Acute supravalvular aortic stenosis following the replacement of the ascending aorta

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Abstract We report a very rare case of ascending aortic replacement complicated by acute supravalvular aortic stenosis. A 53-year-old man was referred to our institution for evaluation of a systolic murmur and congestive heart failure. He had undergone elective ascending aortic replacement one month previously due to acute type A aortic dissection. On admission, transesophageal echocardiography revealed a proximal leak with a pseudoaneurysm compressing the aortic graft and generating a systolic gradient of 84 mmHg. The patient underwent reoperation, the graft was removed and a new Dacron graft was put in place.

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Introduction

Advances in surgical technique have improved early survival after surgery of the ascending aorta. However, serious complications can occur, mainly peri-prosthetic pseudoaneurysm. Transesophageal echocardiography has proved to be an effective method for detecting these complications. We report a very rare case of peri-prosthetic leak in the proximal attachment of the graft with a pseudoaneurysm compressing the aortic graft and generating a severe obstruction of the graft, with systolic gradient of 84 mmHg and congestive heart failure.

Case report

A 53-year-old man was referred to our institution for evaluation of a systolic murmur and congestive heart failure. He had undergone elective ascending aortic replacement one month previously for an acute type A aortic dissection, and a 26 mm Dacron graft had been placed in the ascending aorta using the inclusion technique.

One month following the operation the patient experienced the onset of dyspnea on exertion and after a few days his condition worsened to functional class III (New York Heart Association).

On admission to our institution, findings on physical examination revealed a grade 5/6 holosystolic murmur at the base of the heart which was well transmitted along the carotid vessels. Blood pressure was 95/70 mmHg, and the heart rate was 90 beats/min with regular rhythm. All pulses were present and symmetric. Neurologic examination was normal.

An electrocardiogram showed sinus rhythm and left ventricular hypertrophy. A chest X-ray disclosed a mild dilatation of the ascending aorta.

Transthoracic echocardiography (TTE) showed left ventricular hypertrophy mild left ventricular dysfunction (ejection fraction 40%) and evidence of elevated left atrial pressures. The aortic valve showed a mild aortic regurgitation. The ascending aorta was dilated (50 mm) and an echo-free space...
between the aortic graft and the wall of the aorta was seen. Color flow mapping could not identify flow into the echo-free space. There was a systolic jet through the ascending aorta and continuous-wave Doppler revealed a maximal velocity of 4.5 m/s which corresponded to the pressure gradient between left ventricular and the aorta of 84 mmHg. Moderate pericardial effusion and right pleural effusion were seen.

Transesophageal echocardiography (TEE) allowed the diagnosis of pseudoaneurysm, demonstrating a flow into the echo-free space around the aortic graft due to a peri-prosthetic leak located in the proximal attachment of the graft (Fig. 1). The pseudoaneurysm compressed the lumen of the graft severely (Fig. 2), having in the distal attachment a lumen of 5 mm, generating a severe obstruction with a systolic gradient of 84 mmHg.

Figure 1  Transesophageal echocardiography. Color Doppler image of long-axis view of the ascending aorta (with transducer at 90°) showing blood flow through entry from aortic graft to pseudoaneurysm (PA). LA, left atrium; LV, left ventricle.

Figure 2  Transesophageal echocardiography. Short-axis view of the ascending aorta (with transducer at 0°) showing an echo-free space around the aortic graft (G) corresponding to the pseudoaneurysm (PA) and the severe compression of the graft (left) more evident in systole (right).

Thoracic computed tomography (CT) revealed a supravalvular aortic pseudoaneurysm which was partially thrombosed, resulting in compression of the aortic prosthetic graft with severe obstruction. The patient underwent reoperation. A partial dehiscence of the proximal attachment of the graft was seen, so the graft was removed and a new Dacron graft was put in place. The postoperative course was uneventful and the patient was discharged on postoperative day 8.

Discussion

Over the years surgical management for aortic dissection has improved considerably, including early diagnosis and refinements in operative techniques. Consequently, in-hospital events and operative mortality have been reduced. However, the underlying disease remains and residual fragility of aortic tissue exposes patients to severe complications and reoperations. The initial success rate supports the need for a careful follow-up to thoracic aorta morphology after surgery and for early detection of pseudoaneurysm (PA). This complication can happen after elective surgery for aneurysm as well as after emergency cases of acute aortic dissection.

Because of its non-invasive nature, TEE, CT and MR should be used in the follow-up of these patients. If a peri-prosthetic hematoma (PPH) is found in the first postoperative study the features and the measurement of its circumference may harbor predictive value. A PPH circumference greater than 10 mm or a non-circumference PPH greater than 15 mm indicate high risk for a non-regressive PPH and subsequently the development of a pseudoaneurysm.
This report shows a very unusual and life-threatening early complication following aortic dissection surgery, presenting as acute supravalvular aortic stenosis with congestive heart failure due to suture line dehiscence, pseudoaneurysm formation and severe compression of the aortic graft. Acute supravalvular aortic stenosis happened as a result of bleeding into the space between the graft and the ascending aorta used to wrap it. When the association of hypotension with elevated left atrial pressures happens in the immediate postoperative period after replacement of ascending aorta, this complication should be suspected. Our patient and all patients reported with this complication had that hemodynamic instability.

Our patient was treated with an aneurysm wrap around the graft. This approach is extremely useful in achieving immediate hemostasis, but also causes excessive tension on all suture lines within the aneurismal sac and induces leakage, large PPH and late pseudoaneurysm. That is why many centers have abandoned this technique and have replaced it by a total root excision with coronary reimplantation.

Our report illustrates a rare mechanism by which an aortic dissection operation may produce acute supravalvular aortic stenosis, and shows the benefit of TEE for a detailed diagnostic assessment of this rare complication.

References

Coronary artery wall enhances with intracoronary injection of echocontrast media during in vivo intravascular ultrasound

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Abstract Currently, vascularity of the coronary artery wall can be assessed only in vitro. We sought to determine if there is any contrast enhancement of the coronary artery wall after injection of echocontrast media during in vivo intravascular ultrasound imaging, which may represent blood flow within the wall supplied by the vasa vasorum. © 2006 The European Society of Cardiology. Published by Elsevier Ltd. All rights reserved.

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