

Early and midterm outcomes of left pulmonary artery angioplasty using an anterior wall flap of the main pulmonary artery in tetralogy of Fallot repair

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Objectives: Postoperative left pulmonary artery (LPA) kinking is problematic in repair of tetralogy of Fallot (TOF). We used angioplasty of the proximal LPA with an anterior wall flap of the main pulmonary artery (MPA) to prevent this problem.

Methods: We have used an anterior wall of the MPA as a flap for LPA angioplasty in 42 patients with TOF and pulmonary stenosis (26 males and 16 females) since February 2007. During the same period, 116 patients underwent total repair of TOF with pulmonary stenosis. The median age was 7.1 months (range, 3-88.8), and the median weight was 8.4 kg (range, 5-27). The indications for LPA angioplasty were acute-angle proximal LPA in 17 (40.5%), proximal LPA stenosis in 6 (14.3%), acute-angle and stenotic proximal LPA in 18 (43%), and short and small distal MPA in 1 patient. The patches used for MPA and LPA reconstruction were glutaraldehyde-treated autologous pericardium in 34 and bovine pericardium in 8 patients.

Results: No operative or late death occurred. The mean follow-up duration after surgery was 26.4 ± 18.6 months (range, 0.5-67). During the follow-up period, reoperation for LPA stenosis or kinking was not required in any patient; however, balloon angioplasty was performed with good results in 4 patients (9.5%). No postoperative kinking of the proximal LPA occurred. Echocardiography or computed tomography angiography at the recent follow-up visit demonstrated good branch pulmonary arteries in all patients.

Conclusions: Angioplasty of the proximal LPA using an anterior wall flap of the MPA in the patients with TOF and pulmonary stenosis is an effective method in the management of acute angle and/or stenosis of LPA without postoperative kinking. (*J Thorac Cardiovasc Surg* 2014;148:2597-601)

Although numerous published reports have demonstrated excellent immediate and long-term outcomes after surgical correction of tetralogy of Fallot (TOF),¹⁻³ branch pulmonary arterial obstruction related to postoperative left pulmonary artery (LPA) kinking is 1 of the most frequent indications for reoperation or reintervention.⁴⁻⁶ It is encountered in many patients with TOF undergoing reoperation for other reasons.^{7,8} Several therapeutic methods have been addressed to solve this problem.^{4,6,9,10} We report angioplasty of the proximal LPA using the anterior wall of the main pulmonary artery (MPA) as a flap for avoiding postoperative LPA kinking.

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Supported by a 2013 research grant from Pusan National University Yangsan Hospital.

Disclosures: Authors have nothing to disclose with regard to commercial support. Received for publication Aug 7, 2013; revisions received Oct 6, 2013; accepted for publication Oct 26, 2013; available ahead of print Dec 11, 2013.

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<http://dx.doi.org/10.1016/j.jtcvs.2013.10.060>

METHODS

Patients

The institutional review board at Pusan National University Yangsan Hospital approved the present study (approval no. 05-2013-025). We have adopted an anterior wall flap of the MPA for LPA angioplasty in 42 patients with TOF and pulmonary stenosis (26 males and 16 females) since February 2007. During the same period, 116 patients underwent total repair of TOF and pulmonary stenosis (42 of 116 [36.2%]). The median age was 7.1 months (range, 3-88.8), and the median weight was 8.4 kg (range, 5-27). A total of 18 palliative procedures were performed before TOF repair in 16 of the 42 patients enrolled in the present study. These included right modified Blalock-Taussig shunt in 3, left modified Blalock-Taussig shunt in 5, balloon pulmonary valvuloplasty in 9, and surgical infundibulotomy in 1 patient. A total of 16 patients underwent transannular patch enlargement of the right ventricular outflow tract. The indications for LPA angioplasty were an acute-angle proximal LPA in 17 (40.5%), proximal LPA stenosis in 6 (14.3%), acute-angle and stenotic proximal LPA in 18 (43%), and a short and small distal MPA in 1 patient (2.4%).

Surgical Technique

When a patient with TOF and pulmonary stenosis has an acute-angle and stenotic proximal LPA, we have used an anterior wall flap of the MPA for proximal LPA angioplasty to augment the posterior wall of the distal MPA and release the acute angle of the proximal LPA. A right-sided longitudinal incision was made at the MPA, and this incision was extended to the LPA inferior margin crossing the MPA-LPA junction (Figure 1, B). The anterior wall flap of the MPA was unfolded toward the LPA and anastomosed to the incision at the under surface of the LPA to enlarge the posterior wall of the distal MPA and alleviate the acute angle of the MPA-LPA junction using fine polypropylene suture (Figure 1, C). A small incision was added to

Abbreviations and Acronyms

- LPA = left pulmonary artery
- MPA = main pulmonary artery
- RPA = right pulmonary artery
- TOF = tetralogy of Fallot

prevent stenosis of the suture site at the LPA (Figure 1, D). The MPA and LPA incision sites were covered with a reversed D-shaped patch using continuous suture under arrested heart or beating heart conditions (Figure 1, E). The patches used for this technique were glutaraldehyde-treated autologous pericardium in 34 and bovine pericardium in 8 patients. After this procedure, we could observe an obtuse-angle and broad proximal LPA (Figure 1, F). Follow-up computed tomography angiography also showed the same findings (Figure 1, F, small box).

Proximal right pulmonary artery (RPA) stenosis was present in 9 patients. In these cases, a longitudinal incision was made from the MPA incision site to

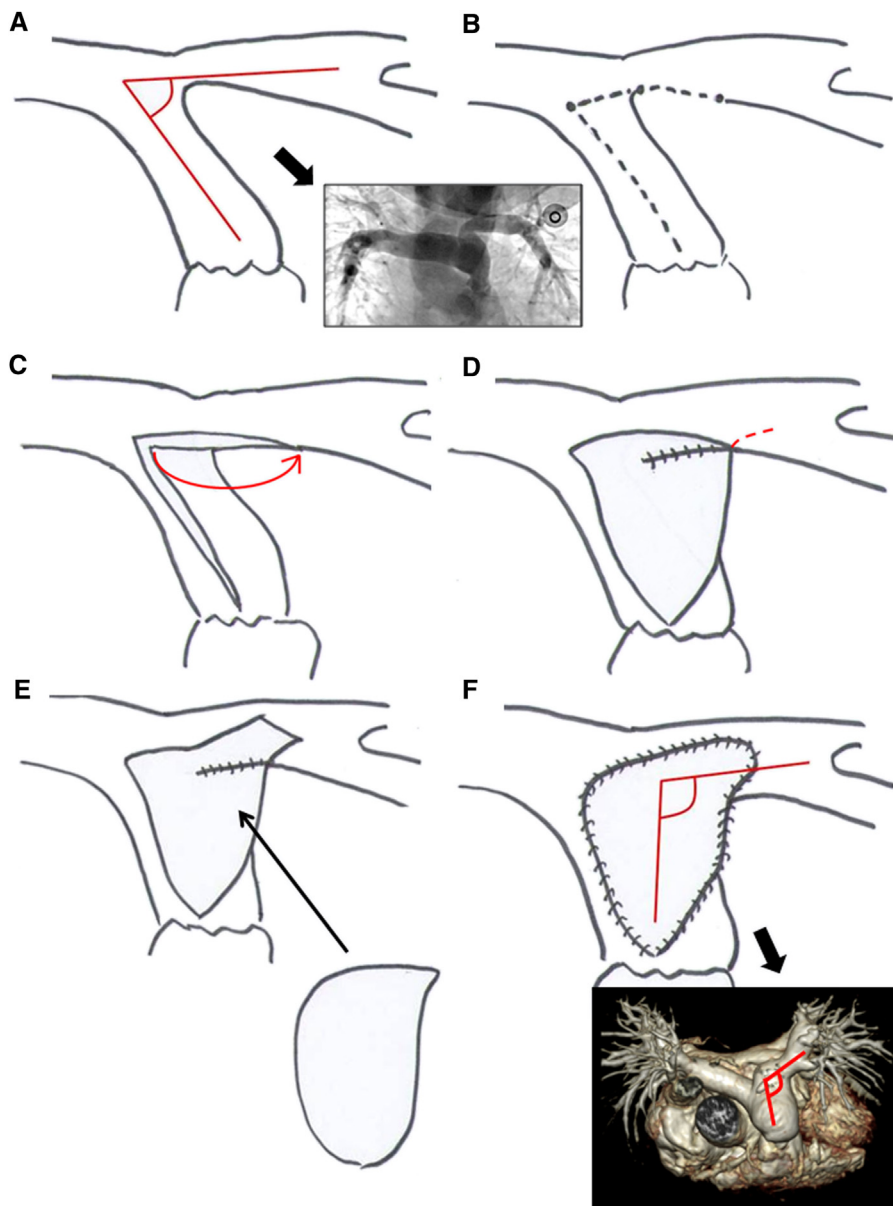


FIGURE 1. Schematic drawings of (A) left pulmonary artery (LPA) angioplasty (*inset*) of an acute-angle and stenotic proximal LPA, (B) a right-sided longitudinal incision extending to the LPA inferior margin and crossing the main pulmonary artery (MPA)–LPA junction, (C) an anterior wall flap of the MPA unfolded toward a LPA, (D) the addition of a small incision to prevent stenosis of the suture site at LPA, (E) coverage of the MPA and LPA incision sites with a reversed D-shaped patch, and (F) an obtuse-angle and broad proximal LPA (*inset*).

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