Coronary artery ostioplasty without a patch for congenital left main coronary artery ostial atresia

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Central picture

The incision in the anterior wall of the dysplastic left main coronary artery was extended into the aorta to produce a new left coronary ostium. The incision was then closed with four interrupted sutures.

Central message

For congenital left main coronary artery ostial atresia combined with a dysplastic left main coronary artery stem, ostioplasty without a patch might be a feasible method.

Introduction

Congenital left main coronary artery ostial atresia (LMCAOA) is an extremely rare coronary anomaly, and thus far, there are only approximately one hundred cases reported in the literature.¹ Patch ostioplasty is gradually becoming the major surgical technique to treat LMCAOA, rather than coronary artery bypass graft (CABG).²⁻⁴ Ostioplasty without a patch has never been reported in the literature, with the exception of one case of ostial dilatation.
However, the patient in that case did not survive the surgery, and the details of the procedure were not described.5 We describe the case of a six-month-old infant with LMCAOA who underwent a successful ostioplasty without a patch and with no adverse postoperative events. The IRB/ERB number and date of approval are XHEC-D-2022-145 and July 20th, 2022, respectively. Written consent was obtained from the parents.

**Case report**

A six-month-old male infant, who was asymptomatic with excellent general condition after birth, had a sudden worsening of his condition over four weeks following an episode of pneumonia. On examination, the heart sounds were distant, and a grade II/VI systolic murmur was heard in the mitral area. Electrocardiography revealed sinus rhythm without the typical indicators of myocardial ischemia. Transthoracic echocardiography showed that the origin of the left main coronary artery (LMCA) was indistinct, with retrograde blood flow in the left anterior descending branch (Figure 1A, B), combined with severe dilatation of the left ventricle and moderate mitral valve regurgitation (MR). Therefore, an anomalous origin of the left coronary artery was suspected, and a diagnosis of anomalous origin of the left coronary artery from the pulmonary artery (ALCAPA) was considered. Cardiac computed tomography (CT) showed a possible connection of the LMCA to the distal left posterior wall of the main pulmonary artery, supporting the diagnosis of ALCAPA (Figure 1C, D).

As angiocardiology is not routinely performed for ALCAPA at our center, the patient underwent immediate surgical treatment. The pulmonary artery was opened; however, no coronary artery ostium was identified. A transverse aortotomy was then performed, and
exploration revealed a normal ostium of the right coronary artery, with no ostium of the LMCA. A tenuous LMCA was observed after transection of the main pulmonary artery. The LMCA showed a normal distribution and was connected to the lateral wall of the aorta (Figure 1E). The surgeon attempted insertion of a 24-G puncture needle into the lumen of the LMCA from inside the aorta, but failed (Figure 1F). The anterior wall of the LMCA was incised, and the incision was extended into the aortic lumen to form an ostium. The luminal diameter of the LMCA was approximately 1 mm. The incision was then closed with four interrupted sutures (Figure 2). Directly after closure of the aorta and pulmonary artery, the heart activity was restarted, exhibiting forceful contraction and a normal electrocardiogram (Video 1, Supplemental). The patient’s postoperative period was uneventful. At the last follow-up (five months after the operation), the patient was in good general condition. Echocardiography and CT showed that the ostium of the LMCA was patent, and the LMCA trunk was well filled. The left ventricular systolic dysfunction and MR had decreased significantly (Figure 3, Supplemental).

Discussion

Congenital LMCAOA is an extremely rare coronary anomaly, and this case was the first in our center. In recent years, coronary artery ostioplasty has become the predominant procedure for treating LMCAOA.2-4 Because coronary angiography is not routinely performed for ALCAPA in our center due to radiation hazards and economic limitations, LMCAOA was confirmed during surgery in this patient. The surgeon first performed an ostioplasty as described above, and CABG was
planned if the ostioplasty failed. Fortunately, ostioplasty was successful, and the patient recovered well after the operation. Although the ostium and LMCA are only approximately 2 mm in diameter postoperatively, the patient is in good condition, indicating sufficient blood flow through the LMCA. This patient’s outcomes indicate that we may underestimate the growth potential of the LMCA, which may be considerable after re-connection to the aorta. However, long-term follow-up is necessary to evaluate the risk of re-stenosis.
References:


Legends:

Figure 1 LMCAOA displayed on echocardiography, CT, and during operation

A The ostium and distribution of the LMCA are indistinct on echocardiography.

B Only retrograde blood flow is observed in the LMCA.

C Preoperative CT shows no origin of the LMCA from the aorta.

D The LMCA appears to connect with the pulmonary artery.

E The LMCA and its branches are dysplastic.

F The surgeon attempts insertion of a puncture needle into the lumen of the LMCA from inside the aorta, but fails.

LMCAOA: left main coronary artery ostial atresia, LMCA: left main coronary artery, CT: computed tomography.

The yellow arrow indicates the LMCA.
Figure 2 Main steps of coronary artery ostioplasty

A An incision is made into the aorta and extended to create an ostium of the LMCA.

B An incision into the anterior wall of the LMCA shows that the LMCA is extremely dysplastic but without atresia.

C Interrupted sutures on the LMCA and final appearance of the LMCA.

LMCA: Left main coronary artery.

The yellow arrow indicates the ostium or main branch of the LMCA.

Figure 3 Improved LMCA and MR

A Antegrade flow in the LMCA one week after the operation.

B Antegrade flow in the LMCA four months after the operation.

C The LMCA is 0.181, 0.188, and 0.159 cm at the ostium, median, and distal parts, respectively, four months after the operation.

D CT image showing the LMCA connecting with the aorta before patient discharge.

E Enlarged left ventricle and significant mitral valve regurgitation preoperatively.

F Significant reduction in left ventricular dialation and mitral valve regurgitation.

LMCA: left main coronary artery; MR: mitral valve regurgitation; CT: computed tomography.

The yellow arrow indicates LMCA (A-D) or MR (E-F).

Video 1:
This video shows the major surgical steps, including detection of the LMCA, incision into the anterior wall of the LMCA, creation of a new ostium of the LMCA, and interrupted suturing of the LMCA incision.