Case Report

Prosthetic Aortic Valve Endocarditis Complicated with Annular Abscess, Sub-Aortic Obstruction and Valve Dehiscence

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We present a 76-year-old woman with infective endocarditis of a prosthetic aortic valve. The course of her illness started with an ischaemic stroke and she was admitted with prolonged fever and an episode of loss of consciousness. Echocardiography revealed acute aortic regurgitation and dehiscence of the prosthetic valve with excessive "rocking motion", aortic abscesses and left ventricular outflow obstruction caused by a semilunar shelf of tissue probably due to endocarditis vegetations. She underwent an urgent surgical procedure that confirmed the echocardiographic findings. Our case report reinforces the value of early diagnosis in the presence of a high clinical suspicion of prosthetic valve endocarditis. An extended workup, including transoesophageal echocardiography, in such a patient with a mechanical valve is mandatory.

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Endocarditis of a prosthetic heart valve is a life-threatening condition that is associated with high morbidity and mortality. Here we describe a case in which transoesophageal echocardiography assisted in the diagnosis.

Case presentation

A 76-year-old woman was admitted to our hospital because of fever episodes (>38˚C) that had occurred during the last month. She had also suffered an episode of loss of consciousness. In addition, she had a medical history of diabetes mellitus, high blood pressure and implantation of a mechanical prosthetic aortic valve 12 years previously to treat aortic stenosis.

She referred to shortness of breath, NYHA class III, during the last 4 months and she had been hospitalised 2 months before for an ischaemic stroke which left her with a mild left hemiparesis. On clinical examination she had an arterial blood pressure of 90/40 mmHg, sinus tachycardia 110 / min, arterial saturation 91%, PO_2 59 mmHg, PCO_2 28 mmHg. She had a systolic murmur, intensity 4/6, at the right cardiac base and a protodiastolic murmur at the left parasternal border, intensity 2/6. Crackles were audible in the lower third of the pulmonary fields. She immediately underwent transthoracic echocardiography which revealed a normal sized left ventricle (LV), with concentric hypertrophy but normal systolic function, and severe aortic stenosis with peak gradient 95 mmHg, mean gradient 53 mmHg and aortic valve area 0.95 cm^2. There was also severe aortic paravalvular regurgitation and evidence of dehiscence, with a major "rocking motion" of the prosthesis.

We proceeded with a transoesophageal echocardiographic study, which again revealed the dehiscence with the ''rocking motion" of the aortic mechanical valve (Figure 1) of at least 75˚. The dehiscence was mainly from the posterior aortic ring and there was also severe paravalvular aortic re-

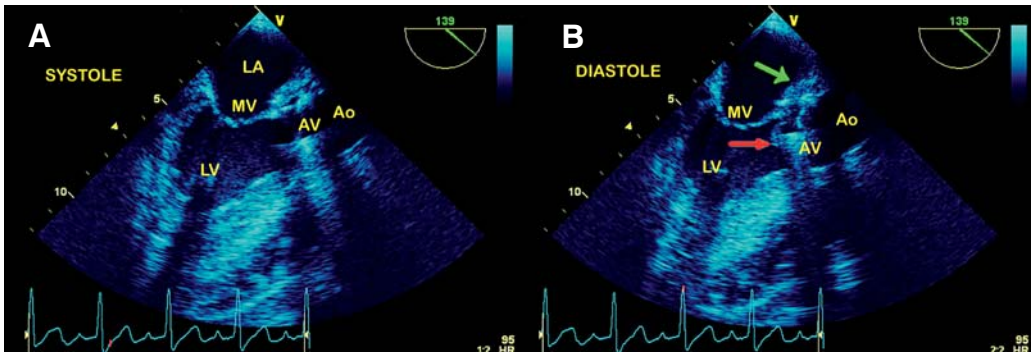

Figure 1. Transoesophageal echocardiography in the mid-oesophageal position at 139 degrees revealed dehiscence of the aortic mechanical valve, mainly from the posterior aortic ring. The aortic valve moves freely in the aorta in systole (A) while it prolapses to the left ventricle in diastole (B). In addition, there were large echogenic masses (B, red arrow) attached to the ventricular surface of the mechanical valve ring and the posterior aortic wall appeared thickened with echolucent regions (B, green arrow). The diagnosis of aortic abscess was made. Ao – aorta; AV – aortic valve; LA – left atrium; LV – left ventricle; MV – mitral valve.

gurgitation (Figure 2A). There were 2 large echogenic masses attached to the ventricular surface of the mechanical valve ring (Figure 1) and the posterior aortic wall appeared thickened (10 mm) with echolucent regions. The diagnosis of aortic abscess was made (Figure 1 B).

Laboratory tests showed increased white blood cells (13,500), anaemia (haemoglobin 9.3 g/ml, haematocrit 27.2%), and increased C-reactive protein (8.5 mg/dl) and sedimentation rate (105) during the first hour. All the blood cultures (9 in all) that were taken were negative, but based on the clinical, laboratory and echocardiographic findings the diagnosis of culture-negative infective endocarditis was made. The patient received antibiotic treatment with gentamycin 1.0 mg/kg every 8 hours and vancomycin 15 mg/kg twice per day, according to the current guidelines of the European Society of Cardiology.[1] She was referred for an emergency operation for replacement of the aortic valve.

The patient presented at surgery in a severely debilitated condition and attempts to improve her haemodynamic status prior to surgery did not achieve much.

A few days later she was taken to the operating theatre and there on cardiopulmonary bypass the aortic root was opened and crystalloid cardioplegia was administered though the left and right coronary ostia .On inspection of the mechanical valve it was found to have almost complete dehiscence from the aortic valve ring (Figure 3). The valve was held in place by only 2 to 3 stitches at the right side of the aortic ring; these stitches were cut and the valve removed. The left ventricular outflow tract below the valve was almost completely obstructed by a semilunar shelf of tissue, similar to subaortic stenosis tissue, to which adhered clumps of fibrous tissue that were probably healed endocarditis

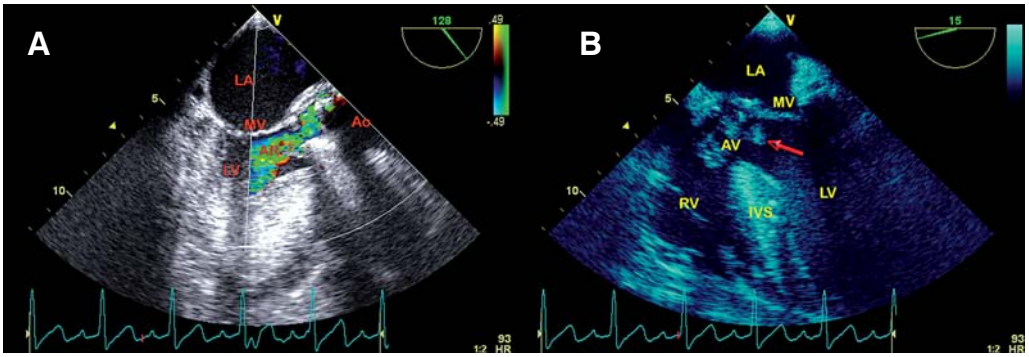

Figure 2. Transoesophageal echocardiography in the mid-oesophageal position shows severe paravalvular aortic regurgitation (A). In addition, the large echogenic masses attached to the ventricular surface of the mechanical valve ring are shown (B, red arrow). IVS – interventricular septum. Other abbreviations as in Figure 1.

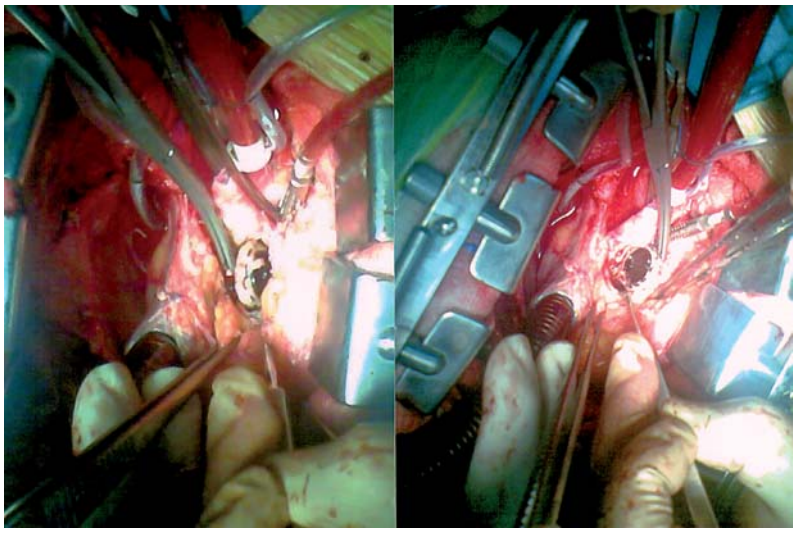

Figure 3. Figures show the extent of detachment of the mechanical aortic valve, which was revealed during the operation.

vegetations (Figure 4). Once all of this tissue was removed 2 very large abscess cavities became apparent, one under the left coronary ostium and the other under the right. Both these cavities were healed and epithelised.

After careful debridement of all excess tissue and removal of all fibrous growth from the anterior mitral valve leaflet – also healed endocarditis vegetations – pledgeted mattress sutures were placed around the valve ring in such a manner that the edges of the abscess cavities were incorporated into the sutures.

The sutures were then passed though the new valve ring and when the valve was tied down the abscess cavities were obliterated. A mechanical St. Jude No 21 valve of the Regent series was used, since the patient had a small aortic root (the previous mechanical valve placed was No 19). Another reason for choosing this valve was that the new valve needed to have a thin suture ring so as to not obstruct the coronary artery ostia.

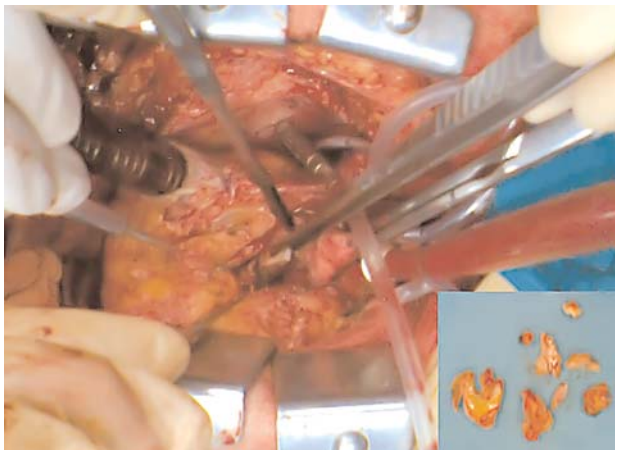

Figure 4. A large amount of connective tissue (small inset) found underneath the mechanical valve, which caused considerable obstruction of the left ventricular outflow tract, thus explaining the preoperative echocardiographic finding of severe aortic stenosis.

Tightening this valve into position was difficult, because on the one hand there was a danger of the sutures cutting through the friable sub-annular tissue, and on the other the valve had to be positioned well underneath the coronary artery ostia so that they would not be occluded.

The end result obtained was quite good and continuity of LV outflow endocardium and healthy aortic root tissue was achieved. The operation was then concluded in the usual manner. The patient was easily weaned off cardiopulmonary bypass and maintained in a stable haemodynamic condition with little inotrope support. The subsequent 5-day stay in the intensive care unit, as well as the 5-day stay in the ward, were uneventful. Echocardiography revealed a well functioning valve with no regurgitation. During all this time, the patient remained on an antibiotic schedule for endocarditis.

However, on the discharge day, she suddenly developed a shock picture, with low blood pressure, vomiting and progressive loss of consciousness. She was urgently readmitted to the intensive care unit. The echocardiography revealed a well functioning mechanical valve but severely depressed LV function. The patient died a few hours later, in spite of all medical support with inotropes and mechanical ventilation. Intracranial haemorrhage with neurogenic stress cardiomyopathy was suspected as the cause of death,[2,3] as we found a very

prolonged prothrombin time with an international normalised ratio of 8.4. Unfortunately the relatives refused an autopsy.

Discussion

Despite the tremendous advances in medical therapy over the past few decades, prosthetic valve endocarditis (PVE) remains a life-threatening disease and is associated with increased and very significant morbidity and mortality.[4-6] The incidence of culture negative endocarditis is around 5%,[1,7] while neurological complications continue to occur in approximately 20-40% of all patients with infective endocarditis and represent a major factor associated with the increased mortality rate.[8,9] Furthermore, periannular complications, including abscesses, pseudoaneurysms, and fistulas, indicate advanced disease with a poor prognosis.[8]

Abscess formation in infective endocarditis is not a rare complication, and in a necropsy study[10] an incidence of 89% of abscesses in aortic endocarditis and 7% in mitral endocarditis was found. Aortic PVE is more common than mitral PVE. Because the synthetic material in mechanical valves does not allow microorganisms to grow, mechanical PVE begins at the sewing ring. When the disease is not controlled early, the infection extends beyond the prosthesis and involves the annulus and other neighbouring structures, such as the conduction system and the mitral valve. Abscess formation occurs and may become circumferential, resulting in partial or complete ventriculoaortic endocardial discontinuity. This requires special technical steps—such as obliterating the abscess cavities with Dacron patches and then tying the valve onto them—apart from simple replacement of the prosthesis.

The now generally accepted surgical strategy to treat aortic PVE accompanied by abscesses consists of radical debridement of infected tissue, in order to obtain a margin of healthy tissue and to avoid recurrent or residual infection.[11,12] Aortic allografts are known to have excellent haemodynamic performance associated with a very low incidence of reinfection and late mortality.[13]

Nevertheless, operation for PVE, especially with perivalvular abscess, remains a surgical challenge, with some series reporting mortality rates of 20-60%,[4,14] although more recent reports give lower mortality rates, less than 10%.[13] Additionally, there is a high rate of recurrence of infection (about 7%)[15] when a new prosthesis is implanted.

This has drawn attention to the use of allografts, which are considered to have the lowest incidence of postoperative recurrence of infection, when compared with other valve substitutes.[16,17]

In several studies, pre-operative transoesophageal echocardiography has proved to be a valuable and useful technique for the early diagnosis of periannular involvement[14,18,19] and has now become a preoperative requirement in the evaluation of the patients with infective endocarditis.

This case report reinforces the value of early diagnosis in the presence of a high clinical suspicion of PVE. An extended workup, including transoesophageal echocardiography, is mandatory in such a patient with a mechanical valve, especially when there are clinical findings suggestive of PVE, such as fever or embolic events.

References

1. Horstkotte D, Follath F, Gutschik E, et al; Task Force Members on Infective Endocarditis of the European Society of Cardiology; ESC Committee for Practice Guidelines (CPG); Document Reviewers. Guidelines on prevention, diagnosis and treatment of infective endocarditis executive summary; the task force on infective endocarditis of the European society of cardiology. Eur Heart J. 2004; 25: 267-276.
2. Samuels MA. The brain-heart connection. Circulation. 2007; 116: 77-84.
3. Lee VH, Oh JK, Mulvagh SL, Wijdicks EF. Mechanisms in neurogenic stress cardiomyopathy after aneurysmal subarachnoid hemorrhage. Neurocrit Care. 2006; 5: 243-249.
4. Calderwood SB, Swinski LA, Karchmer AW, Waternaux CM, Buckley MJ. Prosthetic valve endocarditis. Analysis of factors affecting outcome. J Thorac Cardiovasc Surg. 1986; 92: 776-783.
5. Blackstone EH, Kirklin JW. Death and other time-related events after valve replacement. Circulation. 1985; 72: 753-767.
6. Wilson WR, Danielson GK, Giulian ER, Geraci JE. Prosthetic valve endocarditis. Mayo Clin Proc. 1982; 57: 155-161.
7. Panou F, Papadopoulos C, Kolokathis F, et al. Infective aortic valve endocarditis from Coxiella burnetii. Hellenic J Cardiol. 2007; 48: 177-180.
8. Mylonakis E, Calderwood SB. Infective endocarditis in adults. N Engl J Med. 2001; 18: 1318-1330.
9. Kontogiorgi M, Koukis I, Argiriou M, et al. Triple valve endocarditis as an unusual complication of bacterial meningitis. Hellenic J Cardiol. 2008; 49: 191-194.
10. 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: 140-155.
11. Butchart EG, Gohlke-Barwolf C, Antunes MJ, et al; Working Groups on Valvular Heart Disease, Thrombosis, and Cardiac Rehabilitation and Exercise Physiology, European Society of Cardiology. Recommendations for the management of patients after heart valve surgery. Eur Heart J. 2005; 26: 2463-2471.
12. Leyh RG, Knobloch K, Hagl C, et al. Replacement of the aortic root for acute prosthetic valve endocarditis: prosthetic

composite versus aortic allograft root replacement. J Thorac Cardiovasc Surg. 2004; 127: 1416-1420.
13. Sabik JF, Lytle BW, Blackstone EH, Maurullo AGM, Petterson GB, Crosgrove DM. Aortic root replacement with cryopreserved allograft for prosthetic valve endocarditis. Ann Thorac Surg. 2002; 74: 650-659.
14. Lerakis S, Robert Taylor W, Lynch M, et al. The role of transesophageal echocardiography in the diagnosis and management of patients with aortic perivalvular abscesses. Am J Med Sci. 2001; 321: 152-155.
15. David TE. Surgical management of aortic root abscess. J Card Surg. 1997; 12: 262-269.
16. Dossche KM, Defauw JJ, Ernest SM, Craenen TW, De Jongh BM, de la Riviere AB. Allograft aortic root replacement in prosthetic aortic valve endocarditis. A review of 32 patients. Ann Thorac Surg. 1997; 63: 1644-1649.
17. Dearani JA, Orszulak TA, Schaff HV, Daly RC, Anderson BJ, Danielson GK. Results of allograft aortic valve replacement for complex endocarditis. J Thorac Cardiovasc Surg. 1997; 113: 285-291.
18. Daniel WG, Mügge A, Martin RP, et al. Improvement in the diagnosis of abscesses associated with endocarditis by transesophageal echocardiography. N Engl J Med. 1991; 324: 795-800.
19. Karalis DG, Bansal RC, Hauck AJ, et al. Transesophageal echocardiographic recognition of subaortic complications in aortic valve endocarditis–clinical and surgical implications. Circulation. 1992; 86: 353-362.