

Giant anastomotic pseudoaneurysm after Bentall operation causing late postoperative cardiogenic shock

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Key words:

Aortic pseudoaneurysm;
Bentall operation;
Pulmonary artery
obstruction.

Pseudoaneurysm of the ascending aorta is a rare but severe complication occurring after composite graft surgery for combined aortic valve and ascending aorta disease. The diagnosis of this condition can be difficult because anastomotic pseudoaneurysms show highly variable clinical features depending on the site of the aortic dehiscence and on the involvement of the surrounding structures. We report an unusual case of a late postoperative aortic graft dehiscence, causing acute right heart failure.

(Ital Heart J 2001; 2 (8): 627-630)

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Received March 22, 2001;
revision received June 5,
2001; accepted June 6,
2001.

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Case report

A 42-year-old man, affected by Marfan syndrome, underwent a modified Bentall operation in October 1998 for the correction of an aortic aneurysm associated with aortic valve insufficiency: the surgeon did not use the original "inclusion technique" described by Bentall. A biological aortic valve prosthesis (Carpentier 25, Baxter Edwards, AG, Switzerland) was sewn together with a woven Dacron vascular graft (InterVascular, La Ciotat, France). The coronary arteries were reimplanted with the button technique. The aneurysmatic aortic wall was sutured as a wrap around the Dacron prosthesis. During surgery the mediastinal pleura was not opened.

A biological valve was chosen upon request of the patient, who refused chronic anticoagulant therapy. Warfarin was thus administered only for 2 months after surgery. The pre-discharge echocardiogram documented the normal function of the valvular prosthesis and was not suggestive of postoperative complications; in particular pleural and pericardial effusions were minimal. The postoperative course was uneventful till January 1999 when the patient started to complain of fever, fatigue, and progressive exercise intolerance. Owing to the abrupt occurrence of severe hypotension the patient was admitted to the intensive care unit. The clinical picture was consistent with cardiogenic shock: physical examination revealed signs of a low cardiac

output (diaphoresis, systolic arterial pressure of 90 mmHg) and of an elevated systemic venous pressure (neck vein distension, hepatomegaly). The peripheral arterial pulses were present and symmetrical. The electrocardiogram showed sinus tachycardia that later on converted to junctional rhythm. At cardiac auscultation, a systolic ejection murmur was appreciated. The main finding at the chest roentgenogram was the enlargement of the mediastinum and of the cardiac silhouette. Laboratory analysis showed slight anemia, leukocytosis, renal insufficiency, and altered liver function tests including elevated serum bilirubin. On admission multiple blood samples were obtained for cultures that were negative. A transthoracic echocardiogram was performed. The valvular aortic prosthesis (biologic) showed normal anatomy and motion of the leaflets; in particular, vegetations were excluded. Doppler echocardiography demonstrated a low systolic gradient across the valve and the absence of valvular or paravalvular leaks. Parasternal views revealed a voluminous extra-aortic echodense mass, extending along the ascending aorta, with a maximum transverse diameter of 8 cm (Fig. 1A). Color Doppler did not show flow within the para-aortic structure. Nevertheless, blood leakage at the distal anastomosis of the vascular graft was suspected because of the presence of small echo-free zones around the distal ascending aorta (Fig. 1A). There was no pericardial effusion. Furthermore,

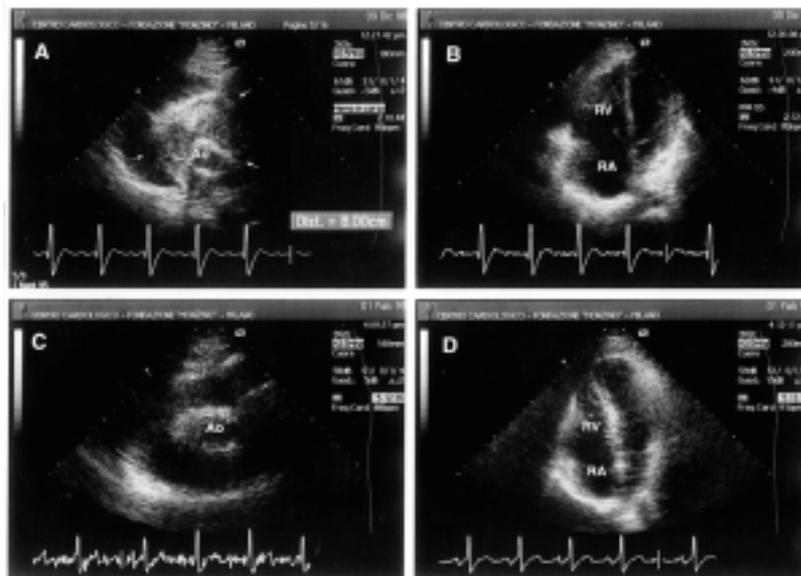


Figure 1. A: the preoperative parasternal short-axis view demonstrates, around the aortic root (Ao), the pseudoaneurysm with a diameter of 8 cm and irregular echodensity within the lumen. B: the preoperative apical 4-axis view shows right ventricular (RV) and right atrial (RA) enlargement. C: at the postoperative short-axis view of the ascending aorta (Ao) there is no redundant tissue around the Ao and it may be seen that the pulmonary artery is normal in size. D: the late postoperative 4-axis view shows normal RV and RA dimensions.

the 4-axis apical view revealed right heart enlargement (Fig. 1B), right ventricular hypokinesia and severe tricuspid valve insufficiency. The Doppler-derived pressure gradient between the right ventricle and the right atrium was 40 mmHg. Due to the displacement of the vascular structures, the pulmonary artery could be explored only at the level of the main stem where it was found to be reduced in size. The pulmonary artery bifurcation was not imaged and Doppler interrogation of flow in the pulmonary artery could not be performed. The overall picture suggested the presence of a pseudoaneurysm originating from the distal graft anastomosis, causing compression of the pulmonary artery branches and secondary severe right heart failure. An emergency transesophageal echocardiogram was also performed and confirmed the presence of redundant tissue around the distal portion of the vascular prosthesis (Fig. 2) and extending towards the pulmonary artery. Again, no flow could be visualized within the pseudoaneurysm by color Doppler investigation. The view of the proximal graft anastomosis ruled out aortic valve vegetations and proximal graft dehiscence (Fig. 2). The diagnosis of aortic pseudoaneurysm and pulmonary artery compression was confirmed by spiral computed tomography (Fig. 3), documenting a para-aortic mass the size and shape of which were properly depicted by echocardiography. The lumen of the pulmonary artery and of its main branches was narrowed due to extrinsic compression (Fig. 3A). The internal density of the mass was nearly equivalent to that of soft tissue. The contrast medium injected at computed tomographic scan caused faint opacification of the lumen of the pseudoaneurysm (Fig. 3B). The site of communication between the aortic lumen and the cavity of the pseudoaneurysm was

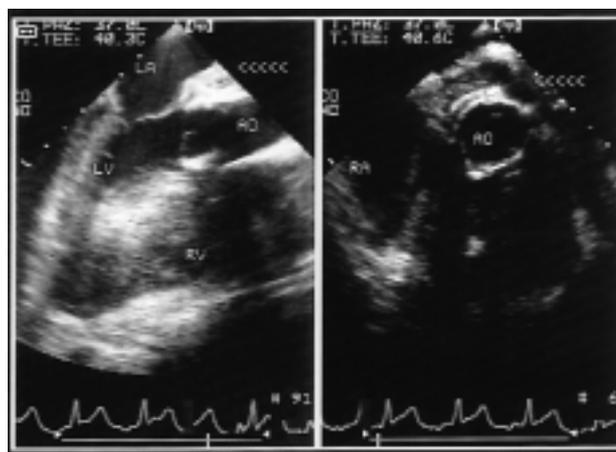


Figure 2. Multiplane transesophageal images of the aortic graft. Left panel: long-axis view (120°) of the aortic prosthesis and of the proximal aortic graft. Right panel: the short-axis view (0°) at the level of the ascending aorta shows redundant tissue around the aortic lumen (AO) and extending towards the pulmonary artery. LA = left atrium; LV = left ventricle; RA = right atrium; RV = right ventricle.

not detectable; however, extravascular contrast medium was visible on the scanning planes of the ascending aorta and absent at the aortic valve level.

At surgery, the mass described by echocardiography was found to be a thrombosed pseudoaneurysm of uneven size, with a prevalent anterior extension. The aortic suture line was found to have partially dehisced at the distal anastomotic site. This was resutured (during a brief circulatory arrest in moderate hypothermia), the pseudoaneurysm was drained, and the aortic wrap was reconstructed.

At postoperative echocardiographic follow-up, a progressive recovery of right ventricular size and func-

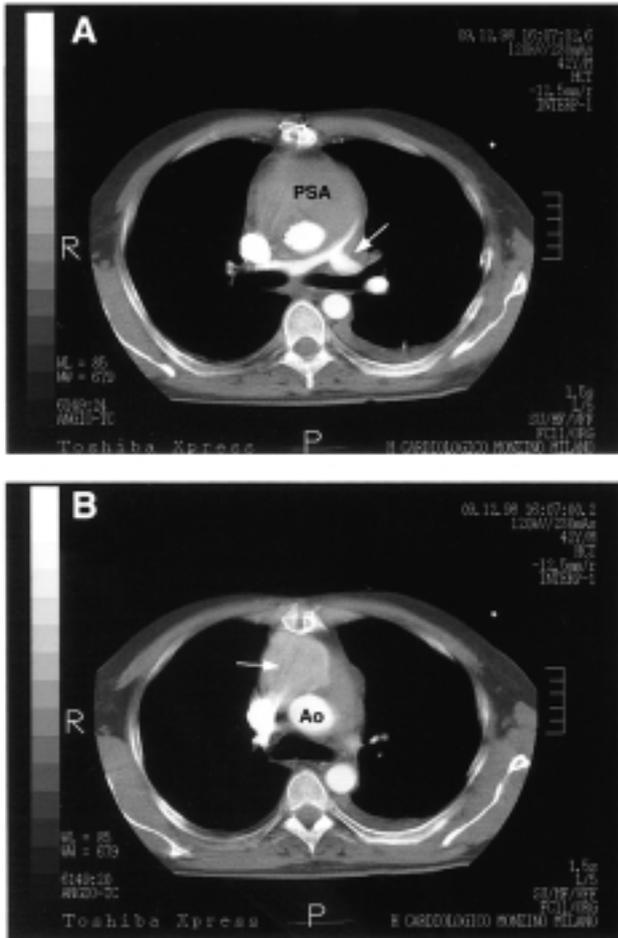


Figure 3. Preoperative spiral computed tomographic images showing the scanning planes at the level of the ascending aorta (Ao). A: the pulmonary artery and its main branches. The lumen is narrowed due to extrinsic compression (arrow). B: the contrast medium (arrow) causes faint opacification of the voluminous mediastinal mass around the Ao. PSA = pseudoaneurysm.

tion was observed. Two months after surgery, a parasternal short-axis view of the aortic root confirmed the absence of redundant tissue (Fig. 1C). The right atrial and ventricular dimensions were normal (Fig. 1D) and tricuspid regurgitant flow was only of moderate severity. The Doppler-derived right ventricular systolic pressure was also normal.

Discussion

The prevalence and the natural history of pseudoaneurysm after Bentall operation have not been established. It is reported to occur, either as an early or as a late complication, after composite graft surgery for combined aortic valve and ascending aorta disease¹. This potentially lethal occurrence is characterized by atypical symptoms and a wide spectrum of clinical features depending on the etiology, the site of dehiscence of the suture line, the rate of expansion and the size of the para-aortic mass impinging upon the adja-

cent structures. In some cases it can be asymptomatic and detected by imaging techniques at surgical follow-up². On the other hand, dramatic clinical pictures can be caused by infection, supra-avalvular aortic flow obstruction, airway perforation or pulmonary artery stenosis³⁻⁵.

In contrast to previous reports, at echocardiography we did not find an echo-free space around the aortic root, a sign considered diagnostic in acute bleeding secondary to aortic rupture⁶⁻⁸. Furthermore, color Doppler mapping failed to show extension of flow beyond the aortic lumen. The presence of clotted blood in the para-aortic space and of a partially occluded aortic rupture together with the equalization of pressures in the vascular and extravascular spaces can justify the absence of a communicant jet between the aortic lumen and the pseudoaneurysm at Doppler echocardiography. Computed tomographic scan with contrast medium injection was necessary to clarify the pathophysiology. This case emphasizes that a common echocardiographic pattern cannot be described as an aortic pseudoaneurysm and the diagnosis cannot be ruled out even in the absence of the more common echocardiographic findings⁹. Another peculiarity of this case is the selective compression of the pulmonary artery by the para-aortic mass. This caused acute right heart failure as the presenting picture. Echocardiography was extremely useful for the description of the anatomical and functional details of this condition: right heart size, tricuspid regurgitation, and right ventricular pressure.

The variable combination of echocardiography, aortography, computed tomography and nuclear magnetic resonance is necessary to diagnose pseudoaneurysms^{10,11}. In this case, mediastinitis, endocarditis and aortic pseudoaneurysm were the considered options in the differential diagnosis, the latter requiring emergency surgery. Reintervention was decided on the sole basis of the noninvasive diagnostic techniques. Computed tomographic scan and echocardiographic findings were found to correlate well. Echocardiography was also useful in order to confirm the progressive recovery of right heart dimensions and function demonstrating a favorable delayed surgical outcome, consistent with the most recent surgical reports¹².

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