SURGICAL TECHNIQUES

Anterior Aortic Reimplantation of Anomalous Left Coronary Artery from the Pulmonary Artery (ALCAPA) Originating from the Nonfacing Sinus in an Adult

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ABSTRACT We report successful repair of a rare type of anomalous origin left main coronary artery from the nonfacing pulmonary artery sinus in an adult patient presenting with cardiac arrest as first symptom. Intraoperative findings and surgical technique are discussed. doi: 10.1111/j.1540-8191.2009.00967.x
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The take-off of the left main coronary artery (LMCA) from the pulmonary artery (ALCAPA) comprise a group of rare congenital anomalies, with often fatal outcome if they are not repaired in a timely fashion.[1,2] Without surgical correction, few patients survive beyond childhood, and of those, 90% suffer sudden cardiac death at an average age of 35 years.[3-5] Coronary bypass, used in adults, raises concerns regarding long-term conduit patency. Reimplantation, which is preferable over tunneling procedures that are known to suffer from shrinkage and late occlusion, can be more challenging in the adult patient, but is considered impossible if the LMCA originates from the nonfacing sinus. We present a case of an adult patient with ALCAPA originating from the nonfacing sinus in whom anterior coronary reimplantation was accomplished by means of coronary extension using a combination of a pulmonary artery wall flap and autologous pericardium.

PRESENTATION

A 44-year-old woman was transferred to the regional University Hospital after resuscitated cardiac arrest due to ventricular fibrillation. She was a smoker but had no other risk factors for coronary artery disease. Chest X-ray showed generous cardiac silhouette and increased pulmonary vascular markings of the lower lung fields bilaterally. Echocardiogram demonstrated anterior hypokinesis of the left ventricle with ejection fraction of 50%. Coronary angiography revealed ALCAPA with a large, tortuous right coronary artery with extensive collaterals to the left coronary artery, which drained into the pulmonary artery root (Fig. 1).

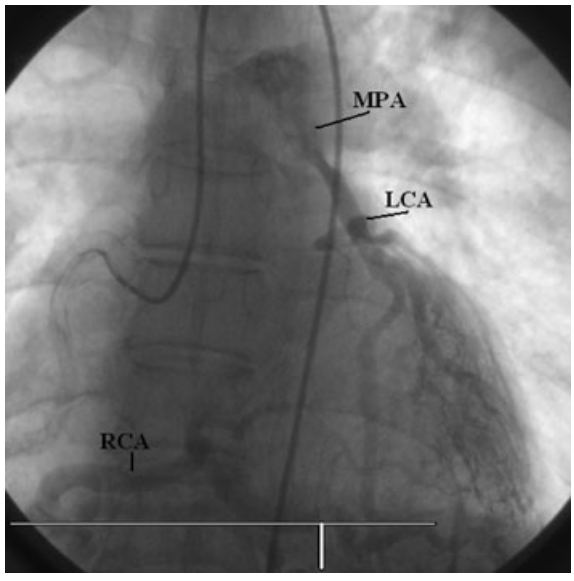

Figure 1. *Preoperative coronary angiogram (right coronary artery [RCA] injection) demonstrating dilated RCA and ALCAPA, with drainage of left coronary artery (LCA) into main pulmonary artery trunk.*

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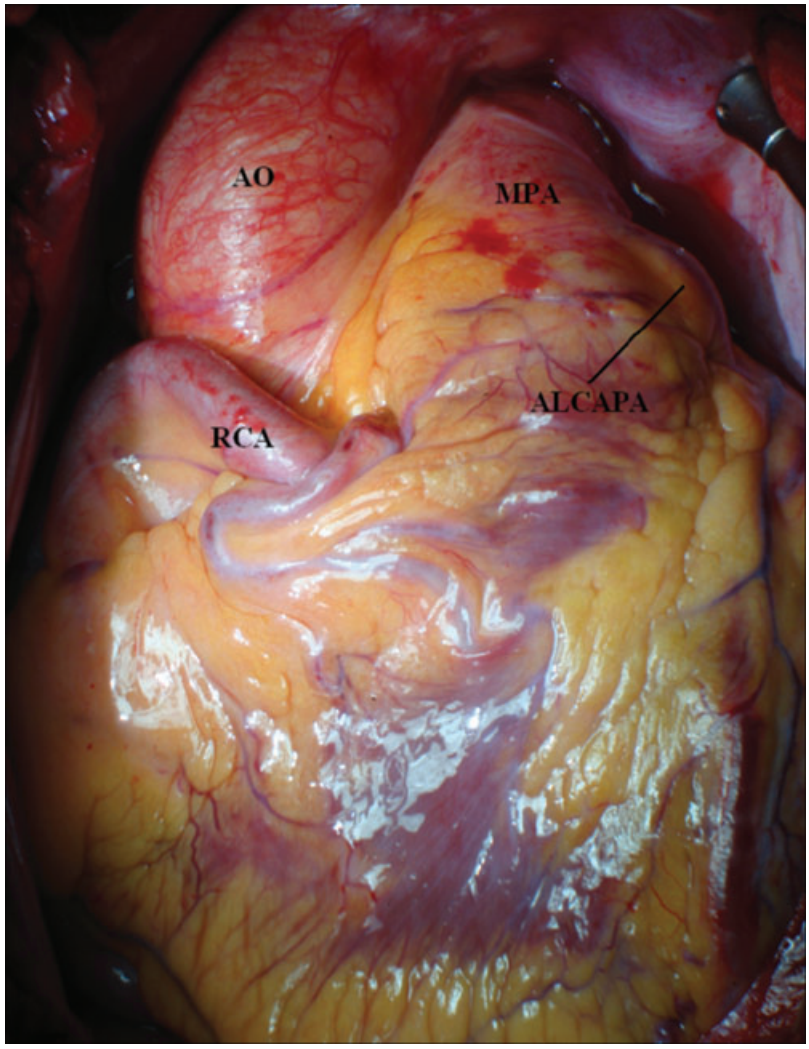

Figure 2. *Intraoperative photograph showing origin of anomalous LCA anteriorly from the nonfacing sinus of the main pulmonary artery (MPA).*

SURGICAL TECHNIQUE

At operation, the rare finding of the LMCA take-off from the nonfacing sinus (Fig. 2) precluded reimplantation to the anatomic posterior position, and an anterior reimplantation technique was used (Fig. 3). The coronary ostium was excised along with a strip of the anterior pulmonary artery wall. Autologous pericardium was used to reconstruct the posterior wall of this "elongated" coronary artery and the neo-ostium was then anastomosed end-to-side with the ascending aorta. The pulmonary artery was reconstructed with an autologous pericardial patch. The patient had an uneventful recovery and has improved ventricular systolic function and patent anastomosis at one-year follow-up, as demonstrated by coronary angiography (Fig. 4).

COMMENT

The surgical correction of ALCAPA includes ligation, coronary bypass, intrapulmonary tunneling (Takeuchi operation), and reimplantation of the anomalous LMCA to the aortic facing sinus, either directly or after augmentation with aortic or pulmonary artery wall, or pericardium. The operative mortality ranges from 0% to 23% and mainly depends on the functional state of the myocardium preoperatively.[3,6,7] Although ligation of the LMCA and coronary bypass are easier technically, there is concern about the adequacy of blood supply to the significantly dilated distal LMCA through an arterial graft and uncertainty regarding the long-term viability of saphenous vein grafts. Tunneling procedures also suffer from late development of stenosis. Using appropriate techniques, aortic reimplantation of the anomalous coronary artery is preferable and feasible even in cases like the one presented, in which the LMCA originates from the nonfacing sinus.[8] Although Turley et al.[8] have reported an LMCA lengthening procedure by means of pulmonary artery flap and posterior reimplantation, we felt that such an approach would result in an excessively long tube that could be stretched posterior to the MPA. Therefore, we chose to perform

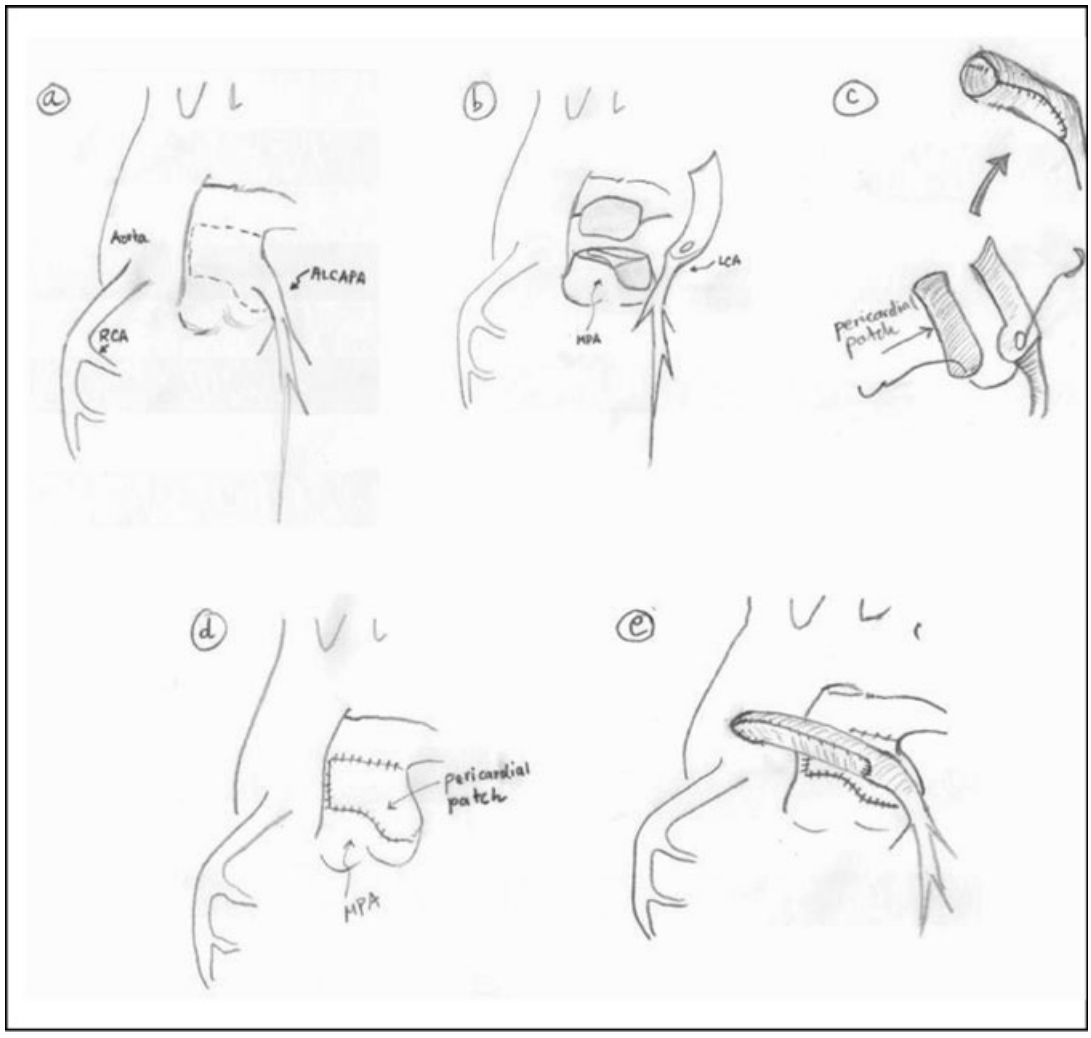

Figure 3. *Graphic depiction of surgical findings and technique: (A) ALCAPA with origin from anterior/nonfacing sinus of main pulmonary artery. Dotted line indicates the anterior pulmonary artery flap to be excised in continuity with the ostium of the left coronary artery (LCA). (B) Divided main pulmonary artery (MPA) and mobilized left coronary artery with in-continuity MPA flap. (C) Pericardial patch sutured to LCA–MPA flap effectively creating an extension of the LCA. (D) Reconstruction of the MPA defect with autologous pericardium. (E) End-to-side anastomosis of the extended LCA to anterior surface of ascending aorta completes the reconstruction.*

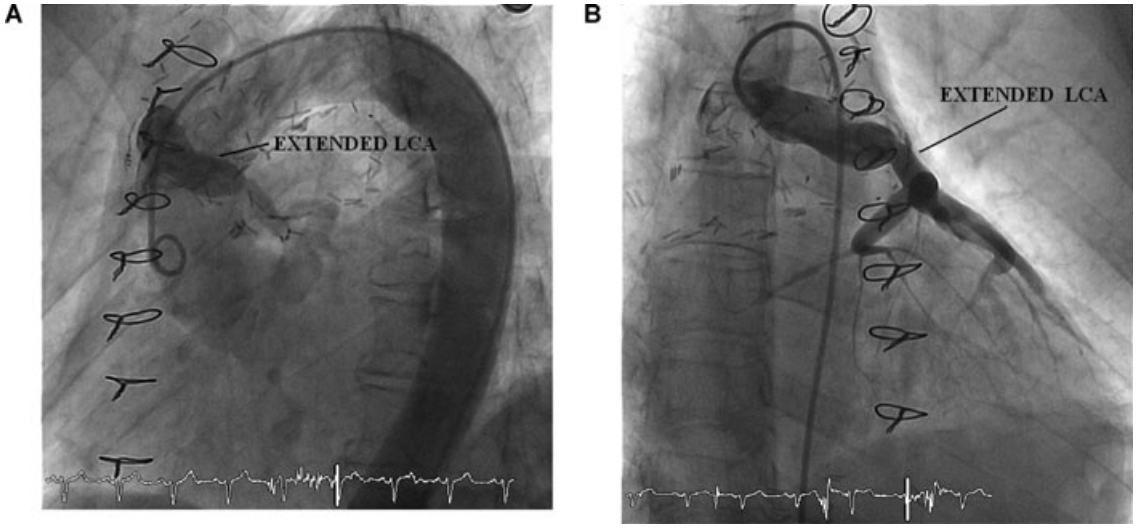

Figure 4. *(A) Aortogram and (B) left coronary injection one-year postoperatively demonstrating widely patent LCA reconstruction.*

coronary translocation anteriorly, as this represented a shorter, more direct course of the elongated coronary without risk of compression by the MPA. The gentle redundancy in the anterior tube, similar to a conventional coronary bypass, should not be subject to stretching and lumen compromise during exercise. Although concern of possible late stenosis or dilatation related to the LMCA augmentation with a pericardial strip exists, we felt encouraged in our approach by the reported absence of such complications after pericardial patch augmentation of translocated coronary arteries during the arterial switch operation. Clearly, long-term follow-up to document patency is necessary for this as for any reimplantation technique.

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