutes part of the commensal human normal oropharyngeal flora and has not been considered to be pathogenic previously [2]. But some studies have indicated that it is an occasional cause of significant infections in humans, such as infective endocarditis, septicemia, and osteomyelitis in recent years.

According to the cases reported previously, we find that a dental procedure or traumatic-oral contact is a common risk factor of *N. elongata* infection. *N. elongata* bacteremia has been previously reported in a 7-year-old Japanes boy who had a dental treatment [8]. Mauro Grandolfo et al. reported that a 39-year-old man got acute purulent balonoposthitis and urethral discharge

**Table 2. Summary of previous reported cases of *N. elongata* infection.**

| Reference | Age | Gender | Diseases | Risk factors | Treatment | Outcome |
|---|---|---|---|---|---|---|
| This case | 30 | M | IE | Congenital heart disease | Intravenous ofloxacin and meropenem for four weeks. Oral cefixime and moxifloxacin for two weeks | Recovered |
| [8] | 7 | M | IE | Rastelli repair with a PTFE pulmonary monocusp dental treatment | Intravenous β-lactams together with gentamicin for 2 weeks. Ceftriaxone alone for 6 weeks | Recovered |
| [9] | 39 | M | Acute purulent balonoposthitis and urethral discharge | Repetitive traumatic oral gender | Intramuscular ceftriaxone and topical mupirocin cream for 2 weeks | Recovered |
| [10] | 60 | M | Peritoneal dialysis-related peritonitis | Poor nutrition and chronic kidney disease | Intraperitoneal gentamicin and ceftriaxone for two weeks | Recovered |
| [11] | 54 | M | Bacteremia | Complement inhibition during treatment of paroxysmal nocturnal hemoglobinuria | Amoxicillin clavulanic acid for two weeks | Recovered |
| [13] | 26 | M | Endocarditis and spondylodiscitis | Prosthetic valve replacement | Intravenous ampicillin and gentamycin for three weeks. Oral ampicillin and ciprofloxacin for another three weeks | Recovered |
| [15] | 31 | F | IE | Recent travel endurance exercise | Ciprofloxacin for four weeks | Mitral valve repair surgery |
| [16] | 70 | M | IE | None | Intravenous amoxicillin gentamicin for 3 weeks. Intravenous ceftriaxone for 3 weeks | Recovered |
| [17] | 66 | M | Bacteremia | Squamous cell carcinoma leukopenic | Intravenous ceftazidime and ciprofloxacin | Died |

and admitted repetitive traumatic oral gender days before the clinical onset [9]. In addition**,** *N. elongata* is more likely to cause opportunistic infections in those whose immune systems are compromised. M. Lin et al. reported peritonitis caused *by N. elongata* in a COPD patient with poor nutrition [10]. It is also reported by Benz Rudolf et al. that a 54-year-old man got *N. elongata* infection associated with complement inhibition [11]. Additionally, IE caused by *N. elongata* usually occurs after interventional cardiovascular operation [5,12]. A. Bousquet reported a 26-year-old man who developed endocarditis and spondylodiscitis four years after his prosthetic valve replacement [13]. In this case, our patient denied dental treatment; however, he received an aortic mechanical valve replacement and might be immunocompromised. We speculated that the source of the endocarditis was the contamination from mouth organisms because *N. elongata* is always present in oropharyngeal flora.

*N. elongata* endocarditis is rarely reported but life-threatening. Choosing effective antibiotics is an important factor of curing *N. elongata* endocarditis. However, there is no optimal antibiotic therapy for *N. elongata*. Almost all cases reported previously were treated with either ampicillin or a third-generation cephalosporin, often in combination with gentamicin [1]. It was reported that a 43-year-old man who had *N. elongata* endocarditis was successfully treated by oral Ciprofloxacin for 7 weeks and remained well for 5 years [14]. Meuleman P. et al. reported a case that a *N. elongata* endocarditis patient showed improvement of the clinical symptoms through a course of ampicillin for 6 weeks and gentamicin for 2 weeks [18]. In the present case, this patient was successfully treated with a four-week course of intravenous ofloxacin and meropenem as well as oral cefixime and moxifloxacin for another two weeks. The antibiotics chosen were consistent with drug susceptibility results.

## CONCLUSION

*N. elongata* endocarditis is an uncommon disease but deadly. Rapid identification of pathogen and effective antibiotic therapy have vital significance for the treatment of the *N. elongata* endocarditis. In our case, we provide a successful example of managing endocarditis.

**Ethics Approval and Consent to Participate:**
This report was approved by the Clinical Research and Ethics Committee of the First Affiliated Hospital of Sun Yat-sen University.

**Consent for Publication:**
Written informed consent for publication of the clinical details including the medical history, bacteria cultures, pictures, videos and text was obtained from the patient.

**Authors' Contributions:**
YLC traced the case, interpreted the patient data regarding the infection disease and was responsible for identifying the bacteria. XCL was a major contributor in writing the manuscript. PHG, YPC, and ZWW participated in strain collection and literature search. All authors read and approved the final manuscript.

**Declaration of Interest:**
The authors declare that they have no competing interests.

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