Case report

Late Aortic Dissection Following Bentall Procedure in an Inoperable Patient: A Case Report and Clinical Insights

ABSTRACT

Introduction

Pathologies of the ascending aorta, such as aneurysms and dissections, present a challenge in cardiovascular surgery. The Bentall procedure, which replaces the aorta and aortic valve while reimplanting the coronary arteries, reduces mortality and morbidity. However, the use of biological prostheses can lead to complications, such as late aortic dissections.

Case presentation

We report the case of a patient who underwent Bentall surgery with a biological prosthesis. Several years after the procedure, he developed a late aortic dissection associated with severe chest pain. Upon examination, his blood pressure was asymmetric between the upper limbs and a soft systolic murmur was heard at the aortic area with diminished femoral pulses. The CT angiography revealed a dissection in the ascending aorta, near the graft anastomosis. Due to the advanced age and comorbidities, surgery was deemed too risky. Palliative treatment was initiated, and the patient passed away after 72 hours.

Conclusion

Patients who have undergone Bentall surgery must be monitored long-term for complications such as aortic dissections. Rigorous clinical follow-up and advanced imaging techniques are essential to improve prognosis and manage risks.

KEYWORDS: Bentall, Biological Prosthesis, Late Aortic Dissection, Case report

1. INTRODUCTION

Pathologies of the ascending aorta, such as aneurysms, acute or chronic dissections, and aortic valve diseases, often require surgical intervention to prevent life-threatening complications, such as aortic rupture or severe heart failure (1). Developed in the 1960s by Hugh Bentall and Antony De Bono, the Bentall procedure revolutionized the management of these complex conditions. This surgery involves the combined replacement of the ascending aorta and the aortic valve, often with a biological or mechanical prosthesis, along with the

reimplantation of the coronary arteries (2). It provides a curative and durable treatment, significantly reducing the morbidity and mortality associated with severe aortic pathologies.

The use of biological grafts in the Bentall procedure is favored for their specific advantages, including the absence of a need for lifelong anticoagulation, a reduced risk of bleeding complications, and an improved quality of life for patients (3). However, despite these benefits, biological grafts are not without long-term complications. These include prosthetic valve insufficiency, distal aneurysms, false aneurysms at the anastomotic sites, and, more rarely, late aortic dissections (4). Although these dissections are uncommon, they represent a major cardiovascular emergency, characterized by a high mortality rate if not promptly and adequately treated.

In this context, this case report presents a rare instance of late aortic dissection in a patient with a biological Bentall graft, occurring ten years after the initial surgery. Through this case, we highlight the potential pathophysiological mechanisms, the diagnostic challenges, and the therapeutic strategies employed to manage this severe complication. Additionally, this case underscores the importance of a multidisciplinary approach and prolonged follow-up for patients who have undergone the Bentall procedure.

CASE PRESENTATION

An 81-year-old patient with a history of aortic valve replacement with a biological prosthesis using the Bentall technique in 2015 and a dual-chamber pacemaker implanted in 2023 for 2:1 atrioventricular block (syncopal), presented to the emergency department with intense, sudden chest pain at rest, radiating to the back, associated with sweating and a feeling of discomfort.

The patient's medical history includes chronic hypertension, moderate renal failure, type 2 diabetes, stable under medical treatment, and obstructive sleep apnea syndrome.

Upon arrival at the emergency department, the patient exhibited asymmetric blood pressure between the upper limbs (left: 190/90 mmHg; right: 130/80 mmHg), a heart rate of 117 beats per minute, oxygen saturation of 98% on room air, a soft systolic murmur audible at the aortic area, and femoral pulses that were present but diminished.

The electrocardiogram showed a paced rhythm with a ventricular response at 117 bpm.

An emergency thoraco-abdominopelvic CT angiography revealed a type A dissection located just distal to the right aortic arch, extending to the abdominal aorta below the renal arteries, with involvement of the right and left renal arteries, without extension to the supra-aortic or digestive arteries (Figure 1).

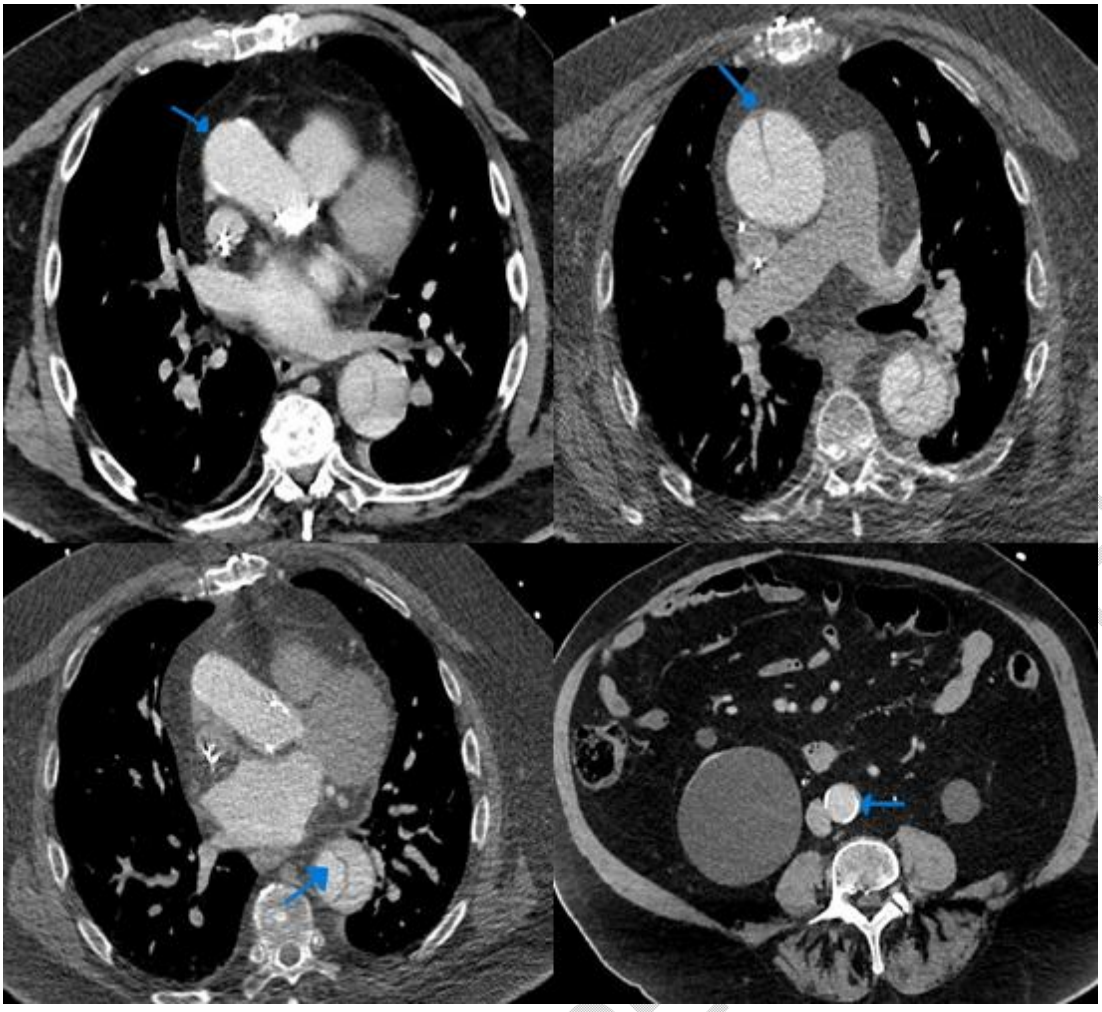

Figure 1: CT angiography images revealed an aortic dissection type A located downstream of the aortic arch and extending to the abdominal aorta.

The patient was immediately started on nicardipine via an intravenous pump for rapid blood pressure reduction, as well as analgesics to relieve the severe chest pain. Despite efforts to stabilize the clinical situation, a discussion was held with the cardiovascular surgery team to assess the feasibility of surgical intervention.

Given the patient's advanced age, multiple comorbidities (moderate renal failure, diabetes, and a history of major cardiac surgery), as well as the extremely high surgical risk associated with this condition, surgery was deemed too risky. After a multidisciplinary evaluation and family counseling, a decision was made to continue medical treatment in a palliative manner.

The medical treatment includes pain management, blood pressure control with calcium channel blockers and beta blockers, and close monitoring in the intensive care unit. The prognosis remains uncertain due to the risk of complications associated with the untreated aortic dissection.

Follow-up care will be provided by the palliative care team to optimize the patient's quality of life, taking into account their wishes and medical priorities.

Unfortunately, the patient's condition rapidly worsened, and he passed away peacefully after 72 hours.

DISCUSSION

The underlying mechanisms of aortic dissection following Bentall surgery are complex and can be influenced by several hemodynamic and biological factors (5). During Bentall surgery, although the ascending aorta and aortic valve are replaced using a graft, the native aortic tissue, particularly the descending aorta and distal portions, is not always altered (6). The ascending aorta, even after replacement, may remain vulnerable to hypertension and other mechanical forces that promote dissection.

After Bentall surgery, the aorta undergoes significant hemodynamic stress related to blood circulation, which can alter the anastomoses between the grafts and native tissues. Excessive pressure at the anastomoses or turbulence in blood flow may lead to intimal tears, especially if the aortic walls are fragile due to underlying pathology (such as an aneurysm or connective tissue disorder) (7).

The anastomosis between the resected aortic portion and the graft can present weak spots, creating a potential starting point for an aortic dissection. These areas may gradually enlarge due to the systemic stresses exerted on the aortic wall. Over time, aging of the prosthetic materials or degradation of the sutures can contribute to the development of the dissection (8)(9).

A pre-existing aortic wall, weakened by degenerative diseases such as atherosclerosis or connective tissue disorders (e.g., Marfan syndrome), can provide a favorable environment for the formation of an aortic dissection, even several years after Bentall surgery. Although this patient does not have a confirmed diagnosis of a connective tissue disorder, underlying structural abnormalities that were not detected during the initial evaluation may have contributed to the vulnerability of the aorta (10).

Uncontrolled hypertension is one of the most significant factors in the development of an aortic dissection. Hypertension can increase the shear force exerted on the aortic walls, thus promoting an intimal tear. In this case, although hypertension was being treated, it was likely not adequately controlled, creating an environment conducive to dissection(11)(12).

The diagnosis of late aortic dissection in a patient who has undergone Bentall surgery is challenging due to the variety of possible symptoms and the complexity of post-surgical anatomy. While acute chest pain and back pain are classic symptoms of aortic dissection, these signs can easily be mistaken for those of other cardiac or thoracic pathologies. In this case, signs of heart failure and electrocardiographic abnormalities may be present without aortic dissection being immediately suspected.

The use of advanced imaging techniques, such as thoracic CT angiography, is crucial for establishing an accurate diagnosis. CT angiography allows for visualization not only of the aortic dissection but also the anatomy of the anastomoses, the configuration of the graft, and the extent of the dissection, thus facilitating therapeutic decision-making (13). Transthoracic and transesophageal echocardiography are also useful, especially for assessing the integrity of the aortic valve and coronary ostia (14)(15).

The management of late aortic dissection after Bentall surgery requires prompt surgical intervention. The reintervention typically involves replacing the affected segment of the ascending aorta, followed by reimplantation of the coronary arteries if necessary. In this case, surgery allowed for the replacement of the dissected portion of the ascending aorta with a new graft, revising the anastomoses and ensuring the stability of the coronary system. Surgical challenges are numerous, particularly due to the complexity of the anastomoses and the anatomy modified by prior surgery. Close post-operative monitoring is essential to prevent complications related to the restoration of cardiac function and the management of the anastomoses. (16)(17)(18)

Post-operative medications, particularly beta-blockers, are crucial in limiting the risk of dissection recurrence. Beta-blockers reduce heart rate and blood pressure, thus decreasing the hemodynamic forces exerted on the aortic wall (19)(20). Post-operative follow-up should also include regular blood pressure monitoring, as well as periodic aortic imaging to detect any new abnormalities.

Late aortic dissection in patients who have undergone Bentall surgery raises several critical points for clinical practice, both in terms of post-surgical management and long-term follow-up. Due to the severity of this complication and the difficulty in diagnosing it early, it is essential for healthcare professionals to adopt a proactive approach to minimize risks and improve outcomes.

Patients who have undergone Bentall surgery must be continuously monitored throughout their lives. Regular surveillance is essential, not only to assess the function of the aortic graft and valve but also to detect any late complications, such as aortic dissection. Follow-up strategies should include regular clinical exams, blood pressure measurements, and periodic imaging studies (such as CT angiography, echocardiography, or cardiac MRI) to evaluate the integrity of the aorta and its anastomoses (21)(22)(23)(24).

Hypertension remains one of the most significant risk factors for aortic dissection, particularly after aortic surgery. It is essential to implement optimal blood pressure control immediately after hospital discharge and continue close monitoring of these patients. Healthcare professionals should ensure that antihypertensive treatments are adjusted according to blood pressure goals and educate patients on the importance of treatment adherence and lifestyle changes, such as smoking cessation and weight management (25)(26).

Biological prostheses used in Bentall surgery may, over time, be prone to degeneration or mechanical failure. Surgeons and cardiologists must be aware of the long-term risks associated with these devices, particularly regarding complications related to anastomoses and material degradation (27). Patients should be informed about the warning signs of graft failure, such as atypical chest pain, shortness of breath, or signs of heart failure.

Managing patients after Bentall surgery requires a multidisciplinary approach involving cardiac surgeons, cardiologists, radiologists, and primary care physicians. Rigorous follow-up demands coordination among these specialists to ensure comprehensive monitoring and appropriate treatment in case of complications. Preventive care, postoperative follow-up, and management of complications should be planned in a holistic and individualized manner, based on the specific risks of each patient (28).

Patient education is essential to improve adherence to treatment and clinical follow-up. Patients should be made aware of the signs of potential complications, such as chest pain, severe back pain, or symptoms of heart failure, and their importance must be explained to ensure early intervention. Furthermore, managing hypertension and monitoring cardiovascular risk factors should be prioritized as part of postoperative follow-up.

Prompt and effective management of late aortic dissections is crucial for improving prognosis. Early diagnosis of aortic dissection in patients who have undergone Bentall surgery should be a priority, as complications can be fatal without rapid intervention. Surgeons and cardiologists must be prepared to intervene quickly to prevent severe complications, including revising the anastomoses, replacing affected aortic segments, and restoring stable coronary circulation (18).

In situations where a patient is deemed ineligible for surgical intervention due to excessively high operative risk or severe comorbidities, a palliative approach becomes essential. Palliative care aims to alleviate symptoms, improve quality of life, and prevent immediate complications related to aortic dissection. Optimal pain management is paramount, often achieved through the use of potent analgesics, such as opioids, to control severe chest pain. Strict blood pressure control is equally critical, typically with beta-blockers or calcium channel blockers, to reduce stress on the aortic wall and limit the progression of the dissection. (29)

Regular clinical and imaging follow-up allows for the detection of secondary complications. Psychological support and multidisciplinary care are essential for the patient and their family, given the potentially terminal nature of the disease. Finally, advanced palliative care may include non-invasive interventions to manage symptoms of heart failure or other systemic consequences, such as oxygen therapy in cases of respiratory distress.

CONCLUSION

Patients who have undergone Bentall surgery require close monitoring and long-term follow-up to prevent and quickly detect complications such as aortic dissection. Rigorous management of cardiovascular risk factors, continuous monitoring with advanced imaging techniques, and a multidisciplinary approach are essential to improve the long-term prognosis of these patients.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

CONSENT

Written informed consent was obtained from the patients for publication of this case report and any accompanying images.

ETHICAL APPROVAL

As per international standards or university standards written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist

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