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Reconstructive surgery for *Staphylococcus lugdunensis* endocarditis complicating a bicuspid aortic valve and ascending aortic aneurysm: A case report

Abstract

We report a rare case of *Staphylococcus lugdunensis* (*S. lugdunensis*) endocarditis in a 42-year-old male with a bicuspid aortic valve and an ascending aortic aneurysm. The patient initially presented with upper respiratory symptoms but rapidly deteriorated, developing acute pulmonary edema. Transthoracic and transesophageal echocardiography demonstrated severe aortic regurgitation, vegetation on the bicuspid valve, and a 52-mm ascending aortic aneurysm. Intraoperative assessment revealed extensive destruction involving the mitral–aortic intervalvular fibrosa (MAIVF), membranous septum, and anterior mitral leaflet. Emergency surgery was performed, including reconstruction of the MAIVF and membranous septum, mechanical aortic valve replacement, and ascending aortic replacement via the Wheat procedure. Tissue and blood cultures grew *S. lugdunensis*, which was sensitive to vancomycin. The patient completed a six-week antibiotic regimen and was discharged in stable condition. This case highlights a unique association between *S. lugdunensis* endocarditis and focal MAIVF destruction in bicuspid aortic valve disease, underscoring the importance of timely surgical intervention.

Keywords: *Staphylococcus lugdunensis*, mitral–aortic intervalvular fibrosa, wheat procedure, infective endocarditis, reconstructive cardiac surgery

INTRODUCTION

Bicuspid aortic valve disease is a congenital anomaly frequently associated with ascending aortic aneurysm and confers a markedly increased risk of infective endocarditis compared with tricuspid aortic valves. *S. lugdunensis* is a coagulase-negative staphylococcus that, unlike most species within this group, exhibits a highly aggressive clinical course in native valve endocarditis (1). Although part of the normal skin flora—predominantly colonizing the perineum and lower extremities—it is capable of causing severe infections such as osteomyelitis, prosthetic joint infections, and native valve endocarditis (1). Despite its rarity, *S. lugdunensis* endocarditis may resemble *S. aureus* in virulence, leading to rapid progression and extensive valvular destruction.

MAIVF is a fibrous, avascular structure forming the junction between the anterior mitral leaflet and the non-coronary and left coronary cusps of the aortic valve (2). Owing to its avascular

nature, it is particularly vulnerable to infective complications. In infective endocarditis, damage to the MAIVF is clinically and surgically critical because its involvement can lead to pseudoaneurysm, fistula, or direct perforation, all of which markedly increase morbidity and mortality unless promptly identified and surgically repaired.

Here, we describe a rare case of *S. lugdunensis* aortic valve endocarditis associated with extensive destruction of the MAIVF and membranous septum, necessitating urgent reconstructive surgery.

CASE REPORT

A 42-year-old man presented to the emergency department with a 10-day history of cough, sore throat, and malaise. His medical history was notable for tobacco and alcohol dependence, and he resided in neglected social conditions. On admission, he was febrile (38.0°C), hypotensive (blood pressure 100/60 mmHg), and tachycardic (heart rate 110 bpm). Cardiac auscultation

revealed a pansystolic murmur best heard at the second right intercostal space. Laboratory testing demonstrated leukocytosis and elevated C-reactive protein levels.

Transthoracic echocardiography showed a preserved ejection fraction (60%), moderate-to-severe aortic regurgitation, mild-to-moderate mitral regurgitation, and a mean/peak transaortic gradient of 36/68 mmHg. Computed tomography confirmed a 52-mm ascending aortic aneurysm, without evidence of pneumonia or abscess (Figure 1A). Transesophageal echocardiography revealed a bicuspid aortic valve with large vegetations and rupture of the right coronary cusp.

Given his rapidly progressive pulmonary edema and clinical deterioration, the patient underwent emergency cardiac surgery. Blood cultures were collected according to the endocarditis protocol, and empirical intravenous antibiotic therapy with ampicillin–sulbactam (4×3 g/day) and gentamicin (3 mg/kg/day) was initiated.

Surgical Procedure

Following systemic heparinization, a median sternotomy was performed. Cardiopulmonary bypass was established via the brachiocephalic artery and bicaval cannulation owing to the presence of an aneurysmal aorta (Figure 1B). The heart was vented through the right superior pulmonary vein. Following aortic cross-clamping, antegrade Del Nido cardioplegia was administered to achieve cardiac arrest.

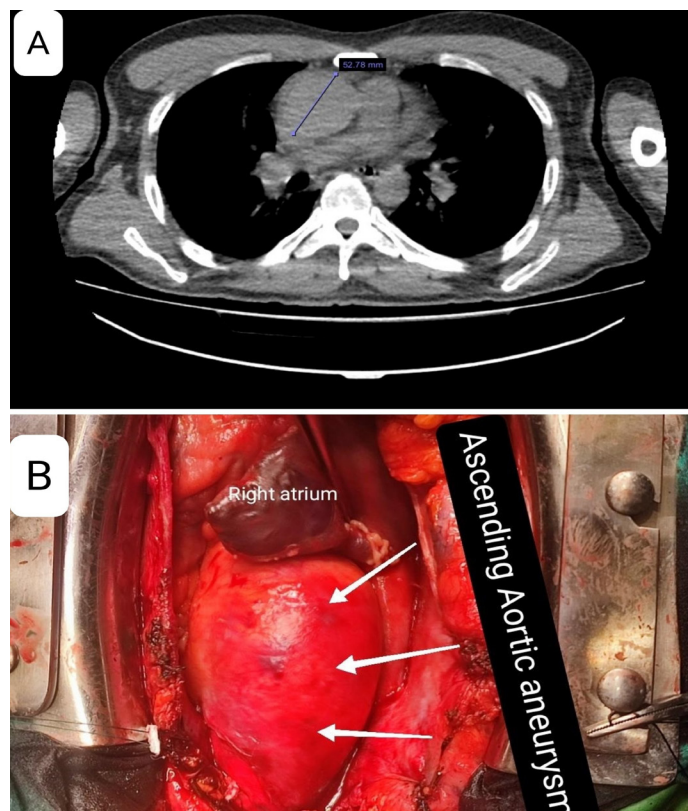


Figure 1. A. Preoperative computed tomographic image of the ascending aortic aneurysm. B. Intra-operative image that demonstrating an ascending aortic aneurysm

A transverse aortotomy exposed a ruptured right coronary cusp with vegetations on the bicuspid valve (Figure 2A, 2B). Extensive destruction of the MAIVF, membranous septum, and ventricular surface of the anterior mitral leaflet was noted. All infected tissue was thoroughly debrided and irrigated with saline. Reconstruction of the MAIVF and membranous septum was performed using pledgeted sutures (Figure 3A), and the mitral leaflet defect was similarly repaired. Subsequently, mechanical aortic valve replacement (St. Jude Regent, size 21, USA) was performed, followed by ascending aortic replacement with a 30-mm Dacron graft (Wheat procedure) (Figure 3B–D). The patient was extubated early and experienced an uneventful postoperative course. Postoperative echocardiography demonstrated normal valve function without complications.

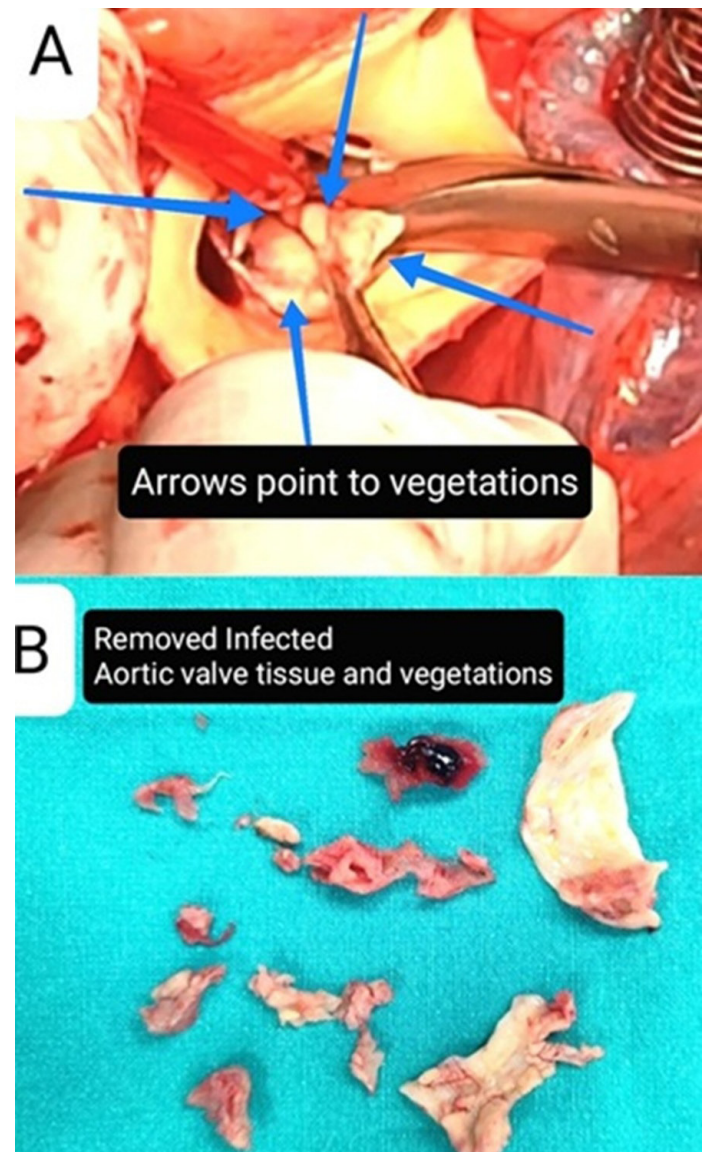


Figure 2. A. Intra-operative image that showing vegetation on the bicuspid aortic valve. B. Resected bicuspid aortic valve with vegetations

Blood and tissue cultures grew *Staphylococcus lugdunensis*, susceptible to vancomycin. The patient completed a six-week

regimen of intravenous vancomycin (30 mg/kg/day), rifampin (600 mg/day), and cefazolin (2 g three times daily). At six-month follow-up, he remained asymptomatic with normal echocardiographic findings.

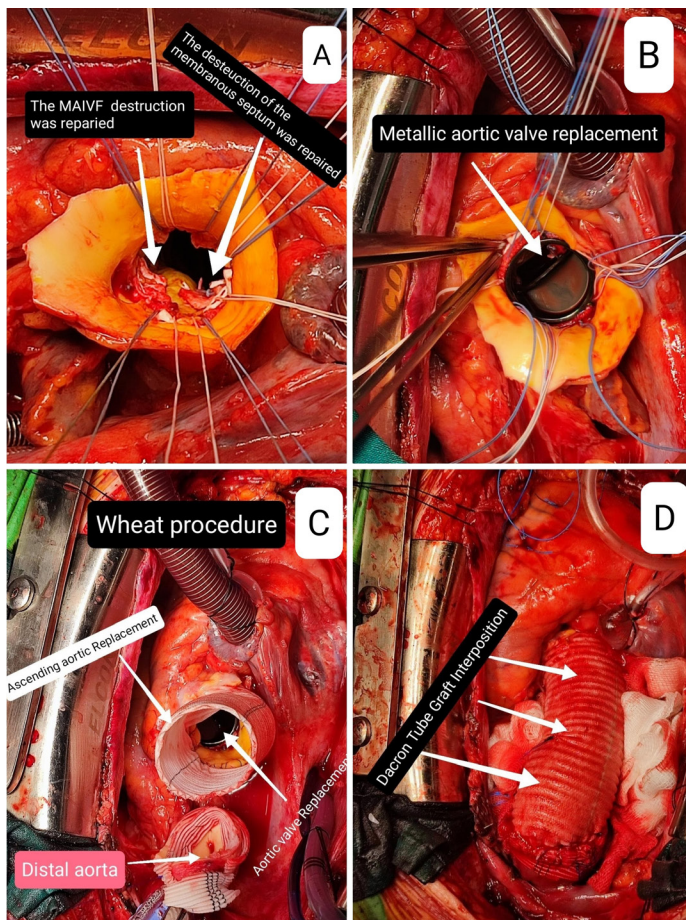


Figure 3. A. Repair of membranous septum and mitral–aortic intervalvular fibrosa (MAIVF) using pledgeted sutures. B. Mechanical aortic valve replacement (St. Jude Regent, size 21). C. Replacement of the ascending aorta and aortic valve with a 30-mm Dacron graft (Wheat procedure). D. Completed Wheat procedure

DISCUSSION

S. lugdunensis is a coagulase- and DNase-negative organism that differs from other coagulase-negative staphylococci in its high virulence, often mimicking *S. aureus* in clinical severity. Rapid and accurate identification can be achieved using matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS), which provides results within one hour with nearly 100% sensitivity (1).

Urgent cardiac surgery is indicated in infective endocarditis when patients develop heart failure from severe valvular dysfunction, uncontrolled infection or perivalvular extension (abscess, pseudoaneurysm, fistula), large/mobile vegetations with high embolic risk or recurrent embolization despite therapy, or refractory pulmonary edema/cardiogenic shock, as endorsed by contemporary guidelines (3). Our patient presented with acute pulmonary edema and hemodynamic instability, fulfilling criteria

for emergency surgery.

The MAIVF, due to its avascular nature, is inherently predisposed to infective destruction. Involvement of this structure can lead to serious complications, including pseudoaneurysm formation, left atrial fistula, aorto-cavitary fistula, and conduction disturbances (4). Standard reconstructive strategies typically employ bovine pericardial or synthetic patches (2,4).

Extensive destruction of the MAIVF and membranous septum by *S. lugdunensis* is exceedingly rare, particularly in the context of native bicuspid aortic valves. To our knowledge, this is the first reported case necessitating MAIVF reconstruction without patch augmentation. Based on our experience and a review of the literature, we propose an intraoperative decision-making algorithm for MAIVF and membranous septum destruction in aortic valve infective endocarditis:

- Focal defects <15 mm, without communication to the pericardial space and without pseudoaneurysm formation, may be repaired using pledgeted sutures or an autologous pericardial patch.
- Extensive destruction (>15 mm), circumferential annular involvement, or the presence of pseudoaneurysm/aorto-cavitary fistula warrants patch augmentation with bovine pericardium or subannular root replacement (e.g., Commando or subannular Bentall procedure), depending on the degree of mitral involvement (5).

In our case, direct pledgeted suture repair was sufficient, demonstrating that not all MAIVF defects require patch augmentation. Early repair in this setting is crucial to prevent complications such as pseudoaneurysm, ventricular septal defect, and aortopulmonary fistula.

CONCLUSION

We hypothesize that in patients with aortopathy, *S. lugdunensis* bacteremia may seed the vasa vasorum and fibrous MAIVF through microerosions adjacent to an aneurysmal ascending aorta, ultimately leading to combined aortic root and membranous septum destruction. For focal MAIVF lesions measuring <15 mm, reconstruction with pledgeted sutures or an autologous pericardial patch is an effective strategy to ensure long-term structural integrity while maintaining infection control.

Conflict of Interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical Approval

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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