Anomalous Left Coronary Artery From Nonfacing Pulmonary Sinus: Direct Aortic Reimplantation

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We report a new technique of establishing a direct coronary transfer for anomalous left coronary artery arising from the nonfacing sinus of the pulmonary artery. This easily reproducible technique was successfully used in 2 patients. It achieves a dual coronary repair without the use of complex aortic or pulmonary arterial flaps and without causing any distortion to the great vessels. (Ann Thorac Surg 2014;97:1819–21) © 2014 by The Society of Thoracic Surgeons

The established surgical strategy for anomalous left coronary artery originating from the pulmonary artery (ALCAPA) is the final correction that results in a dual coronary system [1]. Direct reimplantation is the most widely accepted technique, and is being aggressively pursued when anomalous coronary arises from the facing pulmonary sinuses [1, 2]. However, when the ALCAPA arises from the non-facing pulmonary sinus, direct implantation into aorta becomes technically challenging and often impossible. Hence, various techniques are employed in such cases, with their inherent advantages and disadvantages, with no consensus regarding an ideal repair. We report our method whereby a direct coronary transfer is possible in this rare subset of ALCAPA.

**Technique**

Since December 2010, 16 patients underwent ALCAPA repair in our institution, of whom 2 were found to have the anomalous coronary arising from the non-facing sinus of the pulmonary artery (Fig 1). The details of both these patients are given in Table 1.

The operative procedure was performed through a median sternotomy. The main pulmonary artery (PA) and both branches of the PA were freely mobilized. On examination, both the patients had normal relationship of the great arteries. Under cardiopulmonary bypass, myocardial protection was achieved with antegrade cold blood cardioplegia. The PA was transected just above the sinus safeguarding the coronary artery. The coronary button was excised, and the proximal part of the left coronary artery (LCA) was mobilized away from the PA. The aorta was then transected just above the sinotubular junction. The Lecompte maneuver was then performed, after which the aorta was reanastomosed. A small bulldog clamp was applied over the RCA, and the cross-clamp was released. A suitable site for the anastomosis of the LCA button was marked, and available LCA free length was found to be satisfactory in both cases. The aortic cross-clamp was reapplied, and aortotomy was made at the intended site of the anastomosis. Direct coronary transfer was completed using 8-0 polypropylene. The defect in the PA was repaired with tanned pericardial patch, after which PA anastomosis was completed. Both the patients came off cardiopulmonary bypass with minimal inotropic support. Echocardiography done during the most recent follow-up visit, 2 years (first patient) and 6 months (second patient) after the operation, revealed normal left ventricular function in both patients with no mitral regurgitation (Fig 2).

**Comment**

Direct reimplantation of the anomalous coronary into the aorta is the most frequently adopted surgical technique that has yielded the best long-term results in the surgical treatment of ALCAPA [1]. Long distance from the coronary button to the native aorta and the need for extensive coronary mobilization prevents direct coronary transfer when ALCAPA arises from the non-facing sinus, unless alternative techniques are employed. Takeuchi and colleagues [3] reported the creation of an intrapulmonary baffle in such cases to direct the LCA into the ascending aorta. This technique yielded a good initial patency rate, but there were late complications, such as baffle obstruction, supravalvar pulmonary artery obstruction, baffle leaks creating a coronary pulmonary artery fistula, and aortic valve insufficiency [4]. Reoperation or catheter intervention was necessary in as many as 30% of these patients to correct their complication [4]. To account...
for lack of available free coronary artery length, subcla-
vian artery interposition was tried in a few cases [5].
Recently, complex pulmonary or aortic arterial
flaps with or without tanned pericardial patch augmentation
were used to fashion an extrapulmonary pathway to
redirect the anomalous coronary artery to the ascending
aorta [6–8].
Owing to concomitant myocardial damage, surgical
treatment of ALCAPA remains challenging and carries
significant mortality and morbidity even in the current
era. A conscious effort was made to simplify the surgical
procedure and achieve a direct coronary transfer, thus
reducing the aortic cross-clamp time in these sick pa-
tients. The evolution of this technique has been derived
from the experience obtained with the arterial switch
operation. When direct coronary implantation without
the use of arterial flaps is attempted when ALCAPA
arises from the nonfacing sinus, undue stretching or
kinking of the LCA branches can cause catastrophic
events and, moreover, runs the risk of tense LCA being
compressed by the main PA. The Lecompte maneuver,
when done in these patients, displaces the PA anteriorly
and possibly to the right. That brings the great arteries
into an anteroposterior relationship, reducing the ten-
sion at the site of anastomosis and prevents the need
for extensive coronary mobilization. Moreover, the PA
is displaced anteriorly, preventing the compression
of the reimplanted LCA by the posterior wall of the
PA (Fig 3).
To conclude, it is an easily reproducible technique that
can be used when ALCAPA arises from the nonfacing
pulmonary sinus. Excellent surgical results can be

Table 1. Patient Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Patient 1</th>
<th>Patient 2</th>
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</thead>
<tbody>
<tr>
<td>Age</td>
<td>2 months</td>
<td>6 months</td>
</tr>
<tr>
<td>Weight</td>
<td>3 kg</td>
<td>6 kg</td>
</tr>
<tr>
<td>Preoperative LV dysfunction</td>
<td>Moderate</td>
<td>Severe</td>
</tr>
<tr>
<td>Preoperative mitral regurgitation</td>
<td>Grade 1</td>
<td>Grade 11</td>
</tr>
<tr>
<td>CPB/aortic cross-clamp time</td>
<td>130/80 minutes</td>
<td>170/110 minutes</td>
</tr>
<tr>
<td>Postoperative LV function follow-up</td>
<td>Normal+</td>
<td>Normal</td>
</tr>
<tr>
<td>RVOTO/MR/AR</td>
<td>Nil</td>
<td>Nil</td>
</tr>
</tbody>
</table>

AR = atrial regurgitation; CPB = cardiopulmonary bypass; LV = left ventricular; MR = mitral regurgitation; RVOTO = right ventricular outflow tract obstruction.
obtained in this challenging group of patients, without the use of complex arterial flaps. Early results are encouraging, although additional long-term follow-up will be required.

References