

“Atrial kissing procedure” and bilateral pulmonary artery banding—initial rescue for a high-risk newborn



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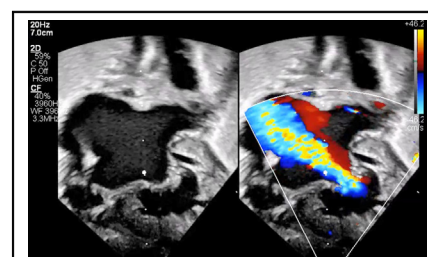
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Preoperative echocardiography with severe mitral regurgitation and enlarged left atrium.

CENTRAL MESSAGE

Anastomosis of atrial appendages is proposed as a rescue procedure for left atrial decompression in a newborn with aortic atresia, severe mitral valve regurgitation and intact interatrial septum.

Video clip is available online.

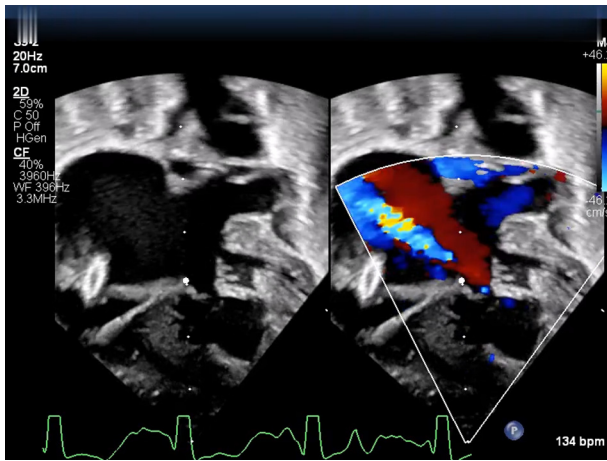
The combination of aortic atresia, mitral valve dysplasia with severe mitral regurgitation, and severely restrictive or intact atrial septum requires an interatrial septal intervention during fetal life or immediately after birth. We performed an off-pump anastomosis of atrial appendages, the “atrial kissing procedure,” and bilateral pulmonary artery banding for a newborn in such a critical condition (institutional review board number and date: Pro00015566; July 1, 2021). A waiver of informed consent was obtained.

CASE PRESENTATION

A few hours’ old baby boy (birth weight 3 kg) at 37 weeks of gestation was transferred to our cardiac intensive care unit immediately following an uneventful labor. Prenatally, he was diagnosed with severe lymphangiectasia of the lungs and nutmeg lung (pulmonary lymphangiectasia) at the 26 weeks of gestation by fetal magnetic resonance imaging. Prenatal stenting of the interatrial septum with a 2.5-mm stent was performed in an outside hospital. Impending hydrops was aborted. Fetal diagnosis was confirmed with postnatal echocardiography, which showed aortic atresia with diminutive ascending aorta and hypoplastic transverse aortic arch, mitral valve dysplasia with severe mitral insufficiency, intact ventricular septum, and severely restrictive atrial septum with an obstructed 2.5-mm interatrial stent in place (Video 1). Transthoracic echocardiography showed up to 17-20 mm Hg mean transatrial gradient, severely dilated left and right

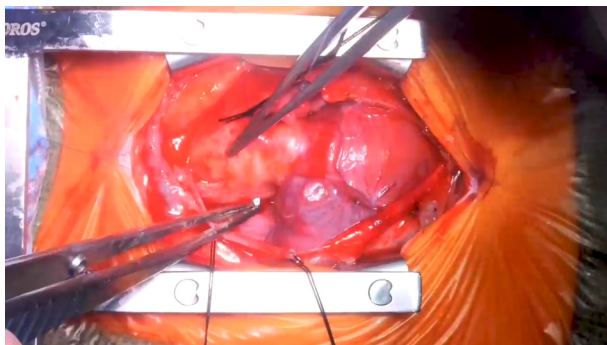
atria, right ventricular compromise by a dilated left ventricle with severely decreased systolic function, and large patent ductus arteriosus with right-to-left shunting.

On continuous prostaglandin E1 and impending cardiogenic shock with extracorporeal membrane oxygenation on standby, an urgent cardiac catheterization was performed. Multiple attempts for atrial septostomy and dilation of the existent interatrial stent failed because of severe recurrent multifocal arrhythmia with episodes of supraventricular tachycardia and short cardiac arrest periods requiring cardiopulmonary resuscitation. Eventually, the patient was urgently transferred to the operating room on high-dose inotropic support with cardiopulmonary bypass (CPB) on standby. Following median sternotomy, first a bilateral pulmonary artery banding was performed in the standard fashion¹ to significantly stabilize the hemodynamic situation. Several episodes with supraventricular tachycardia and ventricular tachycardia with loss of pulse pressure required defibrillation, topical cold saline application, and antiarrhythmic medication during bilateral pulmonary artery banding. Severe biatrial enlargement with an



VIDEO 1. Preoperative echocardiography with severe mitral regurgitation, severely enlarged left atrium, compromised right ventricular by a dilated left ventricle with severely decreased systolic function, and obstructed interatrial septum. Video available at: [https://www.jtcvs.org/article/S2666-2507\(23\)00422-4/fulltext](https://www.jtcvs.org/article/S2666-2507(23)00422-4/fulltext).

enormous left atrium and left atrial appendage and the proximity of both right and left atrial appendages made us think about a possible off-pump surgery. Following the bilateral pulmonary artery banding procedure, the frequency of significant arrhythmia decreased slightly, and both appendages were controlled with side-biting clamps and opened widely by resecting pectinate muscles. Direct anastomosis of left atrial appendage with right atrial appendage could be performed anterior to the main pulmonary artery (Video 2). Postoperative transthoracic echocardiography showed the unobstructed flow in the anastomosis of atrial appendages, decreased estimated left atrial pressure, and the branch pulmonary artery bands with good position and adequate gradient. The procedure was well tolerated. The patient was transferred to the cardiac intensive care unit in stable hemodynamic condition with moderate-dose inotropic support.



VIDEO 2. Surgical video of the “atrial kissing procedure” and bilateral pulmonary artery banding. Video available at: [https://www.jtcvs.org/article/S2666-2507\(23\)00422-4/fulltext](https://www.jtcvs.org/article/S2666-2507(23)00422-4/fulltext).

Three weeks later, the pressure gradient through the anastomosis of atrial appendages started to increase gradually. On postoperative day 30, the patient underwent surgical atrial septectomy, a left-sided Starnes procedure, and bilateral atrial reduction procedure on externally induced ventricular fibrillation at 20 °C on CPB. On the second postoperative month, the patient required urgent extracorporeal membrane oxygenation support and subsequently left ventricle assist device implantation due to global respiratory failure with subsequent cardiorespiratory depression. However, he remained critically ill with marginal respiratory function despite high-ventilatory settings, with moderate-to-severe CO₂ retention. In a meeting with the family, it was decided to proceed with comfort care due to the poor prognosis by the existing severe chronic lung disease. The patient died at the age of 3 months.

DISCUSSION

High inotropic support and postcardiopulmonary resuscitation status, decreased left ventricular function, compromised right ventricular function, severely hypoplastic ascending aorta, and tense and enlarged left atrium were the complicating factors for an on-pump surgery. In a decision to institute CPB, there would be some further issues to address while maintaining a patient on CPB, such as safe arterial/ductal cannulation, effective venting of the heart, prevention of possible pulmonary valve regurgitation following main pulmonary artery cannulation, and maintenance of adequate systemic, myocardial, and cerebral flow without pulmonary overflow. Due to all these reservations and high-risk features of the patient, bilateral pulmonary artery banding and extracardiac atrial appendage anastomosis were preferred over surgical septectomy on CPB.

CONCLUSIONS

As an initial surgical off-pump rescue, the atrial kissing procedure and bilateral pulmonary artery banding in high-risk newborns with impending cardiac arrest allows for initial stabilization, allowing time for recovery and further decision-making.

Conflict of Interest Statement

The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

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