Delayed Infective Endocarditis with Mycotic Aneurysm Rupture below the Mechanical Valved Conduit after the Bentall Procedure

Mei-Ling Chen, 1,3 Michael Y. Chen, 2,3 Wei-Hsian Yin, 4,5 Jeng Wei 4 and Ji-Hung Wang 2,3

The Bentall procedure is the gold standard for treating aortic dissection complicated with valvular and ascending aorta disease. Recent results for this procedure have been excellent; nearly 100% of patients remain free of infective endocarditis in long-term follow-up. We report a case of delayed Streptococcus agalactiae infective endocarditis complicated by mycotic aneurysm in a man who had undergone the Bentall procedure with a mechanical valve conduit 15 years previously. The mycotic aneurysm was located in the remnant aortic root, below the mechanical valve conduit, and later ruptured into the right atrium. The patient was treated conservatively and survived the acute period. Later, the aortic root defect was repaired successfully by means of a hybrid technique using a Amplatzer duct occluder.

Key Words: Amplatzer duct occluder • Aortic dissection • Bentall technique • Infective endocarditis • Mycotic aneurysm

INTRODUCTION

The Bentall procedure was first described by Bentall and De Bono in 1968. Since then, composite replacement of the aortic valve and ascending aorta has been considered the gold standard for treating ascending aortic dissection complicated by aortic regurgitation. Replacement of the aortic root using mechanical valved conduits with reimplantation of coronary arteries results in excellent long-term outcomes. Endocarditis and prosthetic failure are rare after use of a mechanical valved conduit: some studies have shown that almost 100% of patients were free from these complications. However, infective endocarditis can develop in the mechanical valved conduit, and staphylococci are the predominant microorganism involved in this infection. These infections occur most frequently during the early postoperative period. Infective endocarditis with Streptococcus agalactiae has been rarely reported among patients with mechanical valved conduits. Although it is an uncommon cause of endocarditis, it has a high mortality rate. Cardiac surgery is usually required for infections of the mechanical valved conduit because of the high likelihood of resistant organisms and the possibilities of heart failure and embolization. Here, we report a case of very late infective endocarditis complicated by a mycotic aneurysm in a man who had undergone the Bentall procedure. The mycotic aneurysm was located below the mechanical valved conduit in a remnant aortic root and later ruptured into the right atrium. The shunt was successfully repaired by means of a hybrid technique using a hybrid technique using a Amplatzer duct occluder.
procedure (open-chest transcatheter) using a Amplatzer duct occluder.

CASE REPORT

A 55-year-old man presented to our emergency department with a fever of 10 days’ duration. He had a history of type A aortic dissection 15 years earlier, for which he underwent the Bentall procedure. The Bentall mechanical valved conduit was connected to the sino-tubular junction for replacement of the dissecting aortic root with coronary reimplantation, using the Cabrol technique. Ten days before admission, he developed fever, hemoptysis, and severe dyspnea. During hospitalization his temperature was 39.0 °C, and cardiac examination revealed a clear metallic click without murmur. A subsequent blood culture grew *S. agalactiae*. Later he developed intermittent complete AV block and was transferred to the intensive care unit due to hemodynamic instability. A follow-up chest radiograph showed bilateral progressive alveolar infiltrates. Transthoracic echocardiography was performed to investigate the possibility of infective endocarditis and showed a highly mobile 0.6 × 1.9 cm² vegetation attached to the right atrial septum, above the tricuspid septal leaflet. The vegetation was located near the remnant aortic root below the valved conduit (Figure 1A). Mechanical valve function was not affected, but a cardiovascular surgeon was consulted regarding the intermittent complete AV block.

Conservative treatment with antibiotics was recom-

![Figure 1.](image)

(A) Transthoracic echocardiogram showing vegetation (arrow) attached to the right atrial septum, above the septal leaflet of the tricuspid valve and near the remnant aortic root below the valved conduit. (B) Transesophageal echocardiogram (long-axis view) showing the remnant aortic root (dotted arrow) below the anastomotic site of the Bentall metallic valved conduit (arrow). (C, D) Rupture of the mycotic aneurysm (arrow) is clearly visible on a short-axis view; an abnormal, large shunt drains into the right atrium.
mended because the patient did not have decompen-
sated heart failure. Thereafter, the AV block completely
resolved 1 week after antibiotic treatment. The patient’s
condition stabilized, symptoms improved, and fever,
dyspnea, and hemoptysis resolved.

However, 2 weeks after admission a new-onset
grade III systolic murmur was heard at the left lower
sternal border. A transesophageal echocardiogram (TEE)
showed a mycotic aneurysm at the remnant aortic root,
below the anastomotic site of the mechanical valved
conduit. Rupture of the mycotic aneurysm and an ab-
normal shunt that drained into the right atrium were
clearly visible (Figure 1B, C, D). The patient and his
family declined open heart surgery due to the high risk
of the procedure. After 6 weeks of penicillin plus 3
weeks of gentamycin treatment the patient’s infection
was brought under control and he was discharged. How-
ever, 2 months later, he developed worsening heart fail-
ure characterized by exertional dyspnea and leg edema.
TEE was used to evaluate the ruptured mycotic aneu-
rysmost and showed an enlarged rupture with a significant
shunt. Cardiac catheterization was arranged, and the ra-
tio of pulmonary to systemic blood flow (Qp/Qs) was
6.3. Injection of contrast medium into the right heart
during delayed cineangiography showed abnormal flow
of contrast medium from the remnant aortic root back
to the right atrium (Figure 2A). An aortogram showed
minimal aortic regurgitation and no leakage of contrast
medium from the mechanical valved conduit. After dis-
cussion with a specialized heart team comprising cardiac
surgeons and interventional cardiologists, a hybrid pro-
cedure (open-chest transcatheter) using a Amplatzer
duct occluder was chosen to close the site of the an-
eurysmal rupture. The procedure was performed after

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Figure 2. (A) Injection of contrast medium into the right heart on delayed cineangiography reveals contrast medium shunting from the remnant
aortic root into the right atrium (arrow, RAO view). (B) A surgical sketch illustrating closure of the defect using the Amplatzer duct occluder (arrow).
(C, D) Postoperative TEE showing successful deployment of the Amplatzer duct occluder in the mycotic aneurysm (white arrow), with only minimal
residual shunt flow draining into the RA (black arrow). TEE, transesophageal echocardiography.
the patient underwent midline thoracostomy and was placed on cardiopulmonary bypass (Figure 2B). Because retrograde delivery of the Amplatzer duct occluder through the mechanical valved conduit was impossible, an interventional cardiologist advanced the guidewire and sheath from the right femoral vein to the site of the rupture of the mycotic aneurysm. The sheath was then exchanged for the Amplatzer delivery catheter. After right atriotomy, and under direct supervision of a cardiovascular surgeon, the Amplatzer delivery catheter with the loaded occluder was gripped and pushed into the aneurysmal opening from the right atrium to the aortic root. The Amplatzer duct occluder was then released and successfully expanded under the guidance of TEE imaging (Figure 2C and D). The patient’s postoperative course was uneventful, and he had a satisfactory recovery after discharge. At 6 months of follow-up, he has no symptoms of heart failure.

DISCUSSION

The incidence of complications related to the Bentall procedure is low post-surgically for the first ten years. Some patients develop infective endocarditis within 5 years after the procedure, most frequently involving infections near the junction between the aortic annulus and mechanical valved conduit. Our patient developed infective endocarditis caused by Staphylococcus agalactiae 15 years after the procedure. S. agalactiae infection of the endocardium was extremely rare but its incidence has increased in recent years. It is more common among nonpregnant adults, elderly adults, and patients with chronic immunosuppressive diseases. Surgical treatment of invasive infection is usually required due to the possibility of shock, intractable heart failure, persistent sepsis, and mycotic aneurysm. After development of a mycotic aneurysm, antibiotics alone are not likely to eradicate the infection, and aortic root abscess frequently develops. However, patients who undergo surgical repair during the acute stage may develop serious complications such as acute renal failure, complete heart block and late pericardial tamponade requiring re-exploration of the mediastinum.

Our patient was treated conservatively, as recommended by a consulting cardiac surgeon, and survived the acute period. However, he subsequently developed late sequelae of ruptured mycotic aneurysm, complicated by heart failure, after formation of a large left-to-right shunt. Repair of the rupture site was very challenging in our patient, and traditional surgical repair was not an option. Previous reports on the use of transcatheter closure (TCC) to repair the ruptured sinus of a valsalva aneurysm suggested the possibility of such treatment for the defect in our patient. Previous results were encouraging, and mid-term outcomes have been acceptable. However, a pure percutaneous TCC approach would have been extremely technically demanding in this case, as the existing metallic valve above the rupture site prevented retrograde delivery of the closure device to the rupture site. Instead, a hybrid procedure in which a cardiovascular surgeon opened the chest and anterogradely delivered the closure device with the assistance of an interventionist was the best choice for our patient. The results have been excellent, which suggests that the present hybrid procedure is a promising treatment option for complications of this type.

CONFLICTS OF INTEREST

None.

REFERENCES


