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Commentary: Should aortopulmonary shunts be combined with aorto-right ventricular shunts or with a ventricular assist device?

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CENTRAL MESSAGE

Aortopulmonary shunts can be combined with aorto-right ventricular shunts to palliate pulmonary atresia, intact ventricular septum, right ventricular–dependent coronary circulation. Combining them with a ventricular assist device is another promising alternative.

In this issue of *JTCVS Techniques*, Said and colleagues[1] report a combined modified Blalock–Taussig shunt (MBTS) and an aorta (Ao)–tricuspid valve (TV)–right ventricular (RV) shunt in a neonate with pulmonary atresia, intact ventricular septum (PA/IVS), RV-dependent coronary circulation (RVDCC), and bilateral coronary ostial atresia. The patient was bridged by this "double-shunt" strategy until heart transplantation after undergoing 2 runs of extracorporeal membrane oxygenation.

Neonates with PA/IVS, RVDCC, and abnormal coronary arteries are very challenging patients with a high risk of morbidity and mortality. The best way to bridge these patients to transplantation remains controversial. Besides palliative care, which remains an option to discuss with parents, the traditional treatment options are continuation of prostaglandin and listing for transplantation, a MBTS, and a ductal stent and listing for transplantation. The combined MBTS and Ao-RV shunt, first described in the 1990s, is another option that should be kept in mind.

Such an Ao-RV connection has 2 main advantages. Through its bidirectional shunting (right ventricle to aorta in systole and aorta to right ventricle in diastole), it allows for a decrease in suprasystemic RV pressure, thus possibly decreasing or preventing endocardial injury to the right ventricle on the one hand and increasing the diastolic pressure in the right ventricle to improve RVDCC blood flow on the other hand. Said and colleagues actually describe a bidirectional flow in the shunt by both intraoperative fluorescence angiography and Doppler echocardiography.

The authors describe connection of the Ao-RV shunt through the tricuspid orifice. This technique is theoretically quite interesting, as it eliminates tricuspid regurgitation and can help optimize oxygen delivery to the right ventricle and the coronary circulation by elimination of venous influx into the right ventricle. That being said, this technique may come with some additional risks: risk of injury to the conduction tissue, risk of creating a RV–to–right atrial fistula, risk of compression of the graft (a saphenous graft in this report) at the exit site of the graft from the right atrial wall (despite the use of a dilator), and more. Moreover, and more importantly, it is extremely difficult to predict in these fragile patients what is the actual clinical and hemodynamic benefit of adding a Ao-TV-RV shunt to the MBTS. An isolated MBTS is probably sufficient in neonates with at least 1 coronary artery supplied by the native aorta.

In neonates with PA/IVS and bilateral coronary ostial atresia, another very promising treatment strategy not mentioned in this report is the combination of a MBTS with

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a left ventricular assist device (VAD). This option actually may provide these patients with the safest, most reproducible, reliable, and stable way to "bypass" the coronary circulation abnormality and assist the heart to bridge the patient to transplantation. Despite its quite successful use in our center and others, the overall experience with this MBTS-VAD remains limited, and the technique should be further refined (eg, the optimal type of pump: centrifugal vs pulsatile) and reported for it to become more widely accepted by our community.

Reference

1. Said SM, Marey G, Greene R, Griselli M, Hiremath G, Aggarwal V, et al. The double shunt technique as a bridge to heart transplantation in a patient with pulmonary atresia with intact septum and right ventricular-dependent coronary circulation. *J Thorac Cardiovasc Surg Tech*. 2021;7:216-21.