Case report

Translocation of dilated pulmonary artery for relief of bronchial compression associated with ventricular septal defect

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Abstract

Bronchial compression due to a dilated pulmonary artery is a troublesome problem in the surgical management of infants or children with congenital heart disease. We experienced an infantile case of ventricular septal defect and prolonged respiratory insufficiency caused by right bronchial compression and left pulmonary hypoplasia. Anterior translocation of the dilated right pulmonary artery and intracardiac repair succeeded in relieving the bronchial compression and improving left pulmonary function. We advocate that this procedure is useful for bronchial compression with congenital heart disease and maldevelopment of the lung.

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1. Introduction

Airway compression in infants or children with congenital heart disease causes severe respiratory insufficiency and increases mortality or morbidity [1,2]. Abnormalities in the vascular structure such as a vascular ring, an aberrant innominate artery or right aortic artery, or a massively dilated pulmonary artery cause tracheobronchial compression [3,4]. Dilatation of a pulmonary artery may be caused not only by a left-to-right shunt but also by uncontrolled or unbalanced dilatation of the central pulmonary artery, i.e. a stretched and dilated right pulmonary artery. Three-dimensional computed tomography showed a hugely dilated right pulmonary artery compressing each main bronchus (Fig. 1A), but the left pulmonary artery stayed narrow.

To correct these disorders, an operation was performed at the age of 18 months by patch closure of VSD and translocation of the right pulmonary artery by resection—reimplantation technique. Both pulmonary arteries were fully dissected and mobilized to prevent postoperative stenosis. The right pulmonary artery was transected from the main pulmonary artery and reimplanted in front of the ascending aorta to the main pulmonary artery (Fig. 2A—C). The main pulmonary artery was drawn to the right by one pair of sutures attached to the right-sided pericardium (Fig. 2D), so the central pulmonary artery was finally arranged to keep its good figure.

She was extubated on the third postoperative day, and her respiration did not require bidirectional positive nasal airway pressure on the fifth day after the corrective operation. We

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recognized that she did not suffer from bronchomalacia because she had no croupy breath on deep inspiration and her respiratory distress was immediately improved after repair. However, we continued to apply the respiratory support for 2 months to expand the injured bronchi completely and to prevent their restenosis. Enlarged lumen of each main bronchus was confirmed on postoperative computed tomography (Fig. 1B). Malposition of the heart and hypoplastic left lung was improved based on the chest roentgenogram. She was discharged from the hospital 4 months postoperatively after definitive correction.

3. Discussion

Tracheobronchial compression by vascular structures in infants with congenital cardiac defects except vascular sling is uncommon [3,5]. The relationship between the tracheobronchial tree and the anomalous vascular structure, and abnormal hemodynamics by cardiac anomaly cause airway obstruction [2,6]. Even a mild degree of extrinsic compression of the bronchi in infants results in airway obstruction because bronchial luminal resistance is inversely proportional to the fourth power of radius of the lumen [1,7].

Treatment for major airway obstruction associated with congenital heart defects in infancy is variable [4—8]. In our case, the stretched and dilated right pulmonary artery was considered to be a conclusive cause of airway obstruction as follows. Hypoplastic left lung made the heart fall into the left thorax so that the central pulmonary artery was pulled to the left and posterior side. The right pulmonary artery was extensively stretched and compressed the right and left bronchi. Furthermore, an unbalanced massive blood flow to the right lung generated huge dilatation of the right pulmonary artery, resulting in aggravating the respiratory distress. It was essential to repair the malposition of pulmonary artery and unbalanced pulmonary blood flow. In fact, the mortality and residual postoperative respiratory problems in infants who had had repair of the cardiac defect concomitant along with repair of bronchial compression are low as compared to infants who had had only repair of the cardiac defect [7].

Our approach — anterior translocation by resection—reimplantation technique — was reasonable in the case of bronchial compression by a stretched and dilated pulmonary artery. However, the procedure is not new at all and has already been adopted for the treatment of absent pulmonary valve syndrome [4]. It is commonly used in cases of a pulmonary artery sling. In addition, translocation of a pulmonary artery is also a useful procedure, as a Lecompt maneuver.

Reimplantation technique provided enough space between the ascending aorta and the right main bronchus to get complete relief from airway compression. Moreover, this procedure necessarily transferred the main and left pulmonary arteries to the dextro-anterior side. The anatomical change released the extrinsic compression of the left main bronchus and seemed to generate well-balanced and smooth blood flow to each lung. Additional suture traction to the right confirmed that the structural change of pulmonary artery was far more preferable. The low incidence of postoperative pulmonary stenosis might be provided by good reconstruction of pulmonary artery under no tension.

We advocate that the anterior translocation of pulmonary artery is a useful procedure for relief from bronchial compression by stretched and dilated pulmonary arteries.
in a case of a congenital heart disease and a malpositioned heart.

References


