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CASE REPORT

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Aortic pseudoaneurysm repair after Bentall procedure using the IntraClude device

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Abstract

Background: Despite advances in surgical techniques, aortic reoperation is still associated with a high risk of mortality due to possible injury of the myocardium or great vessels during resternotomy.

Materials & Methods: We report the case of a giant aortic pseudoaneurysm, 17 years after the Bentall procedure in a 76-year-old male patient.

Results: Successful pseudoaneurysm resection after the Bentall procedure using the ThruPort IntraClude intra-aortic occlusion device (Edwards Lifesciences) was achieved.

Discussion: The IntraClude catheter can be used effectively to provide endovascular clamping of the ascending aorta during challenging cardiac reoperations.

KEYWORDS
aorta and great vessels

1 | INTRODUCTION

The treatment of pseudoaneurysms of the ascending aorta, as a late complication of aortic procedures due to anastomotic dehiscences, requires sophisticated strategies to safely open the chest and gain control of the pseudoaneurysm.[1,2] We report a case of successful pseudoaneurysm resection after the Bentall procedure using the ThruPort IntraClude intra-aortic occlusion device (Edwards Lifesciences). Written informed consent of the patient was obtained and the case report was approved by the Institutional Review Board.

2 | CASE REPORT

A 76-year-old male patient was referred from his cardiologist to our department with a 1-week history of right parasternal pulsating swelling associated with a stabbing, nonradiating pain. Seventeen years ago, the patient had undergone a Bentall procedure with a 29-mm mechanical prosthetic valve (St. Jude) and partial aortic arch replacement due to Stanford type A aortic dissection. On physical examination, his blood pressure was 120/50 mmHg and his heart rate was 70 beats per minute. The chest examination showed a 5 × 6-cm parasternal, pulsating swelling at the level of the right fourth intercostal space (Figure 1). Electrocardiography showed sinus rhythm without any signs of myocardial ischemia. Computed tomographic angiography showed an aortic false aneurysm (5.3 × 6 cm) originating from the right coronary button and extending to the subcutaneous tissue on the right side of the sternum (Figures 2 and 3). Intraoperative transesophageal echocardiography (TEE) revealed the good hemodynamic performance of the mechanical aortic valve prosthesis without any regurgitation and normal left ventricular function. Percutaneous cannulation of the right internal jugular vein was performed and the left femoral artery and vein were exposed and

Benedikt Mayr and Zahra Alalawi contributed equally to this study.

FIGURE 1 Frontal view of the patient's chest with the visible tumor on the right side of the sternum at the level of the fourth intercostal space (arrow)

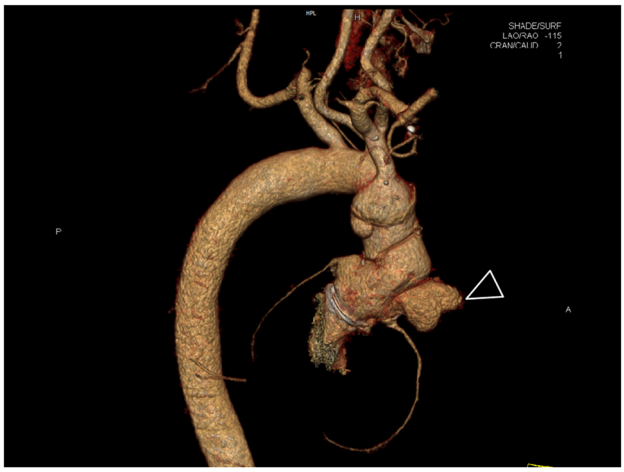

FIGURE 3 Three-dimensional reconstruction of the thoracic aorta with the 5.3 × 6-cm pseudoaneurysm (arrow) originating from the right coronary button

cannulated. The IntraClude intra-aortic occlusion catheter was then positioned in the ascending aorta under TEE-visualization. After systemic heparinization, cardiopulmonary bypass was initiated and the patient was cooled to a target temperature of 24°C, to be prepared for a period of circulatory arrest in case of massive, uncontrollable bleeding. After the heart began to fibrillate at 24°C, intra-aortic occlusion was successfully achieved by inflating the balloon of the IntraClude device. Cardiac arrest was established using antegrade Bretschneider cardioplegic solution via the IntraClude catheter. After the introduction of cardioplegia, the ascending aorta was vented via the same access. Chest access was gained by median sternotomy. Accidental opening of the anterior part of the pseudoaneurysm during sternotomy was avoided by the venting of the ascending aorta. After dissecting extensive adhesions, the sternal halves were spread and the pseudoaneurysm was completely visualized and resected. Its origin was identified as a semicircular detachment of the right coronary button from the aortic prosthesis. Reattachment of the right coronary ostium into the aortic prosthesis was performed using 5-0 Prolene simple interrupted stitches while rewarming the patient (Supporting Information Video). After the successful deairing of the heart, the intra-aortic balloon was deflated. Once complete rewarming of the patient was achieved, he was easily weaned from cardiopulmonary bypass. The sternum was rewired in the usual fashion using stainless steel wires. Postoperatively, the patient required only low-dose inotropic support and was extubated after 16 h. On the second postoperative day, he was transferred to the normal ward and was discharged from the hospital on the tenth postoperative day.

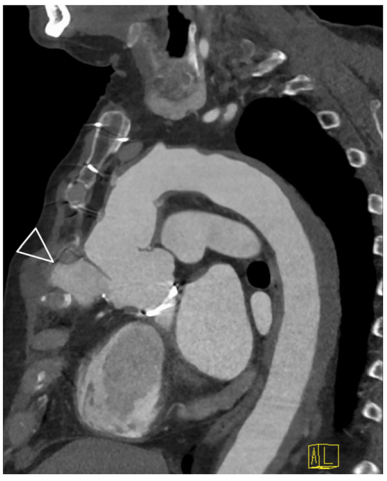

FIGURE 2 Sagittal computed tomography scan showing the aortic pseudoaneurysm (arrow) originating from the right aortic sinus emanating through the intercostal space to the subcutaneous tissue

3 | DISCUSSION

In this case report, we describe the successful resection of a pseudoaneurysm that occurred years after the Bentall procedure using the ThruPort IntraClude intra-aortic occlusion device. Aortic pseudoaneurysm is a serious complication that can occur several months to years after cardiac or aortic surgery.[3,4] In these patients, safe exposure and control of the pseudoaneurysm is a challenging issue. The conventional surgical approach is to connect the patient to cardiopulmonary bypass, cool the patient, then open the chest. Usually, connection to the heart–lung machine is performed by cannulation of the femoral vein and artery, but other approaches are also feasible like cannulation of the right axillary artery and right femoral vein.[1] If the cavity of the false aneurysm is accidentally opened during the division of the sternum, and the distal aorta is not cross clamped, fatal bleeding or cerebral air embolism can occur. These are the two major complications of the standard surgical approach.[5] In the case of massive bleeding with the risk of exsanguination there are only a few means of successful stabilization due to present adhesions. One conventional measure is to apply digital pressure to the bleeding site, reduce the perfusion flow while continuing cardiotomy suction, separate the

sternal edges, and cross-clamp the distal aorta as fast as possible.[5,6] In these cases, venting of the heart can be an issue, a possible approach is described by Smetana et al.[1] that involves the insertion of a venting catheter into the left ventricle through a left mini-thoracotomy before median sternotomy. In these patients, the use of an intra-aortic occlusion device is advisable. The main advantage of this device is the proper internal cross-clamping of the distal aorta without the need for entering the chest and dissecting the pseudoaneurysm and aorta. Thus, extensive bleeding and air embolism can be avoided, even if the pseudoaneurysm is accidentally opened. Further benefits of this equipment include direct antegrade delivery of cardioplegic solution through the catheter as well as venting of the aortic root. Adequate positioning of the balloon proximal to the brachiocephalic trunk and distal to the pseudoaneurysm is mandatory and should be continuously monitored by TEE to prevent device migration.[7] Otherwise obstruction of the supra-aortic vessels, bleeding from the pseudoaneurysm, and air embolism can occur.

In conclusion, the IntraClude catheter can be used effectively to provide endovascular clamping of the ascending aorta during challenging cardiac reoperations and its use should be included in an experienced surgeon's repertoire.

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AUTHOR CONTRIBUTIONS

Concept, data analysis, and drafting article: Benedikt Mayr. *Design, data analysis, and drafting article*: Zahra Alalawi. *Design and drafting article*: Johannes A. Ziegelmüller and Christian Nöbauer. *Critical revision and approval of the article*: Markus Krane and Rüdiger Lange. *Drafting, critical revision, and approval of the article*: Bernhard Voss.

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SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

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