Techniques

Repair of Coarctation of the Aorta Associated with Intracardiac Repair

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CoarctATION of the aorta is a common congenital anomaly that requires surgical repair. Regardless of the technique employed, surgical results are flawed by a significant incidence of recurrent stenosis. Other attendant problems of surgical correction of coarctation are associated intracardiac defects, occurring in 50–75% of patients. A technique using the supraceliac segment of the abdominal aorta for an ascending aorta-abdominal aorta bypass has been utilized at this institution for treatment of recurrent coarctation and in combination with correction of associated intracardiac defects. Recently, we have used a more satisfactory technique for the distal anastomosis.

During the past 6 months, four patients have undergone simultaneous ascending aorta to descending thoracic aorta bypass and open-heart surgery to alleviate aortic coarctation and associated cardiac defects. Cardiac lesions included aortic insufficiency, aortic stenosis, annuloaortic ectasia, and mitral regurgitation. Ages ranged from 19 to 70 years. All patients were symptomatic from both the coarctation and concomitant cardiac lesion. (Table I).

Technique

In each case, a median sternotomy was used. Normothermic cardiopulmonary bypass was established following cannulation in the usual fashion. The ascending aorta was cross-clamped and cold cardioplegia solution infused (Fig. 1A). After the intracardiac repair was completed, the heart was retracted cephalad exposing the poste-

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**TABLE I. Comparison of Patients**

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Sex</th>
<th>Intracardiac Lesion</th>
<th>Repair</th>
<th>Coarctation Preoperative Aortic Gradient (mm Hg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Previous Repair</td>
</tr>
<tr>
<td>1</td>
<td>62</td>
<td>M</td>
<td>aortic insufficiency</td>
<td>AVR</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>F</td>
<td>aortic stenosis</td>
<td>AVR</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>19</td>
<td>M</td>
<td>annuloaortic ectasia</td>
<td>AVR</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>21</td>
<td>M</td>
<td>mitral regurgitation</td>
<td>mitral</td>
<td>No</td>
</tr>
</tbody>
</table>

annuloplasty

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Fig. 1 (A) With cardiopulmonary bypass established and the aorta cross-clamped, cold cardioplegia solution is infused into the ascending aorta.

(B) The heart is retracted by the assistant’s hand as a partial occluding clamp is applied to the descending aorta and the distal anastomosis is performed.

(C) Upon completion of the intracardiac repair, with the aortic cross-clamp removed, the proximal anastomosis is performed.

(D) With the proximal anastomosis completed, air is evacuated from the fabric graft, and cardiopulmonary bypass is discontinued.
rior pericardium. A longitudinal incision was made in the retrocardiac pericardium directly over the descending thoracic aorta. Using a method previously described in this journal, an 18-mm low porosity, woven Dacron graft was prepared by soaking the graft in autologous serum and heating in the autoclave for 3 to 5 minutes, precluding bleeding through graft interstices. Following the placement of a partial occluding clamp, an adequate longitudinal aortotomy was performed. The graft was appropriately tailored for a smooth contour about the acute margin of the heart and the right atrium. An anastomosis was performed in an end-to-side fashion using continuous 4-0 or 3-0 polypropylene monofilament suture material (Fig. 1B). With the graft occluded, the partial occluding clamp was removed from the descending aorta and the suture line carefully inspected for hemostasis. The aortic cross clamp was removed. A partial occluding clamp was placed on the right lateral aspect of the ascending aorta. An appropriate longitudinal aortotomy was made and the graft was tailored to provide an appropriate length to avoid compression of the underlying right atrium. The proximal anastomosis was performed in a similar manner to the descending anastomosis. The graft was allowed to fill in a retrograde manner to facilitate evacuation of air from the proximal graft and ascending aorta (Fig. 1C). Cardiopulmonary bypass was discontinued and the median sternotomy closed in the routine manner (Fig. 1D).

Results

Femoral pulses were palpable in all patients during the immediate postoperative period. No major complications occurred and no morbidity could be attributed to the combined procedure. No compression of the heart resulted from the course of the graft around the acute margin of the heart and right atrium (Fig. 2).

Discussion

The incidence of combined cardiac defects and recurrent stenosis at the site of previous coarctation repair suggests that similar situations precluding a more standard surgical approach will arise in the practice of cardiovascular surgery in major referral centers. This approach offers a safe and efficient means for combining procedures which have previously been done in separate stages. A similar technique was reported by Vijayanagar, who described placement of the graft around the left or obtuse margin of the heart, traversing the pericardium, and the left pleural cavity anterior to the left pulmonary hilum. Such placement may predispose to phrenic nerve injury, encroachment upon the hilar vessels of the left lung, and may require tedious dissection of adhesions from previous coarctation repair. Our technique also obviates the need for entering the abdominal cavity and isolation of the supracaeliac abdominal aorta from the diaphragmatic crura and

Fig. 2 This postoperative arteriogram shows an aortic valve prosthesis in place and the graft lying in a smooth contour around the right of the heart.
the splanchnic nerves. Moreover, the supraceliac position of the distal anastomosis could lead to erosion of the esophagogastric junction.

Summary

In the previous 6-month period at the Texas Heart Institute, four patients requiring intracardiac surgery and coarctation repair have undergone ascending aorta to descending aorta bypass graft with satisfactory results.

This technique permits one stage repair when coarctation occurs in association with intracardiac lesions and provides another method for secondary repair of coarctation after failure of conventional techniques.

Early clinical results have been encouraging and no morbidity or complications have been associated with the combined procedures.

References