DUPLEX PERICARDIAL PATCH AORTOPLASTY

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ABSTRACT

A modification of the Nicks procedure to obtain a firm blood-tight aortoplasty is described. Autologous pericardium was used in a bilayer arrangement with a sandwich suture technique. It was found to be an easy and effective way of decreasing bleeding. It may also prevent true and false aneurysms.

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INTRODUCTION

Various patch aortoplasty techniques have been described for annular enlargement prior to valve replacement or to ensure tension-free closure of the aortotomy around the struts of a prosthesis. Bleeding and aneurysm formation remain infrequent but formidable complications of such procedures.[1–3] The degree of enlargement, the direction and extension of the aortotomy, and the patch material have been the main concerns. However, the sewing technique may have a significant effect on the rate of such complications and it has received less attention. A modification of the Nicks procedure is described, whereby the aortotomy is patched with a bilayer of autologous pericardium, using a sandwich suture technique to obtain a blood-tight reconstruction and prevent aneurysm formation.[4]

TECHNIQUE

An oblique aortotomy is carried out up to the base of the noncoronary sinus, without entering the atrial roof or extending into the mitral valve, as described by Nicks and colleagues.[4] A rectangular autologous pericardial patch is folded over and tailored to a saddle shape. The patch is suspended on stay sutures at two corners for ease of handling. The open edge of this gusset is straddled over the nadir of the aortotomy and stitched with a double-armed polypropylene U-suture (Figure 1). The suture is carried on bilaterally with a running technique for an appropriate distance and kept tight with locking knots. A prosthetic valve is inserted with either simple interrupted sutures or U-sutures. A series of pledgeted U-sutures is passed through the patch if necessary. The excess pericardium is trimmed and the patching is completed.

The high pliability of unfixed pericardium may complicate the patching process. With this technique, it is not essential to uncurl the edges to take delicate bites and we prefer thicker bites from the pericardial rather than the aortic edge. This facilitates sewing and saves time. In addition, the redundant pericardial edges entrapped within the suture loops that buttress the aortic lip from both sides, act as blood-sealing washers, thereby ensuring a tighter closure. Optionally, besides thicker bites, within every 3rd or 4th running loop, some additional small bites can be taken from the patch edge, run before and after passing through the aortic lip, to keep this sandwich arrangement tidy (Figure 2).

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RESULTS

Eleven patients underwent aortic valve replacement with this technique. Seven were male and the mean age (± standard deviation) was 38.1 ± 17.7 years (range, 16 to 65 years). The goal was to aid aortotomy closure somewhat supraannularly in 5 patients (23 to 25-mm pericardial bioprostheses were used) and to implant a larger prosthesis in 6 others (21 to 23-mm bileaflet mechanical prostheses were partially anchored to the patches). The mean aortic crossclamp time was 61.6 ± 7.5 minutes (range, 50 to 77 minutes) and the cardiopulmonary bypass time was 84.7 ± 10.7 minutes (range, 70 to 105 minutes). The suture lines were dry upon release of the aortic crossclamps. No additional reinforcement sutures were required. Postoperative courses were uneventful except for one case of mild hemiparesis. We did not observe any aneurysms, perivalvular leakage, or other complications on postoperative echocardiographic examinations during a mean follow-up of 22.3 ± 13.4 months (range, 3 to 40 months).

DISCUSSION

Bleeding, although infrequent, remains a serious complication of annular and supraannular aortic enlargement. Autologous pericardium has been recommended as favorable patch material to limit this problem. The main advantages of pericardium over prosthetic material are considered to be its ready availability, sewing ease, nonporosity, relative lack of bleeding at the needle holes, low thrombogenicity, low tendency for flow-related hemolysis, and infection resistance.[1–3] On the other hand, there are concerns about aneurysm formation, rupture, or other types of failure of pericardial patches. Although such complications are rare in the aortic root, there have been occasional reports of such occurrences in this location.[2,3] Because of these concerns, glutaraldehyde treatment has been suggested. Besides providing additional strength by cross-linking collagen, this treatment produces better handling properties. However, glutaraldehyde is not completely nontoxic and it is known to induce increased calcification in biologic tissues.[5]

We used a single layer of pericardium, with or without glutaraldehyde treatment, which was satisfactory in our previous experience of aortic enlargement. During this, some troublesome bleeding necessitating additional reinforcement stitches was occasionally encountered. Furthermore, in a patient with a fragile aorta, re-patching under a second period of crossclamping was required. Pericardial and aortic tissues have some incompatibility with respect to thickness and pliability. This could hinder optimal coaptation and contribute to such complications. Duplex pericardial patching was conceived to solve those problems. We found it as easy as our previous experience with single-layer pericardial patching and there were no excessive time delays related to the technique. Although limited data are presented herein, we found that duplex pericardial patching improved the hemostatic properties of the pericardium by firmly incorporating the aortotomy from both sides along the suture lines, which may also decrease the false-aneurysm risk. Furthermore, this bilayer arrangement strengthened the patch material, which may prevent true aneurysms.

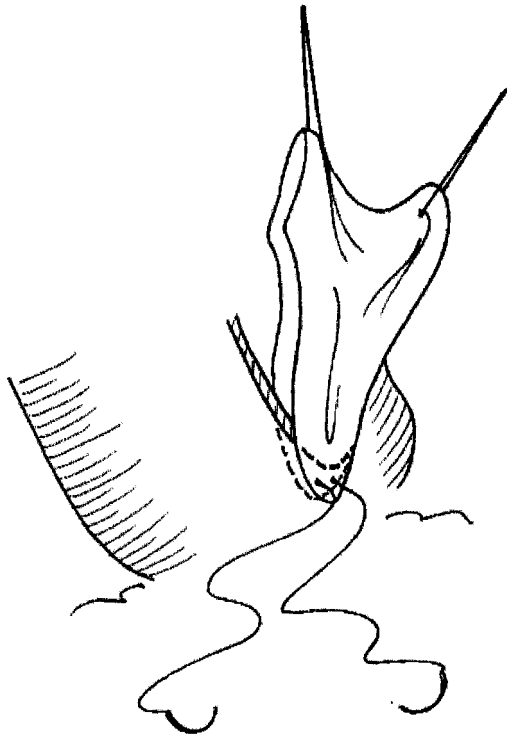

Figure 1. A bilayer pericardial patch is straddled over the aortotomy and stitched with a U-suture.

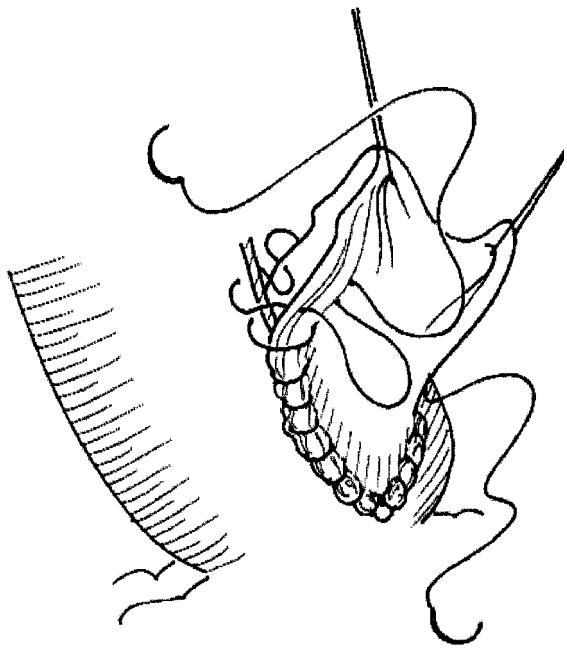

Figure 2. The sandwich-suture technique, taking thicker bites from the pericardial side rather than the aortic rim.

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