Successful aortic valve-sparing procedure for an aortic root aneurysm associated with a congenital defect of the right sinus of Valsalva—a case report

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Background: Aneurysm of the sinuses of Valsalva (ASV) is a rare but potentially lethal condition. Young patients with aortic root aneurysm and normal aortic valve are preferentially treated with a valve-sparing root replacement (VSRR). However, this option may not be feasible in the presence of an ASV. We herein describe a unique repair technique that allows ASV closure and subsequent VSRR.

Case Description: A 50-year-old patient with a dilated aortic root was referred to our clinic. Upon examination of the aortic root, a localized disruption of the aortic wall between the annulus and the right coronary artery was identified. This finding jeopardized the feasibility of a valve-sparing procedure. A primary repair of the congenital aneurysm was attempted using a series of interrupted sutures. This successfully recreated the continuity between the valve annulus and the aortic wall. Reimplantation was then carried out in a standard fashion and the postoperative echocardiography showed good aortic valve and cardiac function. Alternatives to this technique include the Bentall procedure which does not require any continuity between the aortic annulus and the sinuses. However, it has been associated with a higher incidence of valve-related complications.

Conclusions: Direct closure of an ASV can allow successful valve-sparing. It represents an attractive option in young patients with a repairable aortic valve.

Keywords: Aneurysm; sinus of Valsalva; valve-sparing; case report

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Introduction

Aneurysm of the sinuses of Valsalva (ASV) is a potentially lethal condition that can be complicated by heart failure or rupture. Among the several causes of root aneurysm, congenital defects of the Valsalva sinuses represent a rare entity that may go undetected up until the time of surgery (1). Yet, the presence of this condition can significantly alter surgical management. To limit long-term valve-related complications, patients with aortic root aneurysm and normal aortic valve are preferentially treated with a valve-sparing root replacement (VSRR) rather than a Bentall procedure. However, this option may not be feasible

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in the presence of a large sinus defect. We herein present the case of a 50-year-old male with such a large defect who underwent a successful valve-sparing operation. We present this case in accordance with the CARE reporting checklist (available at https://jovs.amegroups.com/article/view/10.21037/jovs-23-11/rc).

Case presentation

The patient was initially referred to our clinic with an aortic root aneurysm. He had undergone a peri-membranous ventricular septal defect (VSD) closure (with no residual defect) at the age of 6 months and had no other comorbidities. The patient was seemingly asymptomatic (dyspnea I/IV) at the time of diagnosis and had no relevant family history.

A transthoracic echocardiogram (TTE) demonstrated a maximum diameter of 50 mm at the level of the sinuses of Valsalva and normal valve function. A chest CT revealed an aortic root of 56 mm with an ascending aorta of 30 mm (*Figure 1A*). The patient was scheduled for an elective valve-sparing procedure.

The intraoperative transesophageal echocardiogram (TEE) showed an aortic annulus of 31 mm and trivial aortic regurgitation (*Figure 1B-1D*). A patent foramen ovale was also diagnosed.

The patient underwent redo surgery with bi-caval cannulation. Antegrade and retrograde Del Nido cardioplegia were used for myocardial protection. The aorta was opened in a transverse fashion. The aortic valve was tricuspid and had a small fenestration but was otherwise normal, with pliable leaflets. The root was then examined and a localized disruption of the aortic wall between the annulus and the right coronary artery (*Figure 2A*) was identified. This finding jeopardized the feasibility of the procedure because there was not enough tissue in the right cusp to allow safe reimplantation of the aortic valve. Yet, given the patient's age, the fact that his aortic valve was normal and that the ASV did not directly involve the annulus, we decided to repair the sinus of Valsalva defect as to allow valve reimplantation. A series of interrupted 4-0 prolene sutures were carefully placed to close the defect and recreate the continuity between the annulus and the aortic wall (*Figure 2B,2C*). A 30 mm Hemashield graft (Getinge; Göteborg, Sweden) was used to replace the root. Valve repair was performed to correct a small cusp prolapse and the fenestration previously identified in the left coronary leaflet was closed using interrupted 6-0 prolene sutures. The coronary buttons reimplantation and distal aortic anastomosis were completed in standard fashion. Cardiopulmonary bypass time and aortic cross clamp time were 139 and 128 minutes, respectively. The intraoperative TEE showed good valve function, with a leaflet coaptation length of 4.8 mm (*Figure 2D*).

The postoperative evolution was unremarkable except for an episode of paroxysmal atrial fibrillation. Postoperative TTE showed a left ventricular ejection fraction of 50%, mild aortic regurgitation, and a mean aortic gradient of 4 mmHg (*Video 1*). The patient was discharged on postoperative day 7.

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

Highlight box

Key findings

- Primary repair of a congenital aneurysm of the sinuses of Valsalva (ASV) was performed to allow valve-sparing root replacement.

What is known and what is new?

- Large defect at the sinus of Valsalva level may jeopardized preservation of the native aortic valve.
- The standard approach in patients with concomitant root aneurysm and large sinus of Valsalva defect is a Bentall procedure. This case report demonstrates the feasibility of a valve-sparing procedure in this patient population.

What is the implication, and what should change now?

- Patients with congenital ASV should be considered for valve-sparing procedure.

Discussion

ASV is a rare clinical entity with an estimated incidence of less than 0.5% (2). The aneurysm may be acquired (infection, trauma, etc.) or congenital. Earlier reports have documented a high prevalence of VSD in patients with congenital ASV. The exact pathogenesis underlying this disorder is not fully elucidated but may involve localized deficiency in elastic tissue and abnormal development of the

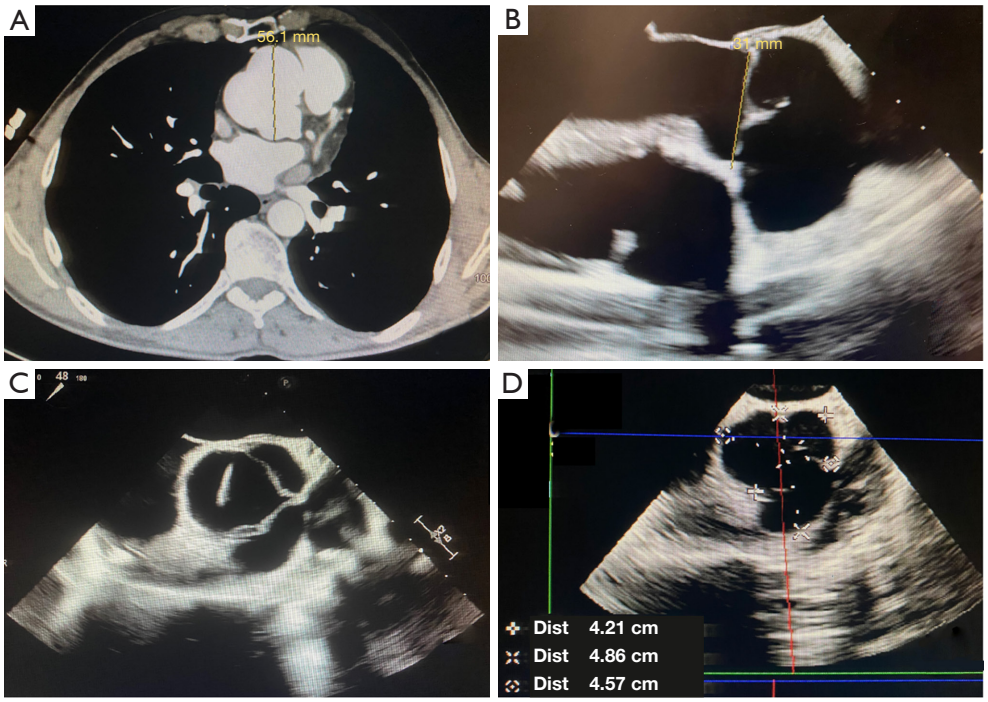


Figure 1 Preoperative imaging studies. (A) Chest CT showing the root aneurysm with a maximum diameter of 56.1 mm. (B) Intraoperative TEE showing a 31 mm aortic annulus. (C) Short axis view of the intraoperative TEE showing the morphology of the aortic root. (D) Long axis view of the intraoperative TEE showing the morphology of the aortic root. CT, computed tomography; TEE, transesophageal echocardiogram.

bulbus cordis (3).

Patients with ASV are usually asymptomatic. In patients with VSD, the aneurysm usually presents much later in life such that they will require VSD closure in infancy and redo operation during adulthood. Current guidelines do not differentiate between congenital ASV and root dilatation. The American Heart Association and American College of Cardiology (AHA/ACC) guidelines recommend that root replacement be performed when the sinuses reach 55 mm, or 50 mm in centers with experience. The same document also states that valve-sparing may be performed if the aortic valve is amenable to repair (4). This is usually feasible in young patients with root aneurysm. However, patients with ASV present unique challenges due to the lack of tissue in the aneurysmal sinus. The main alternative to a valve-sparing operation is a Bentall procedure. Because this technique does not require any continuity between the annulus and the sinuses, it represents a reproducible operation in patients with ASV. However, it has been associated with a higher incidence of valve-related complications when compared with valve-sparing procedures (5). Thus, there are strong incentives to preserve the native aortic valve whenever possible.

Primary repair of ASV allows preservation of the aortic valve in preparation for a valve-sparing procedure. In such cases, surgeons must be careful not to distort the geometry of the aortic annulus while also making sure to reapproximate enough tissue. In fact, avoiding annulus and cusp distortion is key to ensure a competent repair. The aortic valve should be reassessed after the repair and following reimplantation to ensure adequate cusp movement and prevent aortic regurgitation. Patch closure is another repair option, although it may be difficult to achieve when a VSRR is contemplated as it may create redundancy at the repair site (1). However, a patch is probably the best option in cases where a communication exists between the ASV and adjacent cavities or when there is no dilatation of the other sinuses. Finally, the VSRR technique needs to be carefully selected in the presence of an ASV. Compared with a remodeling technique, the reimplantation probably allows better hemostasis because it incorporates the repair within the graft.

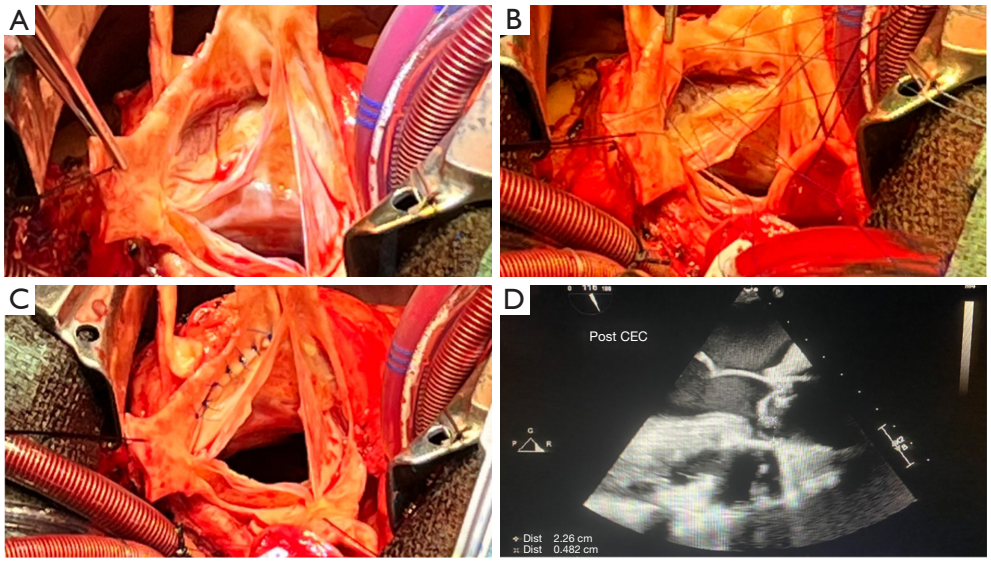
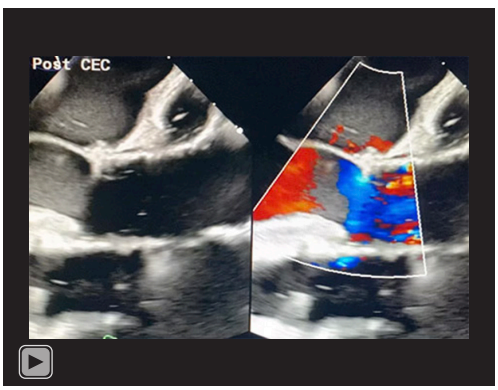


Figure 2 Intraoperative view of the aneurysm. (A) Before repair. (B) During repair with interrupted 4-0 prolene. (C) After repair completion. (D) Postoperative TEE showing a cusp coaptation length of 4.8 mm. CEC, circulation extracorporeal; TEE, transesophageal echocardiogram.



Video 1 Postoperative transthoracic echocardiography showing mild aortic regurgitation and successful valve-sparing root replacement.

Study limitations

This report presents a single case of ASV direct closure. The outcomes may not be generalizable. Furthermore, longer follow-up is needed to assess the durability of the proposed technique.

Conclusions

In conclusion, ASV represents a rare entity that usually presents in young patients. Preservation of the native aortic valve is desirable in this population but may be jeopardized by the presence of a large ASV. Direct closure of the aneurysm, as described in this case, can allow successful valve-sparing.

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Footnote

Reporting Checklist: The authors have completed the CARE reporting checklist. Available at https://jovs.amegroups.com/article/view/10.21037/jovs-23-11/rc

Peer Review File: Available at https://jovs.amegroups.com/article/view/10.21037/jovs-23-11/prf

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Ethical Statement: The authors are accountable for all

aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

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