DISCUSSION

To the best of our knowledge, this is the first case report of a TAAA repair in a patient with a GEA graft for coronary artery revascularization. The GEA has been widely used as a graft for CABG, especially for right coronary artery revascularization. In this case, the GEA and radial artery were used in a composite Y-graft to revascularize the right and left coronary arteries. The TAAA was not identified at the time of CABG. We suggest that both the ascending aorta and TAAA should be screened for atherosclerosis or aneurysmal change, via computed tomography, before the GEA is used for CABG. If TAAA is detected by preoperative computed tomography, separate or combined operations can be considered. Recently, Attaran and associates² reported 2 successful cases of combined TAAA repair and CABG.

In this case, we used partial CPB for TAAA repair. Celiac artery flow rate was determined before CPB using duplex scanning. Close monitoring for cardiac ischemia was performed using electrocardiography and transesophageal echocardiography. Hypothermic circulatory arrest can also be considered for TAAA repair,³⁻⁵ which has the advantage of making sequential aortic

clamping and separate perfusion of the visceral arteries unnecessary. This may be a feasible alternative for cases such as the one presented for surgeons who routinely use hypothermic circulatory arrest.

In conclusion, TAAA repair can be safely performed in a patient with a patent GEA graft used for CABG using partial CPB. Duplex scanning was useful to determine celiac artery flow rate in this case.

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A new type of aortic arch interruption without significant patent ductus arteriosus and with no ventricular septal defect

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We report the case of an infant with a previously unrecorded type of aortic arch interruption (AAI). There was only insignificant patent ductus arteriosus and no ventricular septal defect. Although this congenital heart condition did not fall within the type B1 classification, it may have had the same underlying genetic cause.

CLINICAL SUMMARY

A 2.5-month-old girl was referred to our hospital for collapses and cardiac murmur. She had normal height and weight development, and physical examination revealed only a low systolic murmur.

Two-dimensional echocardiography showed an AAI with a small patent ductus arteriosus of 2 mm, no ventricular septal defect, and an atrial septal defect of 4 mm. It also showed a left ventricular hypertrophy but without left ventricular outflow tract obstruction. Electroencephalography and brain magnetic resonance imaging (with a complete Willis circle) were normal. Both 2- and 3-dimensional computed tomographic scan angiography (Figure 1, A, B, and C) established the diagnosis. The ascending aorta gave rise to both carotid arteries, and the descending aorta was supplied by large subclavian arteries supplemented by collaterals between external carotids and vertebral arteries. The right subclavian artery was retroesophageal; however, bronchoscopy and esophageal opacification showed no significant

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FIGURE 1. Two-dimensional scan frontal reconstructed images showing the aortic arch interruption (*arrows*), the ascending aorta giving both carotid arteries (A) and both subclavian arteries supplying the descending aorta (B). Three-dimensional angiographic scan reconstructed image showing large external carotid arteries and large collaterals (C, *arrow*) to vertebral arteries. Cardiac catheterization showing the previously described anatomy at 3 different times (D, E, and F).

narrowing. Cardiac catheterization (Figure 1, D, E, and F) confirmed the described anatomy and pathophysiology. We measured a gradient of 45 mm Hg between the ascending and descending aorta, confirming the indication for surgical repair.

Through a sternotomy, after ligation and section of a small patent ductus arteriosus (with no hemodynamic change) and an extensive dissection of supra-aortic vessels and descending aorta, a direct aorto-aortic anastomosis was achieved under double partial lateral clamping (Figure 2, A and B). Cardiopulmonary bypass was available on standby but was not required with this peculiar anatomy, because lateral clamping preserved the perfusion of carotid arteries, cervical anastomosis, and descending aorta. During surgery, the absence of thymus was noted. Chromosome 22q11 deletion syndrome was confirmed by genetic analysis.

The postoperative course and follow-up at 3, 6, and 12 months were satisfactory with no significant residual gradient, regression of left ventricular hypertrophy. Computed tomographic scan control shows a good result (Figure 2, C).

DISCUSSION

The child was symptom free, but we could not assess the pressure in the left ventricle and ascending aorta because all

the peripheral arteries (except the carotids) were downstream the cervical anastomosis. To confirm indication for a surgical repair, we assessed the left ventricular pressure by cardiac catheterization through the foramen ovale. This examination confirmed high left ventricular pressures, with the potential for left ventricular failure or neurologic complications.

With respect to anatomic features, an AAI is usually associated with a large patent ductus arteriosus, which is crucial in supplying blood flow to the descending aorta, and a ventricular septal defect is associated in 2 thirds of cases.¹ The descending aorta of our patient was perfused by vertebral arteries through large collaterals developed from external carotid arteries. The lesion in our patient thus cannot be classified as a type B1 AAI according to Celoria's revised classification² because of the absence of a significant patent ductus arteriosus. This unique AAI may have resulted, however, like most (60%) classic type B AAI, from an abnormal sequence of development in the embryonic pharyngeal system related to chromosome 22q11 deletion syndrome.³

Finally, this atypical presentation of IAA allowed us to perform a direct aorto-aortic anastomosis to restore a physiologic circulation without cardiopulmonary bypass or interposition of any vascular graft.

FIGURE 2. Intraoperative images showing the double partial lateral clamping (A, *arrows*) and the direct anastomosis (B, *arrow*). Six-month follow-up angiographic scan showing the reconstructed aortic arch (C, *arrow*).

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