

Infective Endocarditis with Pseudoaneurysm of the Mitral-Aortic Intervalvular Fibrosa Presenting as Complete Heart Block

CULLEN SOARES, MD; PINAR ARIKAN, MD; MICHAEL GILSON, MD, MPH, FACC

ABSTRACT

A 79-year-old male with a history of ESRD and treated *MRSA* endocarditis was found to have a recurrence of *MRSA* bacteremia. He was treated with antibiotics. During his hospitalization, he suddenly developed complete heart block requiring transcutaneous pacing, and subsequently transvenous pacing wires were placed. Transesophageal echocardiography demonstrated pseudoaneurysm of the mitral-aortic intervalvular fibrosa as well as aortic valve thickening, and a mitral vegetation. Cardiothoracic surgery was consulted to obtain source control, but the patient was deemed to be a poor surgical candidate. While continuing medical therapy and transvenous pacing, the patient developed refractory hypotension, acidosis, and ultimately expired.

KEYWORDS: endocarditis, echocardiography, complete heart block, mitral-aortic intervalvular fibrosa pseudoaneurysm

CASE REPORT

A 79-year-old male was brought to the hospital by his family after collapsing at home due to weakness after missing a session of dialysis. There was no head strike or loss of consciousness. He denied lightheadedness, dizziness, vision changes, palpitations, fever, or chills. On presentation he was afebrile, pulse 76, blood pressure 140/61, respirations 18, saturating 94% on room air. He appeared thin, frail, and elderly, in no acute distress. Mouth was remarkable for poor dentition and moist mucosa. Lungs had mild bibasilar rales, heart had a regular rate and rhythm, abdomen was soft, and extremities had no cyanosis or edema. He had multiple excoriations on the scalp, arms, and legs. His dialysis tunneled catheter was clean, dry, and intact.

The patient had a past medical history of end-stage renal disease on hemodialysis, heart failure with preserved ejection fraction (LVEF 50%), paroxysmal atrial fibrillation (on warfarin), prior gastrointestinal bleeds, hypertension, and type 2 diabetes. He had a prior hospitalization for *MRSA* endocarditis 7 months earlier, diagnosed with positive blood cultures and a transthoracic echocardiogram (TTE) that demonstrated a 1.4 cm aortic valve vegetation and severe leaflet thickening. A transesophageal echocardiogram (TEE) was not performed at that time due to patient refusal. The patient was treated for 6 weeks with vancomycin

followed by doxycycline suppression therapy due to concern for *MRSA* colonization of his nonfunctional fistula. His tunneled dialysis catheter was replaced at that time.

He was a former smoker with 27 pack-year-history and quit more than 20 years ago. Family history was remarkable for diabetes, hypertension, and hyperlipidemia in his mother. There was no family history of renal disease.

Admission EKG showed findings suggestive of left ventricular hypertrophy, similar to the EKG during his previous hospitalization (**Figures 1 and 2**).

The basic metabolic panel was abnormal, but not significantly different compared to prior values for this patient over the last 6 months.

Blood cultures and dialysis catheter cultures grew *MRSA*, for which the patient was started on vancomycin. Blood cultures cleared on hospital day 5.

TTE showed thickening of the aortic valve, but no clear vegetation.

He was scheduled to have a new dialysis catheter placed, but while being transported for the procedure the patient developed bradycardia (pulse of 32) and hypotension (80/34). He appeared listless and had cool extremities with a bradycardic pulse. An EKG was obtained showing the patient to be in complete heart block (**Figure 3**). His heart rate failed to respond to 2 doses of atropine 0.5mg, so transcutaneous pacing was initiated, followed by placement of trans-venous pacing wires, and the patient was transferred to the Coronary Care Unit (CCU).

TEE revealed an aortic valve ring abscess, pseudo-aneurysm of the mitral-aortic intervalvular fibrosa, aortic valve thickening without an obvious vegetation, perforation of the left coronary leaflet resulting in mild to moderate aortic regurgitation and a mitral valve vegetation (**Figure 4 and Video 1**).

Despite pacemaker support and multiple intravenous pressors, he developed refractory hypotension and acidosis and died the following day.

DISCUSSION

Pseudoaneurysm of the mitral-aortic intervalvular fibrosa (MAIVF-P) and complete atrio-ventricular heart block are each rare complications of infective endocarditis. The incidence of infective endocarditis in the United States is approximately 15 cases per 100,000 of the total population, with rising rates of *Streptococcal* infection since guidelines for prevention were released in 2007.¹ A prior review of the literature found approximately 89 cases of MAIVF-P

Figure 1. EKG from first hospitalization with findings suggestive of left ventricular hypertrophy and secondary repolarization abnormalities.

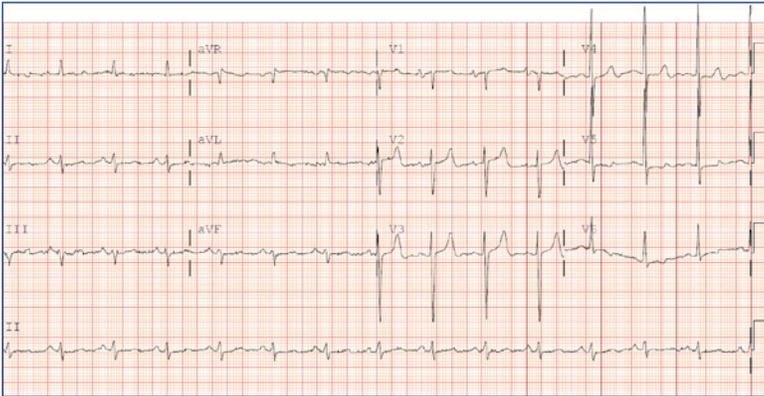


Figure 2. EKG from second hospitalization with findings suggestive of left ventricular hypertrophy and secondary repolarization abnormalities.

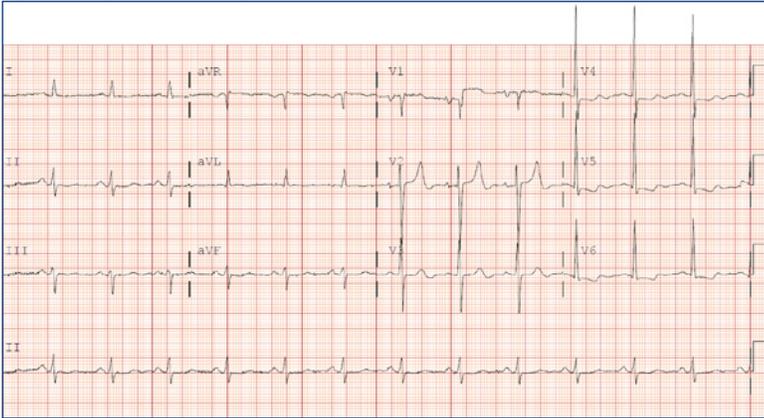


Figure 3. EKG from second hospitalization showing new complete heart block with narrow QRS complex during episode of hemodynamic instability.

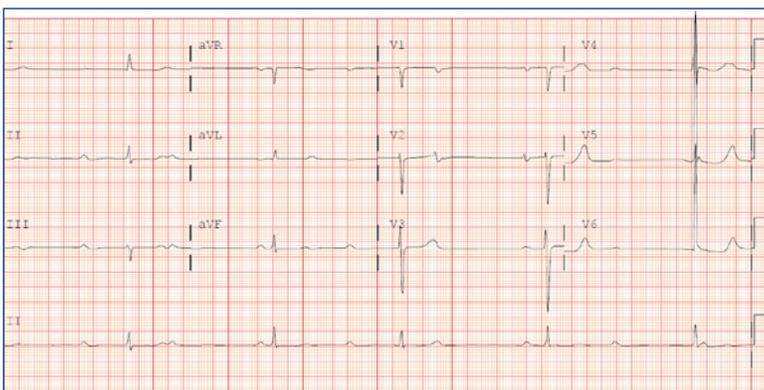


Figure 4. TEE image from second hospitalization demonstrating MAIVF-P.

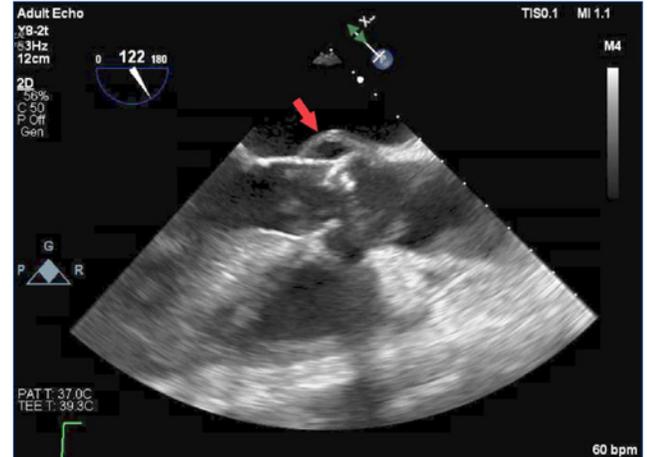
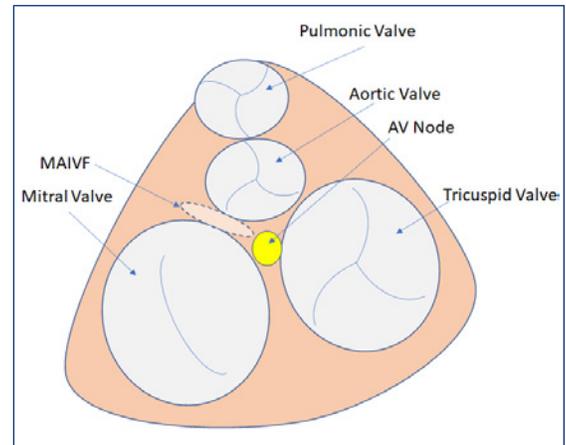


Figure 5. Diagram of cardiac anatomy depicting the location of the MAIVF.



Video 1. Transesophageal echocardiogram demonstrating MAIVF-P. [0.03, <https://vimeo.com/558106605>]

[Click to view video](#)



reported from 1966 to 2010.² Complete heart block has previously been reported at 4% and 11% in 2 prior cohorts.^{3,4}

The MAIVF refers to the inter-annular zone between the mitral and aortic valves, adjacent to the atrio-ventricular node (AVN). Due to the relatively avascular nature of this cardiac structure, it is prone to infection and injury, and is susceptible to forming pseudoaneurysms as a complication of endocarditis or valve replacement.² A pseudoaneurysm generally develops between the left coronary or non-coronary aortic cusp and the anterior leaflet of the mitral valve. Localized edema and extrinsic compression of the AVN by the expanding pseudoaneurysm may result in AVN dysfunction eventually progressing to complete heart block.

This patient presented with recurrent *MRSA* bacteremia and endocarditis. *MRSA* is a virulent organism that, once established on a valve surface, commonly invades the surrounding cardiac tissue resulting in formation of a valve ring abscess or fistula. According to the 2020 ACC Guidelines for the Management of Patients with Valvular Heart Disease, paravalvular cardiac abscesses occur in 30% to 40% of cases of *MRSA* endocarditis.⁵ Trans-thoracic echocardiography has poor sensitivity for identifying these complex infections.^{6,7} As such, the ACC Guidelines endorse a Class I indication for TEE in the setting of *MRSA* bacteremia if endocarditis is suspected. CHB, because it almost always signifies ring abscess formation⁴ and also represents a Class I indication for TEE.⁵ The AHA also supports similar guidelines.⁷ Furthermore, CHB also represents a Class I indication for early surgery, during the initial hospitalization and before completion of a course of IV antibiotics.⁵

The chronology of events in this patient's cases suggests that he could have already developed an aortic valve ring abscess at the time of his initial presentation. Antibiotics may have suppressed the bacteremia but not completely sterilized the valve annulus, despite appropriate medical therapy. At his second presentation, the abscess could have progressed to cause a MAIVF-P. Examination of cardiac anatomy demonstrates that the MAIVF lies adjacent to the AV node at the AV junction. Extrinsic compression of the AV node by the expanding pseudoaneurysm as well as localized edema and inflammation associated with the infection likely resulted in the development of complete heart block (**Figure 5**). The ECG is consistent with this pathophysiology; the narrow QRS complex suggesting heart block at the level of the AV node, rather than below (**Figure 3**). From our literature search, MAIVF-P has been reported before in case reports and case series⁸⁻¹¹, and of these only 1 report found an intermittent AV block.¹¹ CHB has been reported previously as a presenting sign of infective endocarditis.¹² However, we believe our patient is the first reported case of MAIVF-P presenting as complete heart block.

CONCLUSIONS

This case highlights two rare and late complications of infective endocarditis occurring concurrently: the pseudoaneurysm of the mitral-aortic intervalvular fibrosa and complete heart block. In cases of *MRSA* bacteremia, TEE is important to properly assess for endocarditis and to guide appropriate management.

References

- Pant S, Patel NJ, Deshmukh A, et al. Trends in infective endocarditis incidence, microbiology, and valve replacement in the United States from 2000 to 2011. *J Am Coll Cardiol*. 2015;65:2070–6. doi:10.1016/j.jacc.2015.03.518
- Sudhakar S, Sewani A, Agrawal M, et al. Pseudoaneurysm of the mitral-aortic intervalvular fibrosa (MAIVF): A comprehensive review. *J Am Soc Echocardiogr*. 2010;23:1009–18; quiz 1112. doi:10.1016/j.echo.2010.07.015
- Wang K, Gobel F, Gleason DF, et al. Complete Heart Block Complicating Bacterial Endocarditis. *Circulation*. 1972;46:939–47. doi:10.1161/01.CIR.46.5.939
- Meine TJ, Nettles RE, Anderson DJ, et al. Cardiac conduction abnormalities in endocarditis defined by the Duke criteria. *Am Heart J*. 2001;142:280–5. doi:10.1067/mhj.2001.116964
- Otto CM, Nishimura RA, Bonow RO, et al. 2020 ACC/AHA Guideline for the Management of Patients with Valvular Heart Disease. *J Am Coll Cardiol*. 2021;77(4):e25–e197
- Sekar P, Johnson JR, Thurn JR, et al. Comparative Sensitivity of Transthoracic and Transesophageal Echocardiography in Diagnosis of Infective Endocarditis Among Veterans With *Staphylococcus aureus* Bacteremia. *Open Forum Infect Dis*. 2017;4:ofx035. doi:10.1093/ofid/ofx035
- Baddour LM, Wilson WR, Bayer AS, et al. Infective Endocarditis in Adults: Diagnosis, Antimicrobial Therapy, and Management of Complications: A Scientific Statement for Healthcare Professionals From the American Heart Association. *Circulation*. 2015;132:1435–86. doi:10.1161/CIR.0000000000000296
- Apostolidou E, Beale C, Poppas A, et al. Pseudoaneurysm of the Mitral-Aortic Intervalvular Fibrosa: A Case Series with Literature Review. *CASE (Phila)*. 2017;1:221–6. doi:10.1016/j.case.2017.07.001
- Bonou M, Papadimitraki ED, Vaina S, et al. Mitral-Aortic Intervalvular Fibrosa Pseudoaneurysm. *J Cardiovasc Ultrasound*. 2015;23:257–61. doi:10.4250/jcu.2015.23.4.257
- Tak T. Pseudoaneurysm of mitral-aortic intervalvular fibrosa. *Clin Med Res*. 2003;1:49–52. doi:10.3121/cm.r.1.1.49
- Hasebe H, Takanohashi A, Shiota K, et al. Infective Endocarditis with Intermittent Atrioventricular Block and Pseudoaneurysm of the Mitral-aortic Intervalvular Fibrosa in a Patient with Severe Aortic Stenosis. *Intern Med*. 2016;55:2825–9. doi:10.2169/internalmedicine.55.7031
- Brown RE, Chiacio JMC, Dillon JL, et al. Infective Endocarditis Presenting as Complete Heart Block With an Unexpected Finding of a Cardiac Abscess and Purulent Pericarditis. *J Clin Med Res*. 2015;7:890–5. doi:10.14740/jocmr2228w

Authors

Cullen Soares, MD, House Staff Officer in Medicine, Rhode Island Hospital; Alpert Medical School of Brown University, Providence, RI.

Pinar Arikan, MD, House Staff Officer in Medicine, Rhode Island Hospital; Alpert Medical School of Brown University, Providence, RI.

Michael Gilson, MD, MPH, FACC, Attending Physician, Rhode Island Hospital; Clinical Associate Professor of Medicine, Alpert Medical School of Brown University, Providence, RI.

Disclosures

Project Support/Funding – No funding

Disclaimer

This work does not represent the views of Brown University, Rhode Island Hospital, or Lifespan.

Correspondence

Cullen Soares, MD
cullen_soares@brown.edu