

Aortic Root Reimplantation Using a Valsalva Graft for Postoperative Pseudoaneurysm after Acute Aortic Dissection

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We report a reoperative case in which a Valsalva graft was utilized on a 64-year-old woman who had previously undergone emergency repair of a DeBakey type I acute aortic dissection. On follow-up computed tomography (CT), she was found to have pseudoaneurysms of both proximal and distal anastomoses. We performed valve-sparing aortic root replacement (VSRR) with the reimplantation technique and total arch replacement, since we felt that a graft with pseudosinuses helps to prevent torsion of the coronary arteries. The postoperative course was uneventful, and postoperative echocardiography revealed no significant aortic valve regurgitation. The pathology results raised the hypothesis that pseudoaneurysm formation might have been related to the use of gelatin-resorcinol-formaldehyde (GRF) glue at the time of the initial intervention. (Ann Thorac Cardiovasc Surg 2008; 14: 339–342)

Key words: Valsalva graft, aortic root reimplantation, pseudoaneurysm

Introduction

Valve-sparing aortic root replacement (VSRR) has been gaining popularity because of the potential freedom from long-term anticoagulation.^{1,2)} Some studies have additionally implied that preservation of the sinuses of Valsalva might lead to better hemodynamic performance.^{3,4)}

Although aortic root remodeling techniques recreate the typically scalloped sinus morphology, several modifications have been applied to the reimplantation technique to shape sinuses within a cylindrical prosthesis.^{5,6)} Some reported that the presence of the sinuses might play a role in pressure dispersion, aiding in the creation of naturally occurring eddy currents and coronary flow.³⁾

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Received July 4, 2007; accepted for publication September 14, 2007

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The Valsalva graft is a Dacron prosthesis that is commercially available and that is characterized by the presence of pseudosinuses. This prosthesis has been used clinically with very encouraging early results.^{7,8)} We describe herein a reoperative case in which we utilized the graft to repair late aortic pseudoaneurysms while preserving the native aortic valve.

Clinical Summary

The patient was a 64-year-old woman who previously had an emergency operation for acute aortic dissection (DeBakey, type I) approximately 8 years ago. Computed tomography (CT) (Fig. 1) showed a saccular pseudoaneurysm formation of the proximal anastomosis and residual dissection of the distal anastomosis. The morphology of the aneurysm was irregular, raising the possibility of an etiologic link with the previous use of gelatin-resorcinol-formaldehyde (GRF) glue. The pathological findings from the first operation showed no cystic medial necrosis. Preoperative echocardiography showed mild aortic regurgitation (AR) (Fig. 2). Cardiopulmonary bypass was established by right axillary artery perfusion and right atrial venous drainage, and

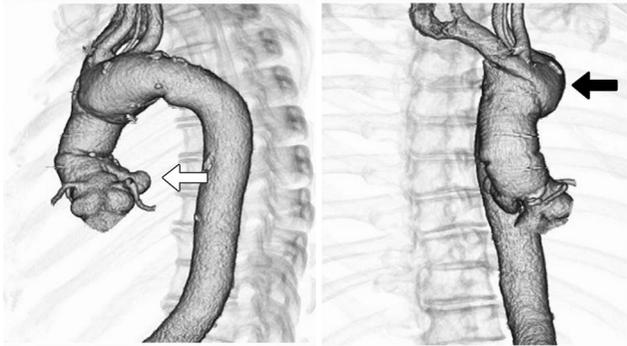


Fig. 1. A preoperative computed tomography scan showed pseudoaneurysm formation at the proximal anastomotic site, which was a saccular-type aneurysm (white arrow), and residual dissection at the distal anastomotic site (black arrow).

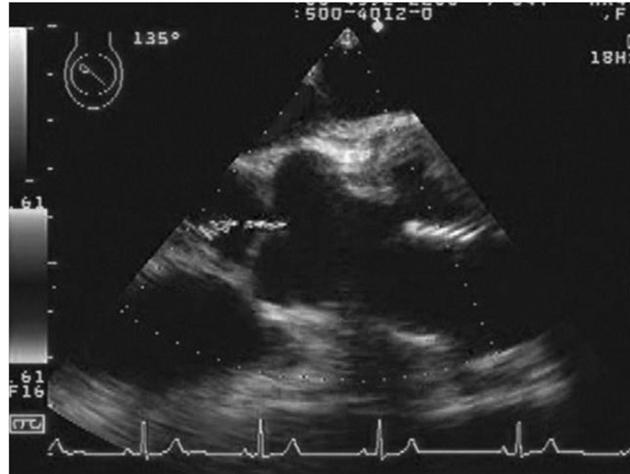


Fig. 2. Preoperative echocardiography revealed a mild grade of aortic regurgitation.



Fig. 3. The pseudoaneurysm reached to the commissure of the left and noncoronary cusp (arrow).

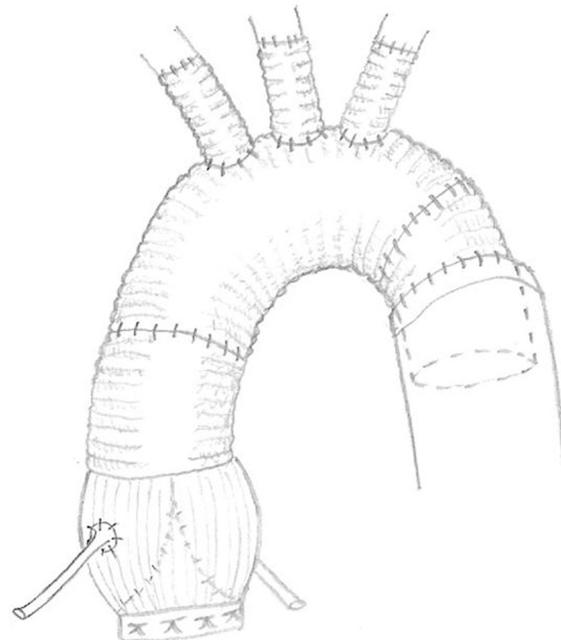


Fig. 4. Total arch replacement with 4 branched grafts was performed along with aortic root reimplantation using a Valsalva graft.

The elephant trunk method was carried out at the distal anastomosis. To reinforce the left and noncoronary cusp commissures, which were totally dissected, a Teflon pledget was used from inside the commissures to the graft. The coronary arterial anastomoses were reinforced by Teflon felt.

the patient was cooled to a core body temperature of 19.1°C. Following cardioplegic arrest, the aortic valve was carefully inspected to evaluate its mobility and pliability. The pseudoaneurysm involved the commissure between the left coronary cusp (LCC) and noncoronary cusp (NCC) with anastomotic dehiscence of the LCC and NCC from the graft (Fig. 3). The aortic root intima appeared necrotic, preventing preservation of the sinuses and root with reanastomosis to a new tubular ascending aortic prosthesis. Aortic root remodeling seemed to be unsuitable in this case because of the potential for bleeding from the anastomotic site. Therefore we decided to perform aortic root reimplantation, using a Gelweave 24 mm Valsalva graft (based on an annulus of 24 mm). Meticulous trimming of the com-

missure site and dissection of the root was required to carry out aortic root reimplantation. The aortic intima and adventitia were completely dissected at the commissure site, and Teflon felt pledgets were used to reinforce the anastomosis of the commissure site. The

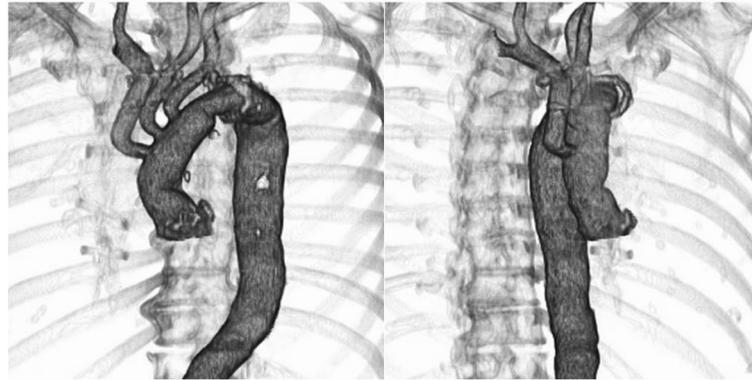


Fig. 5. A postoperative computed tomography scan showed patent coronary arteries and no leakage at the anastomotic site.

sinuses of Valsalva were excised completely, and we anchored the graft to the subannular area with several horizontal mattress 4-0 polypropylene sutures. The valve was resuspended by anchoring the scalloped remnant of the sinuses to the internal aspect of the prosthesis with a running 4-0 polypropylene suture, and the coronary buttons were reimplanted with 5-0 polypropylene sutures. Total arch replacement utilizing a Gelweave 22 mm graft was then performed under hypothermic circulatory arrest with selective bi-hemispheric cerebral perfusion (Fig. 4). The postoperative course was uneventful, and the patient is alive and well at 22 months of follow-up. Pre-discharge CT of the chest and transthoracic echocardiography showed normal aortic valve function and no leakage at the anastomotic site (Fig. 5). Postoperative pathological findings revealed the absence of smooth muscle cells within the wall of the aneurysm (Fig. 6).

Discussion

When reconstruction of the aortic root is performed, preservation of the sinuses of Valsalva is currently considered to be important. Preservation of the sinuses might improve valve longevity and aid in the creation of eddy currents, which is important for normal coronary perfusion.³⁾

Considering these factors, many surgeons have devised techniques and modified the original technique for valve-sparing root replacement by reimplantation. Although aortic root remodeling maintains the shape of the sinuses of Valsalva, it very likely leads to late AR by annular dilatation. With this concept in mind, we previously reported that aortic annuloplasty plays an

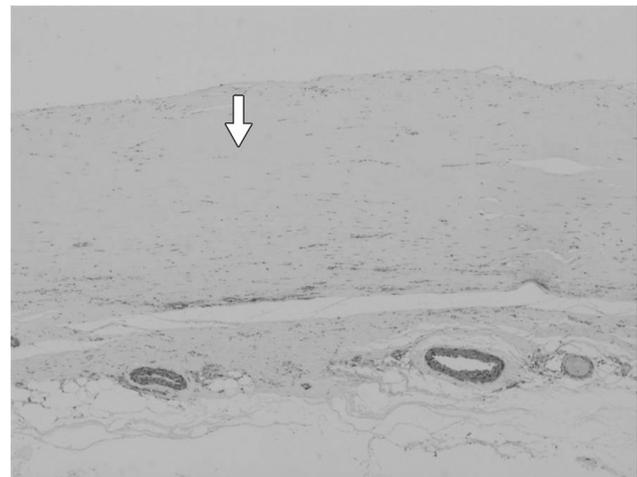


Fig. 6. Pathological picture.

α -smooth muscle actin stain revealed the absence of smooth muscle in the aortic wall (arrow).

important role in preventing dilation of the annulus.⁹⁾ It is also efficient in lowering the plane of aortic valve coaptation, which is useful in patients with preoperative AR.¹⁰⁾ In contrast, aortic root reimplantation requires re-creation of the sinuses of Valsalva. The Gelweave Valsalva graft can be a useful alternative for applying more complex reimplantation techniques and has been available since 1998. It already has the shape of the sinuses of Valsalva and is readily available.^{11,12)}

The opportunity to obtain tension-free coronary anastomoses, especially in cases in which it can be difficult to detach and mobilize the coronary arteries (calcification, reoperations, and dense mediastinal fibrosis), as well as the potential for improved long-term durability of the preserved valve leaflet, are all appealing features of this graft.⁷⁾ The only downside of this

prosthesis in our view is the theoretical inability to adjust the height of the resuspension within a prosthesis of a predetermined size. Some longer-term results are currently available. Pacini et al. reported 151 patients with aortic aneurysms who underwent successful VSRR with this particular prosthesis. In their cohort, 10 patients had greater than grade 3 + AR, and 8 needed aortic valve replacement during 5 years of follow-up.⁸⁾ Patel et al.¹³⁾ and Settepani et al.¹⁴⁾ also reported similar good results.

It is quite possible that in our case GRF glue might have played a role in pseudoaneurysm formation. Kazui et al. reported the pathological findings of the aortic wall, with a disappearance of nuclei of the medial smooth muscle cells in patients with no evidence of a connective tissue disorder.¹⁵⁾ Our pathological findings suggested that nuclei of the aortic medial smooth muscle cells disappeared completely.

In conclusion, long-term aortic valve function and survival are expected to be good, according to reports from Western countries. Using GRF glue requires special attention to avoid pseudoaneurysm formation and redissection.

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