

One-stage Hybrid Procedure for Patients with Valvular Pulmonary Stenosis and Coronary Artery Disease

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To the Editor: We report two cases of hybrid approach by combining percutaneous balloon pulmonary valvuloplasty (PBPV) and off-pump coronary artery bypass grafting (OPCABG).

A 68-year-old male was diagnosed congenital pulmonary stenosis (PS) and unstable angina. He had a history of chronic obstructive pulmonary disease (COPD). Echocardiography revealed dilated pulmonary artery branch and severe valvular PS. Transvalvular peak systolic pressure gradient (PG) was 64 mmHg (1 mmHg = 0.133 KPa). Coronary angiography demonstrated 75% narrowing of left main coronary (LM), 90% narrowing of left anterior descending artery (LAD), and 100% occlusion of right coronary artery (RCA). The second patient was a 52-year-old male with the symptom of dyspnea on exertion and lower extremities edema. He had a history of chronic kidney disease. Echocardiography revealed that transvalvular peak systolic PG was 73 mmHg. Coronary angiography revealed three-vessel disease including 90% narrowing of LAD, 80% narrowing of the first diagonal branch (Diag), and 90% narrowing of mid left circumflex artery.

Both patients were diagnosed PS and coronary artery disease (CAD) with severe co-morbidity. One-stage hybrid procedure involving PBPV and OPCABG was performed in a hybrid suite. For the first patient, right ventricular angiography was performed with 5F catheter through the right femoral vein, which revealed limited opening of the pulmonary valve and enlargement of pulmonary artery trunk. INOUE-BALLOON IMS catheters (Toray Industries, Inc., Tokyo, Japan) of 26.5 mm and 27.5 mm were applied to dilate the pulmonary valve. Transvalvular PGs were measured, which decreased from 64 mmHg before PBPV to 10 mmHg after PBPV. Right ventricular angiography showed that right ventricular pressure decreased from 79/4 mmHg to 22/3 mmHg and that pulmonary artery pressure decreased from 25/14 mmHg to 21/12 mmHg. Hemodynamics was stable during PBPV. Attention was turned to OPCABG once PBPV was complete. After median sternotomy, the coronary stabilizer device was placed while one section of left saphenous vein was harvested to bridge ascending aorta and LAD, and the other section to connect the first conduit sequentially to Diag and RCA. The second patient underwent a similar procedure. Balloon catheter (Shen Zhen Qing Yuan

Medical, Inc., China) of 28 mm was applied to dilate the pulmonary valve [Figure 1]. Improvement of the pulmonary valve PG was observed after balloon dilation, which decreased from 73 mmHg to 21 mmHg. Right ventricular pressure decreased from 90/11 mmHg before PBPV to 25/5 mmHg after PBPV. Moreover, pulmonary artery pressure decreased from 30/18 mmHg to 24/19 mmHg. Then, OPCABG was followed with internal mammary artery and saphenous veins being the grafts.

Both patients recovered uneventfully. No complications related to lung and kidney occurred. Echocardiography demonstrated satisfactory results of PBPV and heart function at 1-year follow-up.

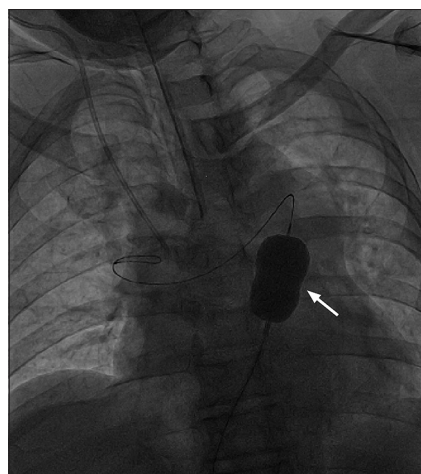


Figure 1: This graph shows that pulmonary stenosis causes the invagination of the balloon (white arrow) during the beginning of percutaneous balloon pulmonary valvuloplasty. When the balloon dilates, the invagination will disappear immediately.

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Received: 08-12-2015 **Edited by:** Ning-Ning Wang
How to cite this article: Liu JJ, Ren CW, Wu WH, Lai YQ. One-stage Hybrid Procedure for Patients with Valvular Pulmonary Stenosis and Coronary Artery Disease. Chin Med J 2016;129:624-5.

Access this article online

Quick Response Code:



Website:
www.cmj.org

DOI:
10.4103/0366-6999.177005

With the advances in cardiac surgical and interventional techniques, exploring new methods aiming at reducing postoperative complications seems to be important. Due to lack of symptoms, diagnosis and treatment may be delayed in some adult PS patients, and a few may associate with CAD. It is not rare for adult PS patients to coexist with CAD. From December 2009 to January 2015, 78 adults (>40 years old) were diagnosed congenital PS in our institute and 10 of them (12.8%) associate with CAD. Traditionally, valvuloplasty and CABG are performed with the use of cardiopulmonary bypass (CPB). For patients with multi-comorbidity, the use of CPB may increase the occurrence of complications. In this circumstance, it is difficult for surgeons to choose a suitable procedure.

PBPV is generally recommended for symptomatic patients when transvalvular peak systolic PG exceeds 50 mmHg.^[1] The immediate and long-term results are excellent with few severe complications.^[2] In addition, both off-pump CABG and on-pump CABG have excellent rate of target vessel revascularization and long-term patency rate.^[3] Off-pump CABG is a valuable technique that may particularly benefit some high-risk patients, such as those with diffusely diseased aorta, pulmonary disease, kidney or hepatic dysfunction. In our cases, the first patient was diagnosed COPD 10 years ago with oxygen saturation around 85–90%. The second suffered from chronic kidney disease for 3 years with high serum creatinine (206 μmol/L) preoperatively. Lung and kidney dysfunctions are both well-documented complications of CPB.^[4,5] The probability of CBP-related complications increases proportionally with the worsening of preoperative organ function. One-stage hybrid technique of PBPV and OPCABG was applied to these patients with satisfactory outcomes.

Patient selection is important for a one-stage hybrid technique. Valvular PS, excluding severe infundibula stenosis, may be a good candidate for PBPV. In addition, which procedure should be

performed first is controversial. In our present cases, PBPV was followed by OPCABG in that PS was the main issue based on clinical manifestations and examinations. However, PBPV might cause arrhythmia, beating arrest, or hemodynamic deterioration to those with severe left main artery disease. OPCABG performed first might be an alternative. Our preliminary experience has demonstrated that one-stage hybrid technique of PBPV and OPCABG could be a safe and effective alternative technique for some selected patients.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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