Post-traumatic Aortopulmonary Fistula after Bentall Procedure

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Abstract

Pseudoaneurysm complicated by aortopulmonary fistula (APF) after a Bentall procedure is extremely rare but potentially fatal, so timely diagnosis and treatment are critical. We present a subacute case of a post-traumatic APF which has had initial aspecific symptoms and later an acute worsening heart failure with chest pain not responding to medical treatment and requiring emergency surgery.

Keywords: Aortopulmonary fistula, Bentall procedure, computed tomography, echocardiography, periprosthetic false aneurysm

INTRODUCTION

The Bentall procedure is a 40-year-old standardized procedure for treating aortic valve diseases and aneurysms involving the aortic root. It is a safe and durable technique, with very good results and a low reoperation rate. However, it sometimes could have early and late complications, of which aortopulmonary fistula (APF) is extremely uncommon but a potentially life-threatening condition requiring urgent treatment. The role of imaging techniques is essential to detect it and define the best therapeutic approach.

CASE REPORT

A 60-year-old man arrived at the emergency department for continuous mild epigastric pain that started the previous day after a rear-end collision. His medical history included ascending aorta and valve replacement with Bentall procedure in 2004 due to bicuspid aortic valve complicated by ascending aorta aneurysm and severe aortic valve regurgitation; besides, in 2010, he had two cerebral hemorrhages after a rear-end collision, which resolved spontaneously. In emergency room, vital signs were normal (blood pressure: 100/50 mmHg; heart rate: 92 bpm; and oxygen saturation: 94% on room air); clinical examination revealed aortic prosthesis clicks, a systolic murmur on mesocardium across the right coronary button anastomosis, and negative T-waves in aVR, aVL, V1, and V2 (unvaried compared to previous echocardiographies) [Figure 1]; high sensitivity troponin value was 100 ng/L (n. v. <19.8 ng/L), so the patient was admitted in cardiology care unit. Transthoracic echocardiography (TTE) showed a large aortic graft pseudoaneurysm and a shunt from aortic graft to periprosthetic false aneurysm (PPFA) not reported in previous echocardiographies [Figure 2]. For better ascending aorta visualization, computed tomography (CT) scan with contrast was performed: it confirmed the presence of large pseudoaneurysm surrounding the aortic graft and found an APF between the pseudoaneurysm and the pulmonary trunk [Figure 3]. Immediately, after CT examination, the patient’s clinical conditions worsened: he had hemoptysis and acute pulmonary edema treated with furosemide intravenous (iv), sodium nitroprusside iv, and noninvasive ventilation. Besides he had acute chest pain, an EKG promptly carried out showed ST elevation in the right leads [Figure 4] which improved after nitrates iv administration. Urgent coronary angiogram, aortography, and right heart catheterization were performed: the left coronary artery was normal [Figure 5a] and the right coronary artery was not visualized due to failure to pass a guidewire across the right coronary button anastomosis [Figure 5b]; aortopulmonary fistula (QP/QS = 2.7) and postcapillary pulmonary hypertension pulmonary artery wedge pressure.

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pressure (PAWP): 25 mmHg and mean pulmonary arterial pressure (mPAP): 35 mmHg) were confirmed. Heart team discussion indicated cardiac surgery to close the APF. The surgery confirmed the large chronic PPFA with thrombi inside and calcific wall and the wide APF between PPFA and pulmonary trunk; besides, it found dehiscence of the right coronary button anastomosis. Surgical treatment was performed across four steps: saphenous vein graft to right coronary artery, pericardial patch to close the APF, right coronary ostium closure, and saphenous vein anastomosis to Bentall prosthesis [Figure 6].

**Figure 1:** Electrocardiogram: sinus rhythm (92 bpm) and aspecific repolarization alterations (negative T-wave in aVR, aVL, and V1-V2)

**Figure 2:** Parasternal long-axis view of transthoracic echocardiography: color Doppler shows a shunt from vascular aortic prosthesis (asterisk) to periprosthetic false aneurysm. Quality of image does not allow a better definition

**Figure 3:** Axial plane of computed tomography angiography: large aortopulmonary fistula is visualized between vascular aortic prosthesis and pulmonary artery trunk(*)

**Figure 4:** Electrocardiogram during chest pain shows sinus rhythm (93 bpm) and ST elevation in the right leads (aVR, V1, V2, and V2R)

**Figure 5:** Coronary angiography: left coronary artery is normal (a), the right coronary artery is not visualized (b) due to failure to pass a guidewire across the right coronary button anastomosis

**Figure 6:** Cardiac surgery: in a pseudoaneurysm (white asterisk) and pericardial patch (white arrow) and in b aortic vascular prosthesis (black asterisk) and right coronary ostium closure (black arrow) are visualized.
Early complications include re-exploration for bleeding, acute renal failure, low cardiac output syndrome, upper gastrointestinal bleeding, myocardial infarction, prolonged mechanical ventilation, pericardial effusion, transient ischemic attack, cerebral infarction, and superficial wound infection. 

Late complications involve periprosthesis haematoma, PPFA, and evolutive aortic aneurysm developing at a distal location from the graft attachment. 

APF is a rare complication of thoracic aortic aneurysms representing 4% of postmortem cases. It can be spontaneous (degenerative atherosclerosis) or secondary to aortitis, thoracic trauma, dissecting aortic aneurysms, or to a previous aortic aneurysm surgery. The diagnosis is generally made by CT scan or magnetic resonance imaging (MRI), but sometimes, it could be detected also by TTE.

Our clinical case is very interesting for several aspects:

1. TTE detected the fistula between aortic graft and PPFA, an occasional find which, in retrospect, was a chronic complication of Bentall procedure which was never seen until this hospitalization.

2. CT scan was performed to better visualize this unknown evidence: it confirmed his chronicity (PPFA walls were calcific and there was thrombotic material inside it) and found the acute cause of the patient’s hemodynamic instability and the APF between the pseudoaneurysm and the pulmonary trunk.

3. Electrocardiographic right lead abnormalities during acute chest pain associated at difficult crossing a guidewire through the right coronary button anastomosis led us to think that there was a problem related to this coronary, which then was identified in an operating theater (dehiscence of the right coronary button anastomosis).

4. Another important aspect was the patient’s high hemorrhagic risk, proved by two previous cerebral hemorrhages after another rear-end collision: for this reason, we stopped anticoagulant therapy during diagnostic workup, although his international normalized ratio was low (1.98).

APF requires urgent treatment that usually consists in open procedure or, when this is contraindicated, using endovascular stenting. In our opinion, pseudoaneurysm of the ascending aorta was probably a chronic complication of previous Bentall procedure; instead, APF was an acute complication due to car accident, and it was responsible for patient’s hemodynamic instability.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will be not published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conclusion

The development of APF after Bentall procedure is an extremely rare and potentially fatal complication of a PPFA and requires urgent surgical treatment, which can be successfully accomplished through open surgery or endovascular stenting. We want to underline the relevance of accurate and appropriate use of imaging techniques (TTE, CT, or MRI) both in acute setting and in chronic follow-up after Bentall procedure; they could detect this severe and potentially life-threatening condition when the patient is still asymptomatic or has aspecific symptoms.

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Conflicts of interest

There are no conflicts of interest.

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