Streptococcus mitis Endocarditis Leading to Acquired Gerbode Defect and Atrioventricular Block

Edward D. Shin, MD, Anika Naidu, MD, Nirmala D. Ramalingam, MPP, and Eugene Fan, MD, *Oakland, California*

INTRODUCTION

Infective endocarditis (IE) is an infection that involves the endocardial surface of the heart, usually involving 1 or more cardiac valves. Potential complications from IE include new-onset or worsening heart failure, damage to native or prosthetic heart valves, embolic phenomena, and conduction system disease. One potential rare but serious complication is a fistula between the left ventricle (LV) and right atrium (RA; acquired Gerbode defect). In this case report, we present a patient with *Streptococcus mitis*–associated IE of the aortic valve leading to acquired Gerbode defect and second-degree atrioventricular (AV) block.

CASE PRESENTATION

The patient is a 63-year-old with no known medical history who presented to the emergency department with 4 weeks of flu-like symptoms. During this period, the patient also experienced 2 weeks of poor oral intake and a 30 pound weight loss. The patient denied any preceding fevers, nausea, vomiting, or dysuria but did note intermittent chest discomfort as well as shortness of breath. At their baseline, the patient did not seek health care and thus denied any recent health care–related visits. In the emergency department, the patient had a respiratory rate of 26/minute and was afebrile and normotensive. A faint diastolic murmur was appreciated. Labs revealed a blood glucose of 583 mg/dL with an elevated anion gap of 23 mEq/L and the presence of urine ketones. The patient was diagnosed with diabetic ketoacidosis and started on subcutaneous insulin. They were also found to have a leukocytosis of 20 K/uL with no clear source of infection, and thus blood cultures were obtained and they were started on broad-spectrum antibiotics. Blood cultures quickly returned as gram-positive cocci (later speciated as pan-sensitive *S. mitis*), and a transthoracic echocardiogram (TTE) was ordered. On TTE, the patient was found to have a ~12 mm aortic valve vegetation that prolapsed into the LV outflow tract with severe aortic regurgitation (AR) and a possible tricuspid annular mass. There was LV dilation (end-diastolic diameter 65 mm), the AR pressure half-time was short (200 msec), and holodiastolic flow reversal was noted in the descending thoracic aorta (Figures 1-4, Videos 1 and 2). For a better assessment of the valvular vegetations and AR, a transesophageal echocardiogram (TEE) was subsequently performed, which demonstrated a 15 mm aortic valve vegetation predominantly on the noncoronary cusp of the trileaflet aortic valve, which extended into the RA with continuous left-to-right flow between the LV outflow tract and RA, along with severe AR with a large flow convergence zone (Figures 5 and 6, Videos 3-5).

On hospital day 3, the patient became increasingly agitated and delirious, with hypotension (systolic blood pressure 90 mm Hg) and tachycardia (rate 150 bpm). The blood pressure did not improve with fluid resuscitation, and the patient was transferred to the intensive care unit for closer monitoring. A 12-lead electrocardiogram was notable for progressive first-degree AV block, later followed by second-degree AV block (Figure 7). The patient was then

VIDEO HIGHLIGHTS

Video 1: Two-dimensional TTE, parasternal long-axis zoom view, demonstrates a large, echogenic mass in the LV outflow tract consistent with an aortic valve vegetation.

Video 2: Two-dimensional TTE, apical 4-chamber zoom view, demonstrates a right atrial mass near the medial tricuspid annulus.

Video 3: Two-dimensional TEE, midesophageal 5-chamber view (0°) view, demonstrates the large aortic valve vegetation predominantly on the noncoronary cusp.

Video 4: Two-dimensional TEE, midesophageal long-axis (138°) view without (*left*) and with (*right*) simultaneous color-flow Doppler, demonstrates the large aortic valve vegetation with associated severe AR.

Video 5: Two-dimensional TEE, midesophageal short-axis (50°) view without (*left*) and with (*right*) simultaneous color-flow Doppler, demonstrates both the aortic valve vegetation and the adjacent RA vegetation with the associated Gerbode defect with continuous flow from the LV outflow tract to the RA.

View the video content online at www.cvcasejournal.com.

From the Department of Medicine (E.D.S., A.N.), Graduate Medical Education (N.D.R.) and Department of Cardiology (E.F.), Kaiser Permanente Oakland Medical Center, Oakland, California.

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Correspondence: Edward D. Shin, MD, Kaiser Permanente Oakland Medical Center, 3883 Turquoise Way Apt 1214, Oakland, CA 94604. (E-mail: *edward.d.shin@kp.org*).

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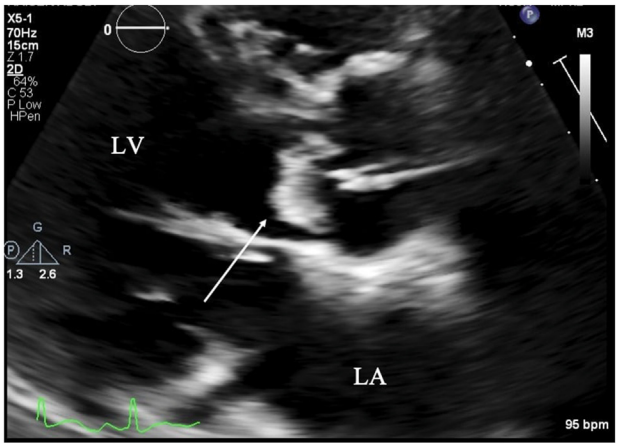

Figure 1 Two-dimensional TTE, parasternal long-axis zoom view, diastolic phase, demonstrates a large, echogenic mass in the LV outflow tract consistent with an aortic valve vegetation. *LA*, Left atrium.

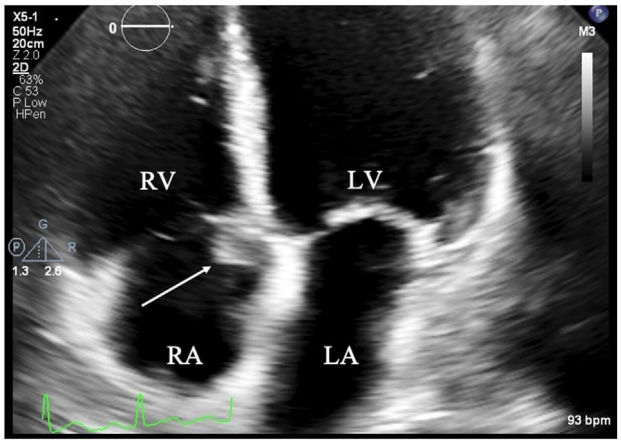

Figure 2 Two-dimensional TTE, apical 4-chamber cropped view, systolic phase, demonstrates a right atrial mass near the medial tricuspid annulus (*arrow*). *LA*, Left atrium; *RV*, right ventricle.

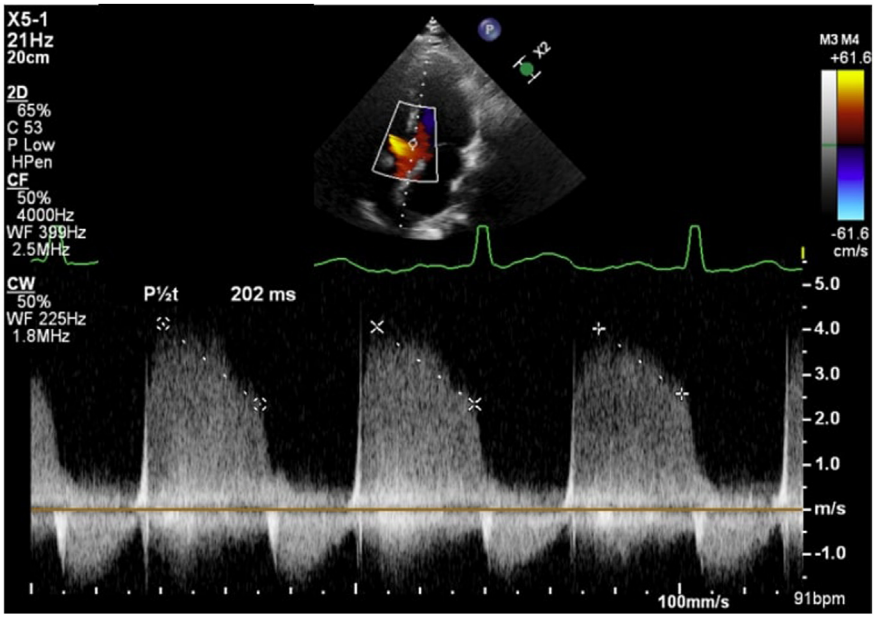

Figure 3 Two-dimensional TTE, apical 5-chamber view, pulsed-wave Doppler through the aortic valve, demonstrates a pressure half-time (P1/2t) of ~200 msec, suggesting severe AR.

intubated and a temporary transvenous pacemaker was placed via the right internal jugular vein. They were then urgently transferred to a medical center with cardiac surgery capabilities for surgical intervention.

Upon transfer, the patient was initiated on continuous renal replacement therapy for worsening oliguric renal failure and started on dobutamine for inotropy. After medical optimization, the patient ultimately underwent valve replacement surgery on hospital day 14, which found a destroyed aortic valve with large vegetations mainly on the noncoronary cusp, a 10 × 10 mm large opening within the membranous interventricular septum that communicated with the RA, along with vegetations on the septal leaflet of the tricuspid valve. The patient underwent a successful double-patch closure of the LV-to-RA connection (from both the LV and RA sides), aortic valve and tricuspid valve replacements with bioprostheses, and a dual-chamber pacemaker implantation with epicardial leads connected to the RA and right ventricle. Intraoperative cultures returned negative, but this was after treatment with 14 days of antibiotics.

Postoperatively, the patient's course was complicated by deep venous thromboses and pulmonary emboli requiring anticoagulation and temporary inferior vena cava filter and persistent renal failure requiring ongoing hemodialysis. Follow-up echocardiography showed properly functioning aortic and tricuspid valve prostheses and no residual LV-RA shunt. The patient was subsequently discharged to a skilled nursing facility after a 4-week hospitalization.

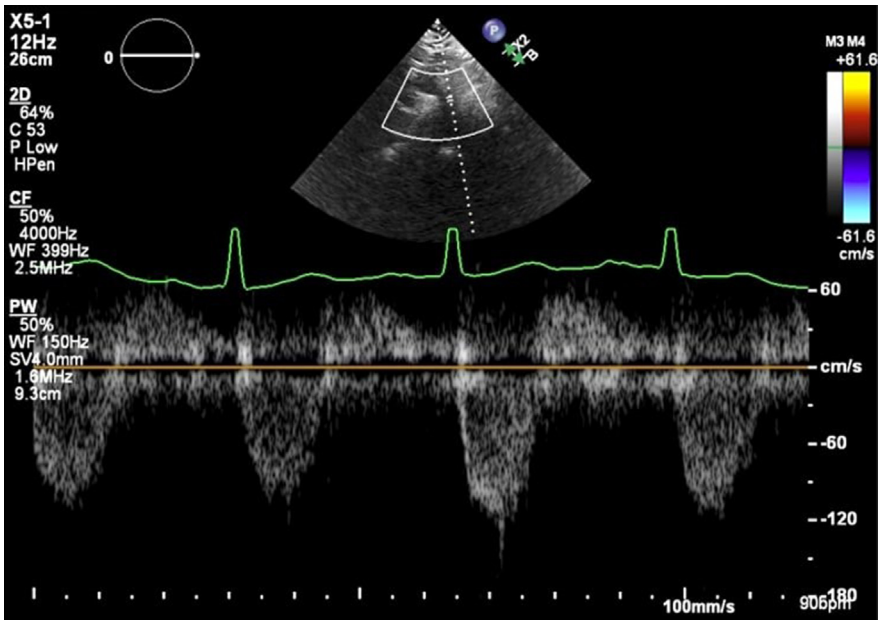

Figure 4 Two-dimensional TTE, suprasternal notch view, pulsed-wave Doppler through the descending thoracic aorta, demonstrates significant holodiastolic flow reversal indicative of severe AR.

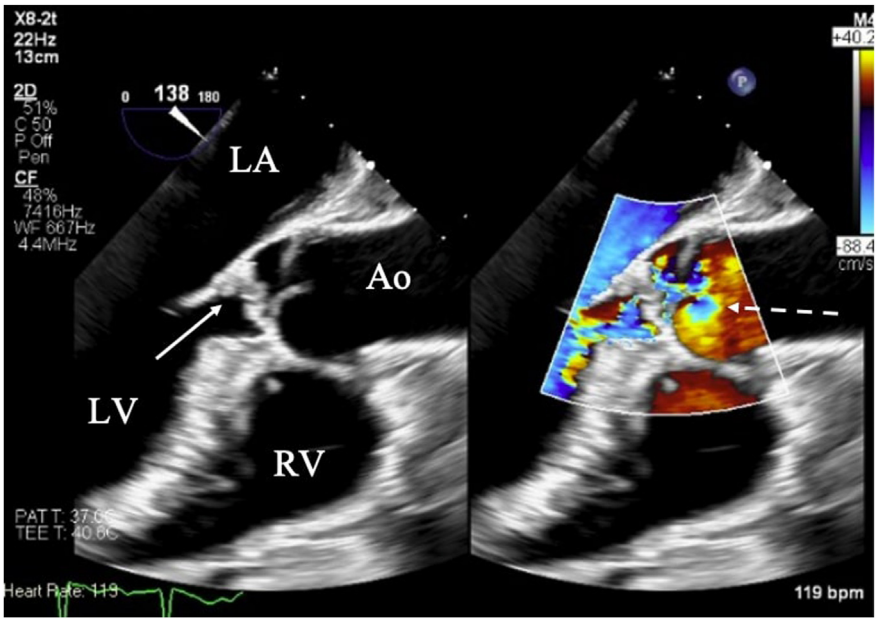

Figure 5 Two-dimensional TEE, midesophageal long-axis (138°) view without (*left*) and with (*right*) simultaneous color-flow Doppler, demonstrates the large aortic valve vegetation (*solid arrow*) with associated severe AR as demonstrated by the large Nyquist-limit adjusted flow convergence pattern (*dashed arrow*). *Ao*, Aorta; *LA*, left atrium.

DISCUSSION

The Gerbode defect was first described when a congenital shunt was identified between the LV to RA in an autopsy report of a patient in 1838.[1] This defect accounts for only 0.08% of all intracardiac shunts and less than 1% of all congenital cardiac defects.[1,2] The etiology of the Gerbode defect includes congenital or acquired causes such as IE. In cases of endocarditis, the local infection can cause destruction of the interventricular septum and lead to this abnormal communication. In the literature, the Gerbode defect has previously been described with other common endocarditis organisms including *Staphylococcus aureus, Streptococcus mutans, Hemophilus aphrophilus, Cardiobacterium hominis, Staphylococcus lugdunensis,* and culture-negative organisms. *Streptococcus mitis,* a gram-positive, catalase-negative facultative anaerobe, is typically an organism that is commonly found in the oral cavity. Interestingly, *S. mitis* accounts for 10% to 30% of all IE, yet there is little to no literature associating this organism with an acquired Gerbode defect.[3] *S. mitis* is typically

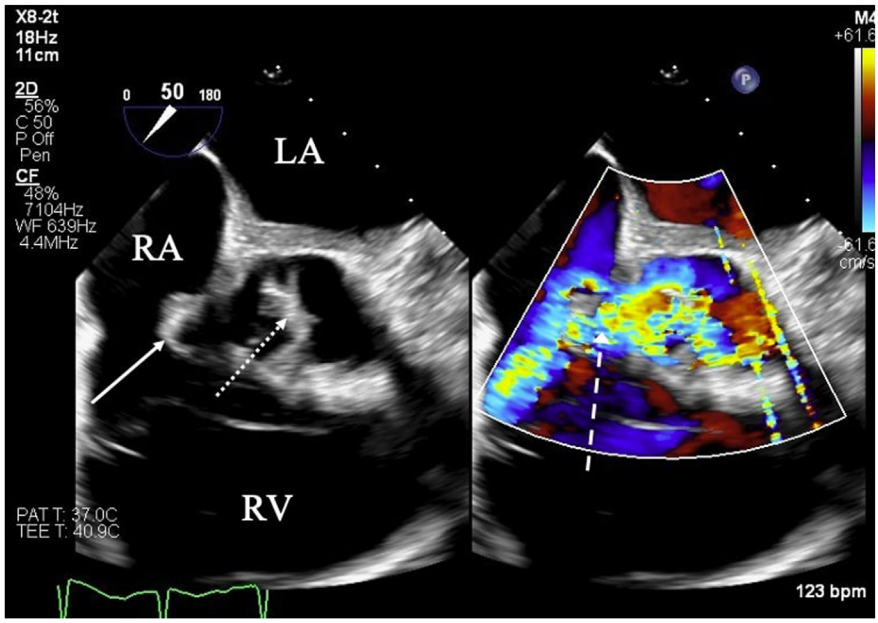

Figure 6 Two-dimensional TEE, midesophageal short-axis (50°) view without (*left*) and with (*right*) simultaneous color-flow Doppler demonstrates both the aortic valve vegetation (*dotted arrow*) and the adjacent RA vegetation (*solid arrow*) with the associated Gerbode defect with continuous flow from the LV outflow tract to the RA (*dashed arrow*). *LA*, Left atrium; *RV*, right ventricle.

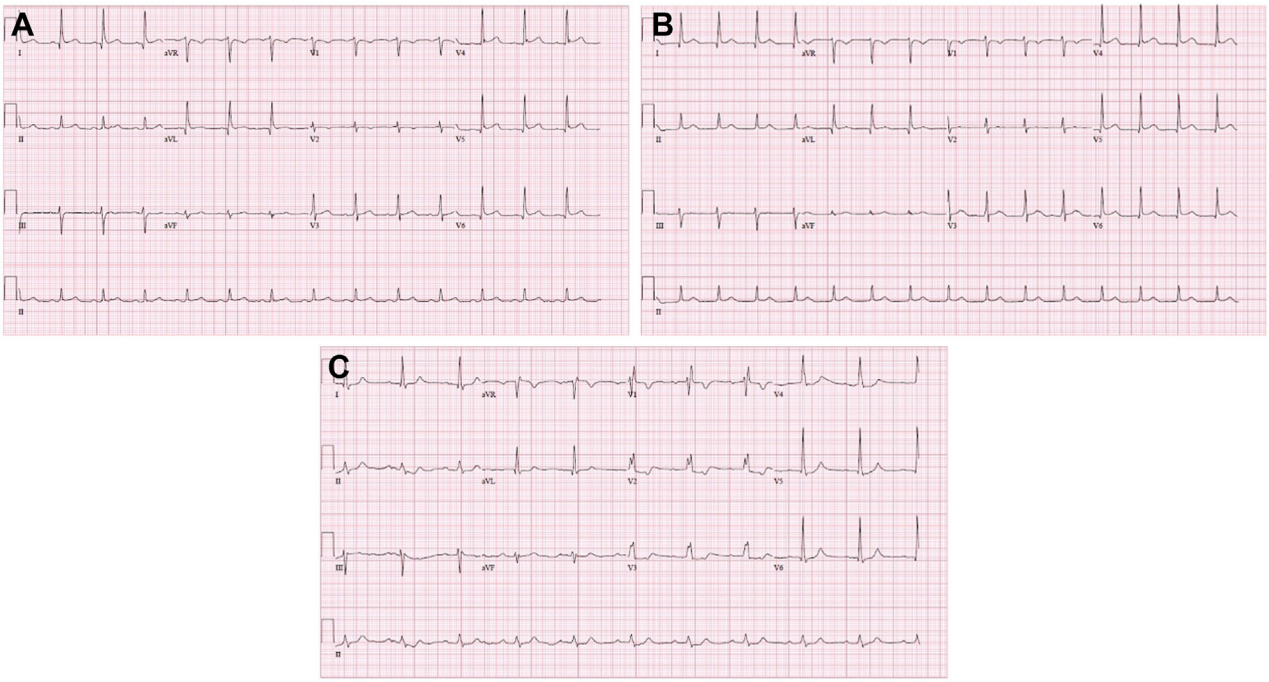

Figure 7 A 12-lead electrocardiogram demonstrates normal sinus rhythm and normal PR interval performed at hospital admission **(A)**, normal sinus rhythm with first-degree AV block performed on hospital day 3 **(B)**, and normal sinus rhythm with 2:1 AV block performed in ICU on day 3 **(C)**.

responsive to intravenous penicillin G treatment for a 4 to 6 week course.[4]

Despite our patient's initial presentation with diabetic ketoacidosis, it was only after a thorough infectious workup, TTE, and TEE that we identified the Gerbode defect. Notably, the Gerbode defect was not seen on TTE, highlighting the importance of TEE when there is any suspicion for complications arising from endocarditis. Our patient had multiple serious complications

related to the aortic valve endocarditis including severe AR with cardiogenic shock and renal failure and progressive AV block requiring pacemaker implantation.

CONCLUSION

An acquired Gerbode defect is a rare, yet potentially devastating, intracardiac shunt that may result from IE. We present a rare case of this defect in a patient who initially presented as diabetic ketoacidosis and was found to have severe AR secondary to *S. mitis* aortic valve endocarditis.

ETHICS STATEMENT

The authors declare that the work described has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans.

CONSENT STATEMENT

Complete written informed consent was obtained from the patient (or appropriate parent, guardian, or power of attorney) for the publication of this study and accompanying images.

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DISCLOSURE STATEMENT

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found at https://doi.org/10.1016/j.case.2024.02.006.

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