

Left Ventricular to Left Atrial Communication Secondary to a Paraaortic Abscess: Color Flow Doppler Documentation

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Aortic root abscess occurs frequently in aortic prosthetic valve infective endocarditis. The present echocardiographic report documents a ruptured abscess that led to a direct communication between the left ventricular

outflow tract and the left atrium confirmed by real-time (color flow) Doppler imaging.

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Aortic root abscess, a serious complication of infective endocarditis, has been reported in up to 30% of patients with native valve endocarditis (1) and 100% of patients with prosthetic valve endocarditis (2). Though previously diagnosed only at surgery or autopsy, aortic root abscess has recently been detected with two-dimensional echocardiography (3,4). This report describes a hitherto unrecognized complication of aortic root abscess: a left ventricular to left atrial communication that was accurately diagnosed by two-dimensional echocardiography and color flow Doppler imaging.

Case Report

Clinical features. A 33 year old female intravenous drug abuser was hospitalized in February 1986 with fever and congestive heart failure. Blood cultures were positive for *Streptococcus viridans*. An echocardiogram revealed a large aortic valve vegetation and significant aortic regurgitation. Because of progressive heart failure, the patient underwent aortic valve replacement with a Carpentier-Edwards porcine heterograft. A 1.5 cm² area of necrotic myocardium beneath the left coronary leaflet was excised surgically. After 4½ weeks of intravenous penicillin therapy, the patient left the hospital against medical advice only to present 2 weeks later with fever and dyspnea.

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On examination, the patient was thin and cachectic with a temperature of 103°F, a pulse of 110 beats/min, respiratory rate of 28/min and blood pressure of 104/60 mm Hg. There was mild jugular venous distension; the lungs were clear. The cardiac examination was significant for a normal first heart sound, single second and absent third, a grade 4/6 harsh systolic murmur at the apex and second left intercostal space and a 2/6 early decrescendo diastolic murmur along the left sternal border. There was mild hepatomegaly. There was moderate digital clubbing, but no peripheral edema or embolic stigmata. Chest X-ray film revealed cardiomegaly with moderate pulmonary vascular congestion. The electrocardiogram (ECG) showed sinus tachycardia with nonspecific ST-T wave abnormalities. The white blood cell count was 9,100 mm³ with 67 segmented polymorphonuclear cells, four band forms and 29 lymphocytes. Multiple blood cultures were positive for *Streptococcus viridans*. Intravenous penicillin, digitalis, furosemide and hydralazine were begun.

Echocardiography. A real-time (color flow) Doppler echocardiographic (Aloka 880) examination revealed a dilated but hyperdynamic left ventricle and excessive motion of a portion of the posterior prosthetic aortic valve. Significantly, the left ventricular outflow tract at the anterior mitral valve juncture was disrupted, with two linear, highly mobile strands prolapsing into the left atrium providing a direct communication between the left ventricular outflow tract and the left atrium (Fig. 1). An abnormal flow pattern was documented by color flow Doppler echocardiography, with direct shunting from the left ventricular outflow tract into the left atrium (Fig. 2), most consistent with a ruptured abscess. There was also moderate paravalvular aortic regurgitation and mild mitral regurgitation.

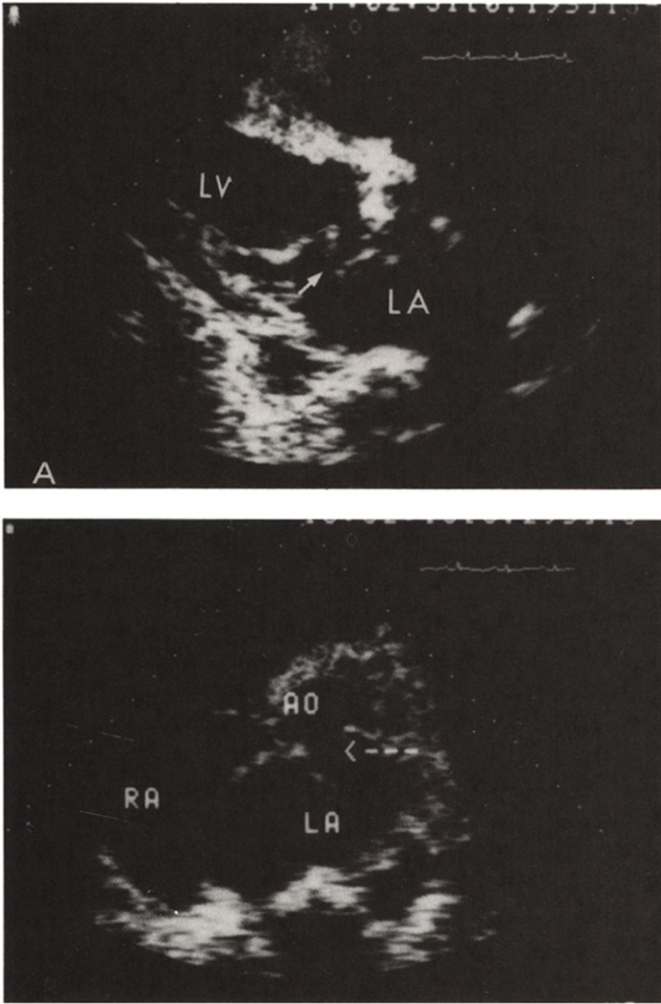


Figure 1. Two-dimensional echocardiography. **A**, Parasternal long-axis view. The **arrow** points to the ruptured abscess wall at the junction of the anterior leaflet of the mitral valve and aortic root. **B**, Short-axis view. **Arrow** points to the ruptured abscess at the left ventricular (LV) outflow tract which is in direct communication with the left atrium (LA). AO = aorta.

Surgery. The patient underwent open heart surgery for mitral and aortic valve replacements and patch closure of the communication. The patient's postoperative course was complicated by sepsis and renal failure, and she died 1 month after surgery.

Discussion

Infective endocarditis was first reported more than 300 years ago (5) and the complication of valve ring abscess was described more than a century ago (6). Although the frequency of prosthetic valve endocarditis is estimated to be 1% (2,7), Arnett and Roberts (1) found all 22 patients with prosthetic valve endocarditis to have valve ring abscess at necropsy. Another study by Stinson (8) found 56% of

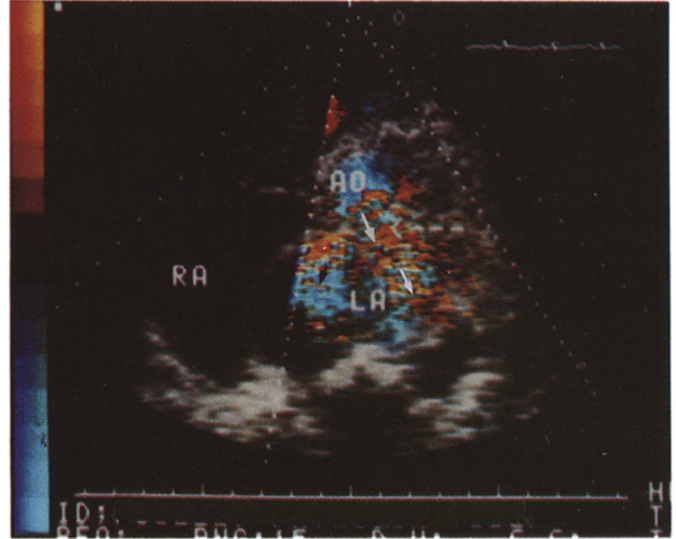


Figure 2. Color flow Doppler study of the same view as in Figure 1. The **white arrows** on the right side of the left atrium demonstrate turbulent flow (mosaic pattern) from the left ventricular outflow tract (labeled AO for aortic outflow) and the left atrium (LA). The **small black arrow** on the left side of the left atrium marks the area of mitral regurgitation.

patients with prosthetic valve endocarditis undergoing valve replacement to have grossly obvious abscess formation.

Pathologic documentation of aortic root abscess. Valve annular involvement in infective endocarditis occurs by direct extension because the relatively avascular anulus offers little resistance to infection (9). Burrowing of an aortic root abscess into contiguous structures is probably abetted by the high blood flow velocity and turbulence across the aortic valve (2). Pathologic studies (2) of native aortic root abscess have documented extension from the aorta into the periaortic space, through the atrial septum into the right and left atria and through the ventricular septum into the right ventricle and anterobasal left ventricular wall (2). A recent pathologic report (10) describes a cavity between the left ventricular outflow tract just below the aortic valve extending to just above the mitral anulus, with imminent rupture into the left atrium. However, our present case demonstrated a communication between the left ventricular outflow tract and left atrium.

Diagnosis. The in vivo diagnosis of prosthetic aortic valve ring abscess is difficult. Clinically, patients may present with fever or congestive heart failure and be found to have ECG prolongation of the PR interval. Echocardiography may reveal excessive thickness of the aortic root (11). Though two-dimensional echocardiography can directly image the typical echolucent cavity in the perivalvular tissue, reports of only 10 native (3,4,10-14) and 5 prosthetic (15,17) valve abscesses have been published. The present complication of infective endocarditis involved rupture of an aortic

prosthetic valve abscess, which created a direct communication between the left ventricle and left atrium. Additionally, pulsed and color flow Doppler imaging documented left ventricular to left atrial flow through the communication. Rupture of the infravalvular abscess generated a significant hemodynamic burden, precipitating congestive heart failure. Also, the location of the abscess and its rupture may have caused malfunction of the aortic prosthesis and mitral valve.

Differential diagnosis. Because of its proximity to the mitral valve, a left ventricular outflow tract to left atrial communication must be differentiated from valvular vegetation and ruptured sinus of Valsalva aneurysm. However, mitral vegetations usually occur on the distal and midportion of the leaflets themselves and rarely at the septal insertion of the anterior leaflet. Furthermore, it is the right sinus of Valsalva aneurysm that usually ruptures into the right atrium or ventricle and not into the left atrium (18). In the present case, the left ventricular outflow tract was involved, not the aortic root. Rupture of the mitral-aortic intervalvular fibrosa (interannular subaortic aneurysm) should also be considered as a possible cause for the left ventricular outflow tract to left atrial communication (8,19).

Surgical implications. Rapid and accurate detection of an abscess complicating endocarditis may reduce the increased morbidity and mortality associated with its presence (14,20,21). Even when successfully diagnosed, an abscess presents surgical problems. Sutures placed deeply into the ventricular septum in an attempt to obliterate an erosive aortic abscess can produce heart block (8,22). Also, sutures in the aortic anulus and mitral-aortic intervalvular fibrosa can cause valvular regurgitation (8).

Summary. We have described an additional complication of prosthetic valve endocarditis, the degeneration of an abscess into a direct communication between the left ventricular outflow tract and the left atrium. Real-time Doppler flow mapping (color flow) proved useful in the definitive diagnosis of this serious complication of infective endocarditis. Physicians should be aware of this potential complication of aortic prosthetic endocarditis when a patient with endocarditis suddenly develops heart failure. Two-dimensional echocardiography can identify the abscess and its rupture, whereas color flow or routine pulsed Doppler echocardiography can confirm the abnormal flow pattern.

References

1. Arnett EN, Roberts WC. Valve ring abscess in active infective endocarditis. Frequency, location, and clues to clinical diagnosis from the study of 95 necropsy patients. *Circulation* 1976;54:140-5.
2. Arnett EN, Roberts WC. Clinicopathologic analysis of 22 necropsy patients with comparison of observations in 74 necropsy patients with active infective endocarditis involving natural left-sided cardiac valves. *Am J Cardiol* 1976;38:281-92.
3. Mardelli TJ, Ogawa S, Hubbard FE, Dreifus LS, Meixell LL. Cross-sectional echocardiographic detection of aortic ring abscess in bacterial endocarditis. *Chest* 1978;74:576-8.
4. Wong CM, Oldershaw P, Gibson DG. Echocardiographic demonstration of aortic root abscess after infective endocarditis. *Br Heart J* 1981;46:584-6.
5. Major RH. Notes on the history of endocarditis. *Bull Hist Med* 1945;17:351-9.
6. Ponfick. Ueber embolische Aneurysmen, nebst Bemerkungen uber das acute Herzaneurysma (Herzgeschwur). *Virchows Arch Pathol Anat* 1873;58:528.
7. Wilson WR, Danielson GK, Giuliani ER, Geraci JE. Prosthetic valve endocarditis. *Mayo Clin Proc* 1982;57:155-61.
8. Stinson EB. Surgical treatment of infective endocarditis. *Prog Cardiovasc Dis* 1979;22:145-68.
9. Ryon DS, Pastor BH, Myerson RM. Abscess of the myocardium. *Am J Med Sci* 1966;251:698-705.
10. Agatson AS, Asnani H, Ozner M, Kinney EL. Aortic valve ring abscess: two-dimensional echocardiographic features leading to valve replacement. *Am Heart J* 1985;109:171-2.
11. Ellis SG, Goldstein J, Popp RL. Detection of endocarditis—associated perivalvular abscess by two-dimensional echocardiography. *J Am Coll Cardiol* 1985;5:647-53.
12. Nakamura K, Suzuki S, Satomi G, Hayashi H, Hinosawa K. Detection of mitral ring abscess by two-dimensional echocardiography. *Circulation* 1982;65:816-9.
13. Maluf J, Yamani M, Dagher I, Bey SK, Alam S. Two-dimensional echocardiographic demonstration of an unusual complication of aortic infective endocarditis. *Acta Cardiol* 1984;39:379-86.
14. Scanlan SG, Seward JB, Tajik AJ. Valve ring abscess in infective endocarditis: visualization with wide angle two-dimensional echocardiography. *Am J Cardiol* 1982;49:1794-1800.
15. Kaiser GC, Willman VL, Thurmann M, Hanlon CR. Valve replacement in cases of aortic insufficiency due to active endocarditis. *J Thorac Cardiovasc Surg* 1967;54:491-502.
16. Pollak SJ, Felner JM. Echocardiographic identification of an aortic valve ring abscess. *J Am Coll Cardiol* 1986;7:1167-73.
17. Vandenbossche JL, Van Kuyk M, Csoma M, Courturier E, Englert M. Echocardiographic documentation of the formation and progression of aortic root abscess associated with Salmonella infection. *J Cardiovasc Ultrasonogr* 1983;2:357-61.
18. Rothbaum DA, Dillon JC, Chang S, Feigenbaum H. Echocardiographic manifestation of right sinus of Valsalva aneurysm. *Circulation* 1974;49:768-71.
19. Bansal RC, Moloney PM, Marsa RJ, Jacobson JG. Echocardiographic features of a mycotic aneurysm of the left ventricular outflow tract caused by perforation of mitral-aortic intervalvular fibrosa. *Circulation* 1983;67:930-4.
20. Wilson WR, Danielson GK, Giuliani ER, Washington JA, Jaumin PM, Geraci JE. Valve replacement in patients with active infective endocarditis. *Circulation* 1978;58:585-8.
21. Crosby IK, Carrell R, Reed WA. Operative management of valvular complications of bacterial endocarditis. *J Thorac Cardiovasc Surg* 1972;64:235-46.
22. Buckley MJ, Mundth ED, Daggett WM, Austen WG. Surgical management of the complications of sepsis involving the aortic valve, aortic root, and ascending aorta. *Ann Thorac Surg* 1971;12:391-9.