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Reimplantation Technique (David Operation) for Multiple Sinus of Valsalva Aneurysms

G. Chad Hughes, MD, Madhav Swaminathan, MD, and Walter G. Wolfe, MD

Division of Thoracic and Cardiovascular Surgery, Department of Surgery, and the Division of Cardiothoracic Anesthesia, Department of Anesthesia, Duke University Medical Center, Durham, North Carolina

Sinus of Valsalva aneurysms are relatively uncommon, and surgical repair is indicated at the time of diagnosis whether or not symptoms are present. This generally entails closure using a patch technique because usually only one sinus is involved. We report here the successful treatment of multiple sinus of Valsalva aneurysms using a David reimplantation valve-sparing root replacement.

The patient is a 63-year-old woman who was hospitalized for pneumonia 3 months before surgery. During that admission, a chest computed tomography (CT) scan demonstrated large sinus of Valsalva aneurysms of the left and noncoronary sinuses. Magnetic resonance imaging (MRI) confirmed the presence of these aneurysms, the largest of which measured 3 cm in diameter (Fig 1). The patient was referred for surgical evaluation. A CT angiogram was negative for any significant coronary disease. Rest and stress cardiac MRI revealed normal biventricular function, 1+ aortic insufficiency, and no stress-induced ischemia.

Because the patient had only mild aortic insufficiency on her preoperative studies, after informed consent was obtained, she was taken to the operating room with the intent to perform a T. David-V valve-sparing root replacement. Intraoperative inspection revealed large, extremely thin-walled aneurysms of the noncoronary and left coronary sinuses of Valsalva (Fig 2). Intraoperative transesophageal echocardiography (TEE) confirmed the presence of the sinus aneurysms and 1+ aortic insufficiency.

A valve-sparing David reimplantation root replacement was performed (Fig 3). Intraoperatively, the mean height of the three aortic valve leaflets was 16 mm, and the aortic annulus measured 19 mm. This was similar to the expected annulus size of 22 mm as calculated using a modification of David’s original formula [4]. A 24-mm De Paulis Gelweave Valsalva graft with prefabricated aortic sinuses (Vascutek USA, Inc, Ann Arbor, MI) [5, 6] was used to reconstruct the aortic root (Fig 3). Immediate postoperative TEE demonstrated no aortic insufficiency.

The patient’s early postoperative course was notable for right ventricular dysfunction likely secondary to inadequate myocardial protection from a nondominant right coronary system despite the use of both antegrade and retrograde cardioplegia. This eventually improved, and at the 6-month follow-up, the patient is doing quite well without cardiac symptoms. Follow-up echocardiogram demonstrates no aortic insufficiency.

Comment

As originally described [4], the David operation entailed reimplanting the aortic root within a tubular graft to treat annuloaortic ectasia. The operation has undergone numerous modifications through the years [7], and the most recent iteration (T. David-V) describes a “reimplantation” procedure that uses a graft with either pre-made or surgeon-constructed sinuses of Valsalva. Although annu-
loaortic ectasia, including patients with the Marfan syndrome and aortic root aneurysms, remains the most common clinical setting in which the procedure is performed [6], it has also been used in other situations, including acute type A dissection [8].

More recently, Akashi and colleagues [1] reported the use of valve-sparing root replacement with the remodeling (Yacoub/David II) operation to repair unruptured aneurysms of all three sinuses of Valsalva. Their patient was treated with a valve-sparing root replacement procedure owing to the difficulty of performing patch repair of all three sinuses. A similar situation was present in our patient because the large aneurysm of the left coronary sinus would have been difficult to repair utilizing a patch technique.

We chose the reimplantation technique because of the putative disadvantages of the remodeling procedure, namely the lack of fixation of the ventriculooaortic junction, which may predispose to late postoperative dilation and aortic insufficiency, as well as the higher risk of bleeding with the latter procedure [7]. Regardless, the risk of late annular dilation with the remodeling technique is probably less of an issue when the procedure is used for SVAs as there is not, to our knowledge, any association between this condition and late annular dilation [2], unlike patients with the Marfan syndrome for whom valve-sparing techniques are more commonly used.

In summary, reimplantation valve-sparing root replacement appears to be an attractive option for treatment of the rare patient with multiple sinus of Valsalva aneurysms in whom the traditional patch repair technique would prove difficult.

References
Fig 3. Line drawing demonstrating the technique of David-V valve-sparing root replacement using a De Paulis Gelweave Valsalva graft with prefabricated aortic sinuses for a patient with aneurysms of the left and non-coronary sinuses of Valsalva. (A) The ascending aorta is divided just above the sinotubular junction. The location of the aneurysms is illustrated. (B) Next, the sinus tissue, including the aneurysms, is excised leaving a 3-mm to 4-mm rim of aortic tissue around the ventriculoaortic junction and commissures. Left and right coronary buttons are also fashioned at this time. (C) Horizontal mattress sutures of 2-0 Ethibond (Ethicon, Somerville, NJ) are then placed from inside to outside circumferentially around the ventriculoaortic junction below the aortic valve leaflets. Care must be taken to avoid injuring the aortic valve leaflets with this maneuver. These sutures will be used to anchor the Valsalva graft after it is telescoped down outside of the aortic valve and commissures to recreate the aortic root. Next, 4-0 Prolene (Ethicon) sutures are run circumferentially around the rim of residual aortic tissue at the ventriculoaortic junction suturing this rim to the inside of the graft (not shown). This represents the hemostatic suture line of the new aortic root. (D) The left and right coronary buttons are then anastomosed to the graft and finally the graft is anastomosed to the native ascending aorta to complete the reconstruction.
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