Case report

Giant pseudoaneurysm of the right ventricular outflow tract after repair of truncus arteriosus: evaluation by MR imaging and surgical approach

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Abstract

One year after surgical repair of the truncus arteriosus, a 1-year 8-month-old boy was found to have a pseudoaneurysm of the right ventricular outflow tract (RVOT). Cine-magnetic resonance imaging (MRI) showed a narrow communication between the RVOT and aneurysm. MRI was useful to evaluate the anatomical and spatial relations between the pseudoaneurysm and the surrounding structures, therefore an appropriate approach was chosen. Thus, a median sternotomy approach was carried out and ordinary central cannulation was feasible to establish a cardiopulmonary bypass. The defect was successfully repaired with reconstruction using a monocuspid outflow patch. MRI provided useful information for deciding the surgical approach.

Keywords: Pseudoaneurysm; Truncus arteriosus; Magnetic resonance imaging; Surgical approach

1. Introduction

Pseudoaneurysm of the right ventricular outflow tract (RVOT) is a rare complication of cardiac surgical procedures done for congenital heart disease. In the literature, the initial procedures included right ventriculotomy and placement of an outflow patch, conduit, or homograft [1–6]. The treatment should be carried out soon after diagnosis because of the risk of spontaneous rupture [7]. Although a midline sternotomy could be safe in most patients, peripheral cannulation should be considered when the pseudoaneurysm adheres to the back of the sternum or extends and covers the ascending aorta. We describe a case in a child who developed a giant pseudoaneurysm after surgery on the truncus arteriosus. In preoperative evaluation, magnetic resonance imaging (MRI) provided useful information for deciding the surgical approach.

2. Case report

A 6-month-old boy had complete repair of the truncus arteriosus that included closure of a ventricular septal defect, RVOT reconstruction (RVOTR) and truncal valve repair. A RVOTR was performed without an external conduit, but with direct anastomosis at the posterior side augmented with bovine pericardium combined with a Gor-Tex monocusp at the anterior wall. Seven days after operation, the patient had a high fever and leukocytosis. The intravenous antibiotic treatment was commenced and continued for 5 weeks until the serum level of C-reactive protein was normalized. Before discharge from the hospital, cardiac catheterization was performed, confirming that there was no pulmonary regurgitation though there was trivial RVOT stenosis.

One year after the initial operation, chest X-ray film revealed enlargement of the upper left cardiac border. Two-dimensional echocardiography indicated an echo-free space in this area, and color Doppler flow mapping suggested communication between the RVOT and aneurysm. Cine-MRI (Fig. 1) showed a small high-velocity jet emanating from the right side margin of the RVOT, confirming the diagnosis of a pseudoaneurysm. The transverse plane of MRI (Fig. 2a) showed there was some distance between the sternum and pseudoaneurysm. The sagittal and coronal planes of MRI (Fig. 2b) showed that the pseudoaneurysm adhered to the left side of the ascending aorta, while the anterior and right sides were free from aneurysm, suggesting that aortic cannulation was feasible in the ascending aorta. There was a mild stenosis between the main PA and PA branches because of compression by the huge pseudoaneurysm. The RV pressure was 38 mmHg.

In view of the MRI findings and the intimate relations of
the aneurysm, sternum, aorta and RA, the median sternotomy approach and ordinary central cannulation were thought to be feasible to establish a cardiopulmonary bypass. Thus, careful sternotomy was carried out and the right side distal ascending aorta was dissected to place an aortic cannula and a single venous cannula was inserted through middle of the RA. Under the beating heart on full cardiopulmonary bypass, the aneurysm was opened and the communication with the RVOT was confirmed. Re-RVOTR was carried out with the same method with bovine pericardium combined with a Gor-Tex monocusp, while both right and left PA branches were enlarged with autologous pericardium. Histopathological examination of the aneurysmal wall indicated polymorphonuclear leukocyte infiltration, suggestive of an infectious aneurysm. Postoperative catheterization was performed 1 year after surgery, confirming that there was no aneurysmal change in the RVOT.

3. Comment

Pseudoaneurysm of the RVOT is an exceedingly rare complication of surgical procedures done for the treatment of congenital heart disease. Although, in the literature, acute, dramatic, and life-threatening clinical presentation is very rare, intervention is necessary and should not unduly delayed. A midline sternotomy could be safe in most patients, but femoral bypass should be considered and prepared in all cases. When the patient is too young, femoral arterial cannulation may be a problem. In such a case, the thoracotomy approach [2,3] or neck vessel cannulation [4] may be alternatives. Often the pseudoaneurysm is not in the midline because of lack of space, but is off to the right or left of the sternum. However, surgical approaches need to be tailored to the individual situation, and evaluation of the precise spatial relations between the pseudoaneurysm and sternum, chest wall, aorta, and RA is crucial to choose the surgical approach.

Two-dimensional echocardiography and color-flow mapping are reported to be reliable in detection and evaluation of these defects [4–6], as indicated in the present case, however, it did not give enough information about whether or not median sternotomy would be safe or aortic cannulation feasible. Therefore, we performed MRI and found that

![Fig. 1. Cine-MRI shows a narrow bloodstream (arrow) emanating from the RVOT, confirming the diagnosis of a pseudoaneurysm. Aneu: aneurysm, Ao: aorta, RV: right ventricle, RVOT: right ventricular outflow tract.](image1)

![Fig. 2. (a) There is some distance between the sternum and pseudoaneurysm on the transverse plane on MRI. (b) The pseudoaneurysm adheres to the left side of the ascending aorta, while the anterior and right sides are free from aneurysm.](image2)
this was very useful to evaluate the anatomical relations between the pseudoaneurysm and surrounding structures. Unlike echocardiography, in which the quality of imaging depends on the examiner, MRI can obtain stable images regardless of the examiner and any image can be obtained from any direction. The combination of echocardiography and MRI can diagnose the location, size, and precise anatomical relations, therefore avoiding any invasive diagnostic approach. In addition to diagnosis, MRI can provide useful information to choose surgical approach, so that the thin-walled structure of the pseudoaneurysm is not entered before establishing a cardiopulmonary bypass.

References


