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Surgical treatment of anomalous left coronary artery from pulmonary artery in an adult

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Anomalous left coronary artery from pulmonary artery (ALCAPA) is a rare congenital heart disease that affects one in every 300 000 live births and accounts for 0.24–0.46% of cases of congenital heart disease [1]. Over the last few decades, four different operative procedures have been recommended as treatment for ALCAPA: the simple ligation of ALCAPA, coronary artery bypass grafting, channel repair (Takeuchi surgery), and coronary artery reimplantation [2]. The reimplantation surgery of ALCAPA is the current ideal option to achieve a definitive two-coronary artery anatomy and physiology, and has a good short-term and long-term outcome; it has become

the first-choice procedure for this anomaly [3]. We report a new modified technique to repair ALCAPA in an adult.

A 46-year-old healthy previously asymptomatic woman was referred to our hospital for evaluation of a 3-month history of palpitation. She denied any history of angina and had no other pertinent history. On physical examination, a systolic murmur was heard on the upper left sternal edge. The resting ECG showed ischemic ST-T changes. Transthoracic echocardiography indicated normal left ventricle dimensions with normal wall motions and ejection fraction. On the parasternal long-axis view, a dilated right coronary artery (RCA) arising from the right aortic sinus was seen. For further evaluation, computed tomography angiography and coronary angiography were performed. The 256-multislice computed tomographic angiography clearly showed that the left main coronary artery (LMCA) originated from the anterolateral aspect of the main pulmonary artery (PA) (Fig. 1). In coronary angiography, the LMCA could not be located in any of the sinuses of Valsalva. Selective right coronary angiography indicated a single, large, and tortuous RCA arising from the right sinus of Valsalva and giving off extensive collateral vessels coursing over the right ventricular wall, the interventricular septum, and the apex to the left coronary artery (LCA) that drained into the proximal

Fig. 1

Preoperative 128-multislice computed tomographic angiography shows anomalous drainage of the left main coronary artery to the posteromedial aspect of the main pulmonary artery.

main PA. The diagnosis of abnormal origin of LMCA from the main PA was confirmed. In August 2014, a LCA reimplantation surgery was carried out in normothermic cardiopulmonary bypass (CPB). On opening the pericardium, the surface was covered with coarse tortuous coronary arteries. The LMCA was dilated to ~ 6.0 mm and originated from the anterolateral aspect of the main PA. After blocking the LMCA temporarily, the origin of the LMCA was resected, along with a long strip of PA front wall. The PA was patched with an autologous pericardial strip and continuous 5-0 prolene sutures. Because the LCA originates from the left side of the PA, direct reimplantation to the ascending aorta is difficult; thus, we removed a short segment (about 5 cm) of the great saphenous vein, which was sliced longitudinally, to rebuild the LMCA with the strip of PA front wall using 6-0 prolene sutures (Fig. 2). After creating an opening in the aorta using a side-biting clamp, the long sleeve made by the great saphenous vein and PA front wall was connected to the

ascending aorta. As a result, the newly constructed LMCA originated from the left side of the ascending aorta. The total time of CPB was 65 min. A postoperative transthoracic echocardiography indicated normal ejection fraction and computed tomographic angiography. Figure 3 shows a patent left coronary anastomosis without any kinking. The patient was doing well and was discharged home without any complications. Written informed consent was obtained from the patients for publication of this case report and all accompanying images.

ALCAPA in an adult usually has adequate collateral circulation from the dominant RCA to the LCA. This left-to-right shunt is known as the coronary steal phenomenon [4], which may cause myocardial ischemia and left ventricular dysfunction, and ultimately left ventricular hypertrophy, endocardial fibrosis, papillary muscle dysfunction, and mitral regurgitation [4]. Sometimes, severe acute myocardial ischemia can cause sudden death. Thus, once ALCAPA is diagnosed, surgery should be performed immediately.

Nowadays, re-establishment of a two-coronary system with a bypass to reduce myocardial ischemia (using either an internal mammary artery or saphenous vein grafts) is most often performed. Imthiaz *et al.* [5] described a technique by creating a sleeve with a flap of PA strip and aorta in an anterior position. In our case, the LMCA originated from the anterolateral aspect of the main PA; it is impossible to rebuild the LMCA by the wall of the PA only. Thus, we used a segment of the great saphenous vein to widen the PA, which yielded good early-term efficacy. Furthermore, the entire operation process was performed under the condition of normothermic CPB without cross-clamp, to minimize myocardial damage as far as possible. We consider that our new technique served as a valuable surgical alternative to correct the defect, and that it might prove useful to others under similar circumstances.

Fig. 2

The new left main coronary artery made by the great saphenous vein and pulmonary artery front wall in the surgery.

Fig. 3

Postoperative 128-multislice computed tomographic angiography shows the newly constructed surgical conduit with no narrowing.

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Conflicts of interest

There are no conflicts of interest.

References

- 1 Fierens C, Budts W, Denef B, van de Werf F. A 72 year old woman with ALCAPA. *Heart* 2000; **83**:E2.
- 2 Lange R, Vogt M, Horer J, Cleuziou J, Menzel A, Holper K, *et al.* Long-term results of repair of anomalous origin of the left coronary artery from the pulmonary artery. *Ann Thorac Surg* 2007; **83**: 1463–1471.
- 3 Dodge-Khatami A, Mavroudis C, Backer CL. Anomalous origin of the left coronary artery from the pulmonary artery: collective review of surgical therapy. *Ann Thorac Surg* 2002; **74**:946–955.
- 4 Peña E, Nguyen ET, Merchant N, Dennie G. ALCAPA syndrome: not just a pediatric disease. *Radiographics* 2009; **29**:553–565.
- 5 Manoly I, Karangelis D, Viola N, Haw M. Repair of Bland–White–Garland syndrome via a modified technique. *Tex Heart Inst J* 2014; **41**: 48–50.