Case Reports

Infective Endocarditis Caused by *Neisseria elongata* on a Native Tricuspid Valve

and Confirmed by DNA Sequencing

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Neisseria elongata*, a common oral bacterium, has been recognized as a cause of infections such as infective endocarditis, septicemia, and osteomyelitis.* Neisseria*-induced infective endocarditis, although infrequently reported, typically arises after dental procedures. Without antibiotic therapy, its complications can be severe.*

We report the case of a 27-year-old man who presented with fever, severe dyspnea, and a leg abscess from cellulitis. An echocardiogram showed a vegetation-like echogenic structure on the septal leaflet of the patient's native tricuspid valve, and an insignificant Gerbode defect. Three blood cultures grew gram-negative, antibiotic-susceptible coccobacilli that were confirmed to be N. elongata*. Subsequent DNA sequencing conclusively isolated* N. elongata *subsp* nitroreducens *as the organism responsible for the infective endocarditis. The patient recovered after 21 days of antibiotic therapy. In addition to the patient's unusual case, we discuss the nature and isolation of* N. elongata *and its subspecies.* ***(Tex Heart Inst J 2014;41(2):227-30)***

Previously, *Neisseria elongata* was considered not to be pathogenic, but it has since been recognized as responsible for infections such as infective endocarditis (IE), septicemia, and osteomyelitis. *Neisseria elongata* endocarditis, although very rare, can cause a variety of severe conditions, such as systemic embolization, congestive heart failure, and myocardial abscess.[1-5] We describe the case of a patient with *N. elongata* endocarditis, an incidentally detected Gerbode ventricular septal defect (VSD), and septicemia.

Case Report

A 27-year-old man was admitted to our hospital with a 7-day history of sustained fever and worsening dyspnea (New York Heart Association functional class IV). He had no history of drug abuse, congenital or rheumatic heart disease, dental caries, or gingivitis. However, he was febrile and had a burning sensation and erythematous color change on the anterior sides of both legs. His vital signs upon admission included a temperature of 39 °C, a respiratory rate of 24 breaths/min, and a blood pressure of 90/60 mmHg. An abscess was seen on his leg, but there was no petechia, purpura, or sign of peripheral embolization. The patient's pH was 7.21. On room air, his P_{CO_2} was 34 mmHg, his P_{O_2} was 100 mmHg, and his bicarbonate level was 10 mmol/L. His leukocyte count of 30,000/mm^3 (90% neutrophils and 6% lymphocytes), platelet count of 50,000/mm^3, and C-reactive protein level of 30 mg/L suggested severe inflammatory response syndrome. The results of liver and renal function tests were normal. Chest radiographs and computed tomograms of the brain, chest, and abdomen revealed nothing unusual. An electrocardiogram showed only sinus tachycardia. The abscess on the patient's leg was drained and cultured. A grade 2/6 systolic murmur on auscultation prompted an elective transthoracic echocardiogram, which showed a mobile, 10 × 5-mm, vegetation-like echogenic structure attached to the septal leaflet of the tricuspid valve, together with an insignificant VSD shunt (Figs. 1 and 2).

On hospital day 1, empiric antimicrobial therapy for cellulitis (1 g of intravenous cefazolin 3 times daily) was changed to 1 g/d of vancomycin for the treatment of

IE. On hospital day 3, the patient was afebrile, and the symptom resolution and laboratory findings indicated a favorable clinical progression. On hospital day 7, 3 of 3 blood cultures grew gram-negative, antibiotic-susceptible coccobacilli, so the vancomycin therapy was continued for 2 weeks. *Neisseria elongata* was identified with

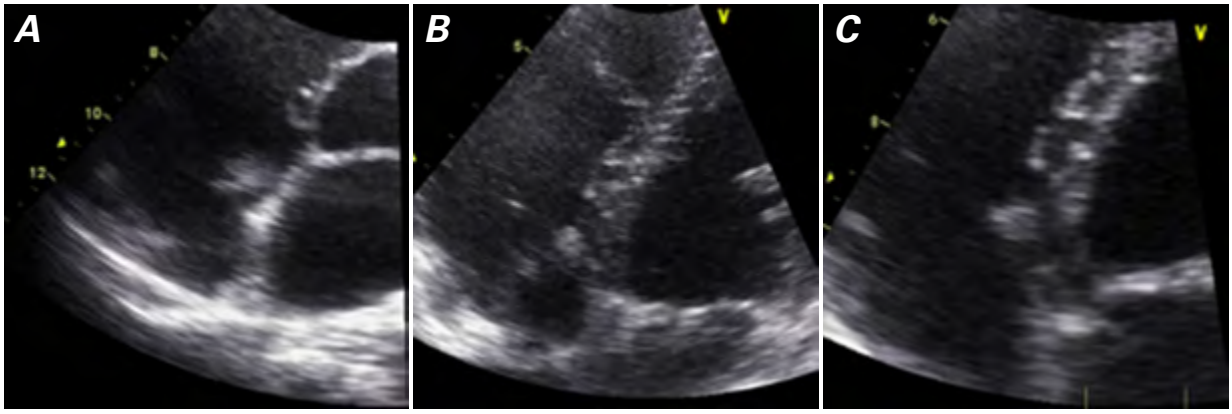

Fig. 1 *Two-dimensional echocardiograms show the 10 × 5-mm vegetation on the septal leaflet of the tricuspid valve in **A**) parasternal short-axis view, **B**) modified apical 4-chamber view, and **C**) magnified modified apical 4-chamber view.*

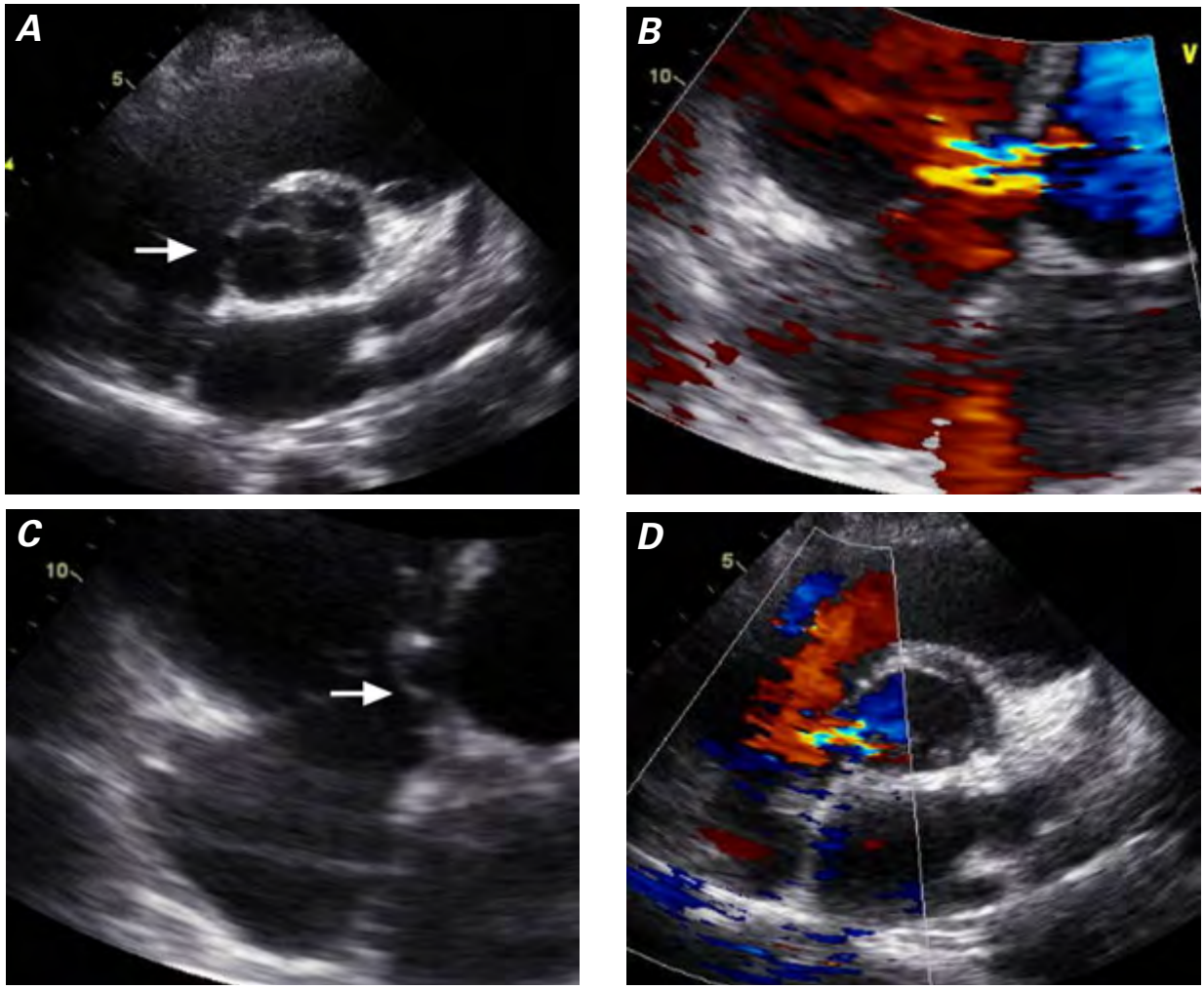

Fig. 2 *Two-dimensional echocardiograms (parasternal short-axis view) show **A**) the Gerbode defect (arrow) and **B**) the shunt flow (color-flow Doppler mode). Two-dimensional echocardiograms (modified apical 4-chamber view) show **C**) the Gerbode defect (arrow) and **D**) the shunt flow (color-flow Doppler mode).*

use of an API® NH identification system (bioMérieux; La Balme-les-Grottes, France), and the isolate was submitted to our Division of Microbiology to be confirmed through a molecular approach based on 16S ribosomal DNA (rDNA) sequencing. A 467-base pair fragment of the 16S rDNA gene was amplified by means of polymerase chain reaction with use of 16S universal forward primer 5′-TCCTACGGGAGGCAGCAGT-3′ and reverse primer 5′-GGACTACCAGGGTATCTAATCCTGTT-3′. Automated sequencing of the purified product was performed on the 2 strands with use of the BigDye® Terminator v3.1 Cycle Sequencing Kit (Applied Biosystems, part of Thermo Fisher Scientific Inc.; Waltham, Mass), and the sequence was analyzed with use of an ABI PRISM® 310 Genetic Analyzer (Applied Biosystems). The Geneious® multisequence alignment program (Biomatters Limited; Auckland, New Zealand) yielded 100% homology with *N. elongata* strains I1 and I4 (GenBank accession nos. AJ239297 and AJ239303, respectively). On the basis of the 16S rDNA gene-sequencing data and the biochemical profile, the isolate was identified as *N. elongata* subsp *nitroreducens*. On hospital day 14, the blood cultures obtained during the patient's antibiotic therapy were negative. The insignificant Gerbode VSD[6] (Qp/Qs=1.4 on the first fast cardiac scan) was not an indication for surgical intervention. The patient was discharged from the hospital on day 21, in very good condition.

Discussion

We report here a case of a rare causative microorganism of IE on the septal leaflet of a native tricuspid valve—*N. elongata* subsp *nitroreducens*—which was identified biochemically and confirmed by means of DNA sequencing. First described by Bovre and Holten in 1970,[7] *N. elongata* is rarely isolated from clinical specimens. The organism's 3 subspecies are *elongata*, *glycolytica*, and *nitroreducens*. The first two are generally regarded as nonpathogenic. A few cases of IE caused by *N. elongata* subsp *nitroreducens* have been described.[2,8,9] In 1990, on the basis of biochemical and DNA studies, the Centers for Disease Control reported on the analysis of 95 strains that belonged to the genus *Neisseria* and recognized that *N. elongata* subsp *nitroreducens* was an important pathogen of the genus *Neisseria* and was responsible for significant infections, such as septicemia, in human beings. In recent decades, the chief designation of this organism as a cause of IE-induced septicemia has been non-gonococcal, non-meningococcal *Neisseriae*.[3] *Neisseria*-induced endocarditis usually results in acute febrile endocarditis with large vegetations and a destructive process that often causes severe cardiac and systemic complications such as systemic embolization, thrombotic thrombocytopenic purpura, heart failure, and myocardial abscesses.[5,10,11] Dental procedures can be a risk factor for IE, because *N. elongata* is part of the normal oropharyngeal flora. *Neisseria elongata* is typically susceptible to a wide range of antimicrobial agents, so prophylactic antibiotics should be recommended for high-risk patients (such as those with valvular or congenital heart disease) before they undergo dental procedures.[12] In our case, even though a Gerbode VSD was incidentally found in our patient,[6] he had no history of gingivitis or dental procedures. However, he did have cellulitis proximal to the diagnosis of IE. We therefore consulted our microbiologists in order to identify this clinically mismatched organism. The outcome of 16S rDNA sequencing revealed that this isolate was *N. elongata* subsp *nitroreducens*. The partial comparison of only 467 nucleotides was not conclusive enough to identify the organism at the subspecies level; however, the sequencing of 16S rDNA in combination with the biochemical characterization enabled definitive identification.

From this case, we conclude that *N. elongata* subsp *nitroreducens* can also be a causative agent of IE originating from a skin infection. The disease course might be complicated and potentially fatal because of septicemia, as described above. Without common predisposing factors, urgent and appropriate antibiotic therapy is important for the modification of the clinical course in *N. elongata* IE with subsequent septicemia.

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