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Unfortunate Accidental Twins: Two Patients with Endocarditis of a Valve-Bearing Conduit

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Abstract

Background Prosthetic valve endocarditis is becoming more common because many patients live long enough to experience bacteremia, while insufficient antibiotic prophylaxis eventually leads to graft infection. Valve-bearing conduit infections are the most feared because of technical challenges.

Case Description Two young patients were coincidental twins in terms of diagnosis and therapy. Both underwent complete replacement of the conduit, aortic arch prosthesis, and additional strategies to reconnect the coronary ostia and the brachiocephalic trunk. Both were discharged without significant residual problems.

Conclusion Even most demanding infectious problems can be solved. Thus, surgery should not be denied.

Keywords
- endocarditis
- reoperation
- aortic disease
- cardiovascular surgery
- aortic valve and root
- aorta/aortic

Introduction

Cases

Case 1

The patient is a 51-year-old man with Marfan's disease and history of mechanical valve-bearing conduit and vein graft implantation to the right coronary artery due to acute aortic dissection type A/I with involvement of the entire aorta in 2009, mitral valve annuloplasty and leaflet repair for severe regurgitation as the first redo procedure in 2017, surgical prosthetic replacement of an aneurysm of the abdominal aorta and iliac arteries with a Y-graft, and subsequent endovascular prostheses for the left internal iliac artery in 2018. He developed acute endocarditis with *Streptococcus* anginosus in September 2022. A mycotic aneurysm was discovered, which resulted from infectious detachment of the anastomosis of the vein graft with the prosthesis (►**Fig. 1**). Urgent surgery was performed. After re-re-sternotomy extracorporeal circulation was established, cardioplegia (Buckberg) was administered via the shortened vein graft, and the patient was cooled to 20°C. The entire conduit was removed. The right coronary ostium had already been closed during the first operation because of severance. The left ostium was detached from the prosthesis with scissors and cardioplegia was applied via the ostium. The infected surgical field was debrided and cleaned with hydrogen peroxide–soaked swabs. The mitral valve was inspected through the left ventricular outflow tract. A defect in the anterior mitral valve leaflet was closed directly after cleaning. An 8-mm prosthetic graft was attached to the left coronary ostium. A new vein graft was anastomosed to the existing one.

Cardioplegia was given via both grafts. After debridement of the annulus, a new conduit was implanted. Direct connection of the left ostium to the conduit was not possible due to stiffness of the area. Circulatory arrest was established at 20°C. A new prosthesis was attached to the proximal arch and clamped. The aortic cannula was

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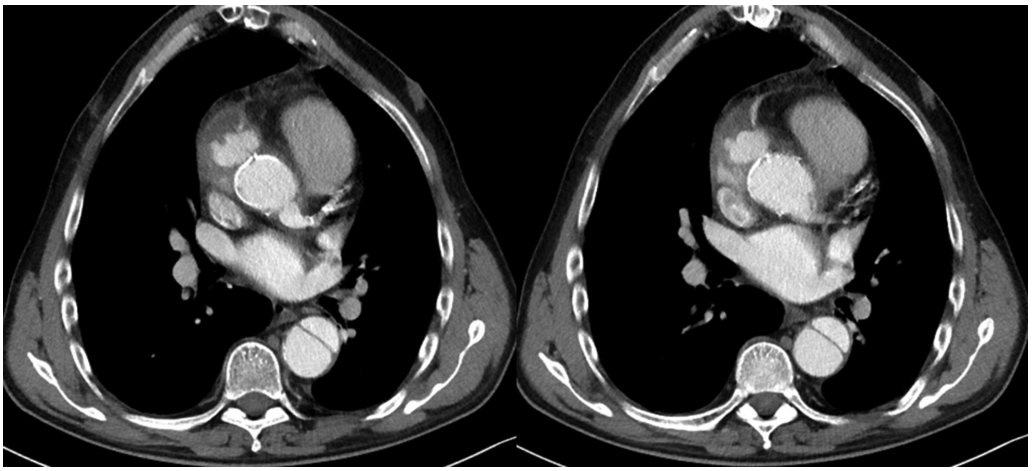

Fig. 1 Preoperative computed tomography (CT) scan. Mycotic aneurysm of ascending prosthesis with partially detached vein graft.

repositioned, extracorporeal circulation was restarted after 19 minutes' arrest, and the patient rewarmed. The new arch prosthesis was anastomosed to the conduit. The left ostium prosthesis as well as the vein graft were anastomosed to the main prosthesis. Weaning from a heart–lung machine was performed. The bypass time was 492 minutes and the X-clamp time was 249 minutes. All prosthetic material was rinsed with bacitracin/neomycin and covered with autologous fibrin glue. The patient was finally discharged (►**Fig. 2**, ►**Video 1**, ►**Supplementary File S1** [available in the online version]).

Video 1

Unfortunate accidental twins. Online content including video sequences viewable at: https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0043-1770722.

Case 2

A 50-year-old male patient with a history of aortic isthmus stenosis correction with stent (exact date not ascertainable) followed by mechanical valve-bearing conduit and proximal arch and brachiocephalic trunk prosthesis replacement due to aortic aneurysm and bicuspid valve in 2016 developed *Staphylococcus aureus* endocarditis. Antibiotic treatment was initiated. Positron emission tomography computed tomography (PET-CT) scan (►**Fig. 3**) and transesophageal echocardiography showed perigraft infection and paravalvular leakage. Resternotomy was performed. The prosthesis and the right atrium were cannulated. Extracorporeal circulation was commenced and the patient was cooled to 20°C. The prosthesis was detached from the aorta. The brachiocephalic trunk (BCT) prosthesis was used for selective antegrade cerebral perfusion. Retrograde flow from the left carotid artery indicated an open circle of Willis. The entire retroprosthetic space was infected and thoroughly cleared of all debris. The situs was repeatedly rubbed out with

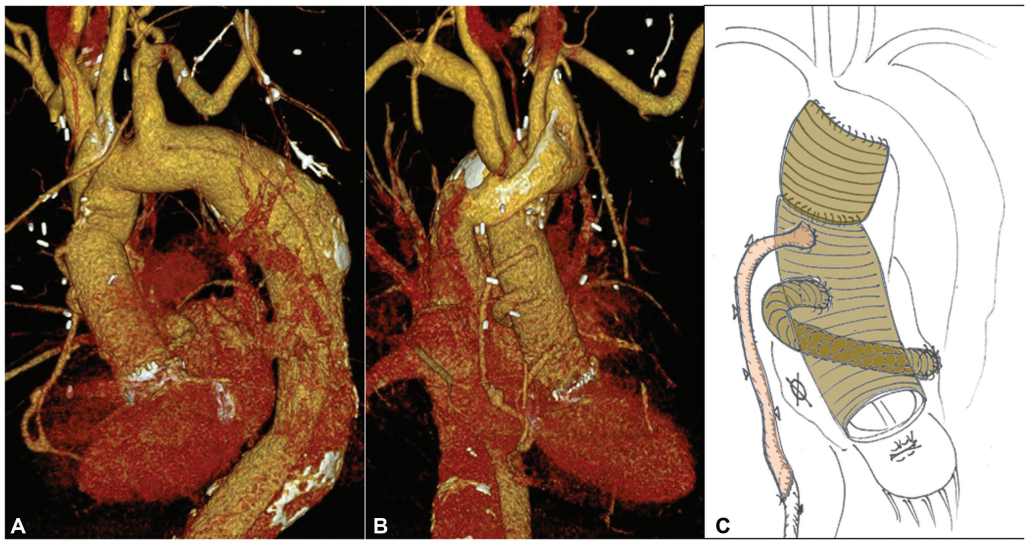

Fig. 2 (**A**,**B**) Postoperative computed tomography (CT) scan. New conduit, partial arch prosthesis, Cabrol prosthesis to the left coronary ostium inserted into the conduit, and new vein graft extension for bypass to the right coronary artery inserted into conduit. (**C**) Schematic view.

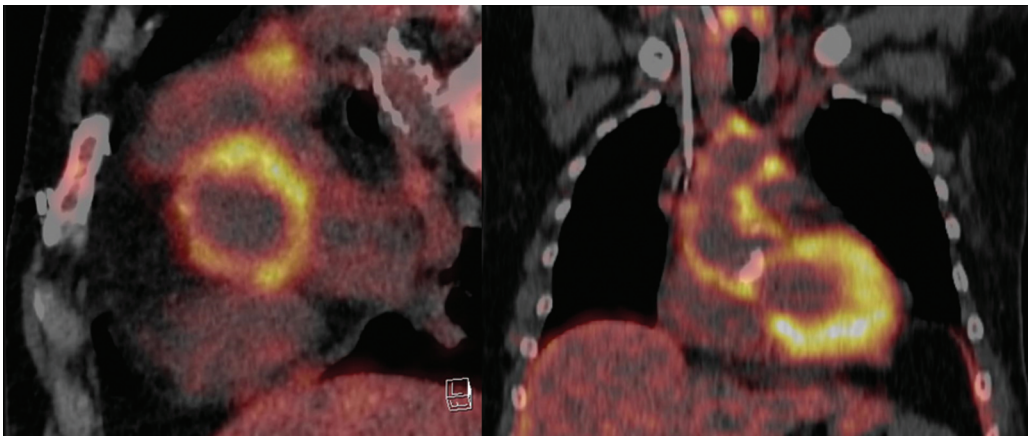

Fig. 3 Preoperative positron emission tomography (PET)/computed tomography (CT) scan. Infected prosthesis radiating.

hydrogen peroxide–soaked swabs. A 26-mm Dacron prosthesis was anastomosed to the aortic arch. A cannula was inserted, the prosthesis was clamped, and the circulation was restored. The BCT prosthesis was removed. An 8-mm Dacron prosthesis was implanted end to end and a cannula was reinserted. With both cannulas via a Y-connector, the brain and the body were perfused and rewarmed. The conduit was completely removed. Both ostia were separated from the main prosthesis. Cardioplegia (Buckberg) was administered intermittently. Debridement of the annulus was performed. The situs was repeatedly cleaned with hydrogen peroxide–soaked swabs. Two 8-mm Dacron prostheses were anastomosed end to end to the ostia. The cannula was transferred to the new arch prosthesis. A new 23-/26-mm conduit was implanted. Both 26-mm prostheses were then shortened and connected. The BCT prosthesis was then connected to the main prosthesis. The left ostium graft was connected to the BCT graft. Finally, the right ostium prosthesis was connected to the left ostium prosthesis. The patient was rewarmed and weaned. The bypass time was 454 minutes, the X-clamp time was 10 minutes, and the circulatory arrest time was 86 minutes. All prosthetic material was rinsed with bacitracin/neomycin and covered with autologous fibrin glue, and the patient was discharged home (►**Fig. 4** ►**Video 1**, ►**Supplementary File S1** [available in the online version]).

Discussion

Endocarditis cases are constantly increasing.[1] Demographic change, interventional procedures, and demanding conservative therapies make patients vulnerable to persistent bacteremia and development of endocarditis. Medical innovations, new interventional methods, and implanted devices also promote it.[2]

In these scenarios, bacteremia can lead to infection of the implants and the valve intima due to a compromised immune response. Because of restrictive policy in endocarditis

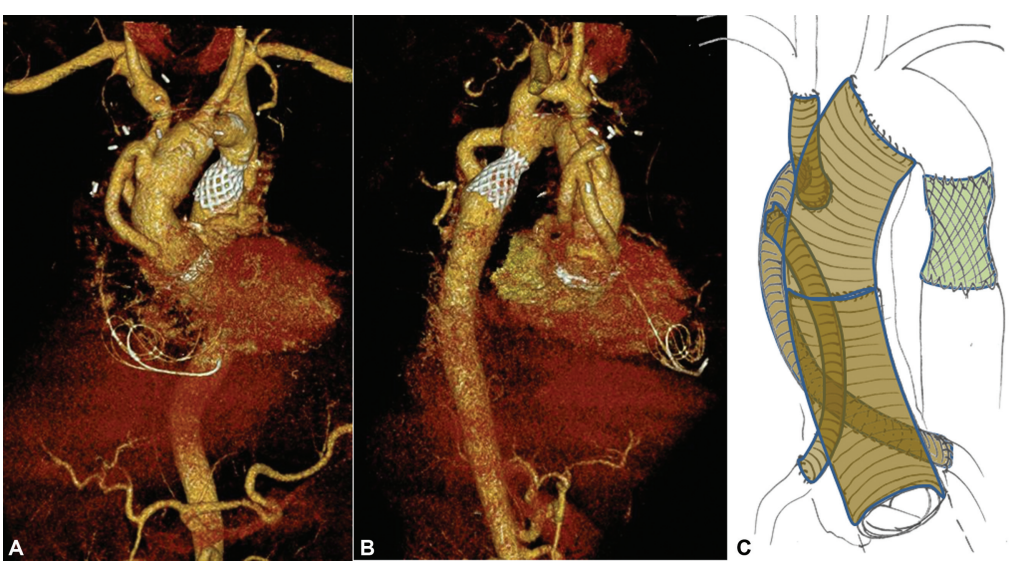

Fig. 4 (**A**,**B**) Postoperative computed tomography (CT) scan. New conduit, partial arch prosthesis, brachiocephalic trunk (BCT) prosthesis inserted into the main prosthesis, Cabrol prosthesis to the left coronary ostium inserted into the BCT prosthesis, and Cabrol prothesis to the right coronary ostium inserted into the left Cabrol prosthesis. Stent in former coarctation of the aorta. (**C**) Schematic view.

prophylaxis, patients are often denied antibiotics. Young adults with implanted device are therefore likely to develop endocarditis later. Although these patients are at high risk and therefore require strict individualized endocarditis prophylaxis, situations will inevitably arise where such prophylaxis has been insufficient.

Devastating aortic graft infection is rare and associated with high morbidity and mortality of 20 to 75% despite therapy.[3] Antibiotic treatment alone is associated with a high mortality of 60 to 100% and should be considered only in inoperable patients.[4] A general recommendation for optimal management and therapy is missing due to the small patient population and consequently limited data.[5] The treatment strategy should be multidisciplinary involving experts in cardiac surgery, cardiology, vascular surgery, intensive care, microbiology, and radiology.[6]

The treatment of infected valve prostheses is more demanding than native valve endocarditis, and proper therapy of an infected valve-bearing conduit is punitive, because the initial procedure creates an unanatomical scenario of the aortic root and reimplanted coronary ostia. Confinement to a root replacement strategy alone is often not possible, and the aortic arch must be addressed with all tactical consequences to gain control of the distal prosthesis. Stiffening of the tissue surrounding the ostia often makes reinsertion into a new prosthetic graft impossible.

The two patients developed endocarditis despite all precautions. Valve-bearing mechanical conduits make diagnosis difficult. The mechanical prosthesis creates extinction phenomena preventing correct echocardiographic detection of vegetations.

Additional diagnostic tools such as CT or PET/CT are often necessary to confirm the diagnosis. In the latest revised guidelines, CT, PET-CT, and MRI are therefore added to the main criteria.[7]

The Bentall procedure with direct reimplantation of the coronary arteries into the prosthesis is impossible in many redo scenarios. The Cabrol prosthesis offers a way out of this dilemma.[8] Intermittent cardioplegia is possible without additional maneuvering by direct connection. An infected prosthesis must be completely removed because the bacteria cannot be eradicated. Often this is only possible with circulatory arrest. In both patients, the prostheses were rinsed with bacitracin/neomycin and then sprayed with autologous fibrin glue. However, there is no study demonstrating a specific benefit for the ascending aorta and aortic arch.

Conclusion

Both cases showed that such diagnostics and the procedures are absolutely demanding and require latest diagnostic modalities such as PET-CT and the most advanced surgical skills. Notwithstanding the hindrances, in these younger patients, all the effort is worth it.

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Conflict of Interest
None declared.

References

1 Ostovar R, Schroeter F, Kuehnel RU, et al. Endocarditis: an ever increasing problem in cardiac surgery. Thorac Cardiovasc Surg 2019;67(08):616–623
2 Ostovar R, Schroeter F, Erb M, Kuehnel RU, Hartrumpf M, Albes JM. Endocarditis: who is particularly at risk and why? Ten years analysis of risk factors for in-hospital mortality in infective endocarditis. Thorac Cardiovasc Surg 2023;71(01): 12–21
3 Akowuah E, Narayan P, Angelini G, Bryan AJ. Management of prosthetic graft infection after surgery of the thoracic aorta: removal of the prosthetic graft is not necessary. J Thorac Cardiovasc Surg 2007;134(04):1051–1052
4 Baddour LM, Wilson WR, Bayer AS, et al; American Heart Association Committee on Rheumatic Fever, Endocarditis, and Kawasaki Disease of the Council on Cardiovascular Disease in the Young, Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and Stroke Council. Infective endocarditis in adults: diagnosis, antimicrobial therapy, and management of complications: a scientific statement for healthcare professionals from the American Heart Association. Circulation 2015;132(15): 1435–1486
5 Isselbacher EM, Preventza O, Hamilton Black J III, et al. 2022 ACC/AHA guideline for the diagnosis and management of aortic disease: a report of the American Heart Association/American College of Cardiology Joint Committee on Clinical Practice Guidelines. Circulation 2022;146(24):e334–e482
6 Wilson WR, Bower TC, Creager MA, et al; American Heart Association Committee on Rheumatic Fever, Endocarditis, and Kawasaki Disease of the Council on Cardiovascular Disease in the Young; Council on Cardiovascular and Stroke Nursing; Council on Cardiovascular Radiology and Intervention; Council on Cardiovascular Surgery and Anesthesia; Council on Peripheral Vascular Disease; and Stroke Council. Vascular graft infections, mycotic aneurysms, and endovascular infections: a scientific statement from the American Heart Association. Circulation 2016;134(20): e412–e460
7 Frantz S, ,-Buerke M, Horstkotte D, et al. Kommentar zu den 2015-Leitlinien der Europäischen Gesellschaft für Kardiologie zur Infektiösen Endokarditis. Accessed June 11, 2023 at: https://leitlinien.dgk.org/files/2016_kommentar_infektioese_endokarditis_final.pdf
8 Gelsomino S, Frassani R, Da Col P, et al. A long-term experience with the Cabrol root replacement technique for the management of ascending aortic aneurysms and dissections. Ann Thorac Surg 2003;75(01):126–131