Transcatheter closure of antegrade pulmonary blood flow with Amplatzer muscular VSD occluder after Fontan operation

To the Editor,

The Fontan procedure refers to any operation that results in the flow of systemic venous blood to the lungs without passing through a ventricle. An accessory source of pulmonary blood flow in patients with the Fontan procedure may cause elevation of the pulmonary artery pressure, leading to ventricular failure (1). An 8-year-old-girl with double outlet right ventricle presented with marked pleural effusion on postoperative day 14 after a Fontan procedure with extracardiac conduit without ligation of the pulmonary trunk. Her immediate postoperative course was uneventful. She had prominent pleural effusion with 80% saturation. Echocardiography showed significant antegrade flow from the right ventricle into the pulmonary artery. The superior vena cava and main pulmonary artery pressures were markedly high [26/22 mm Hg (mean 25 mm Hg) and 27/23 mm Hg (mean 24 mm Hg), respectively]. The pulmonary artery angiogram showed normally branched pulmonary arteries with rapid wash-off of the contrast. The diameter of the stenotic pulmonary valve was measured as 11.2 mm. A 12 mm Amplatzer muscular VSD occluder (AGA Medical, MN, USA) device was deployed very close to the pulmonary valve at the infundibular stenotic region (Fig. 1). The pulmonary artery pressure was not decreased immediately [27/21 mm Hg (mean 24 mm Hg)] when compared with the pressure measured before the intervention. Antiaggregant and anticoagulant therapy were started. The patient recovered uneventfully, with an oxygen saturation >90%, and was discharged two weeks later. She has been symptom-free on sildenafil treatment for one year.

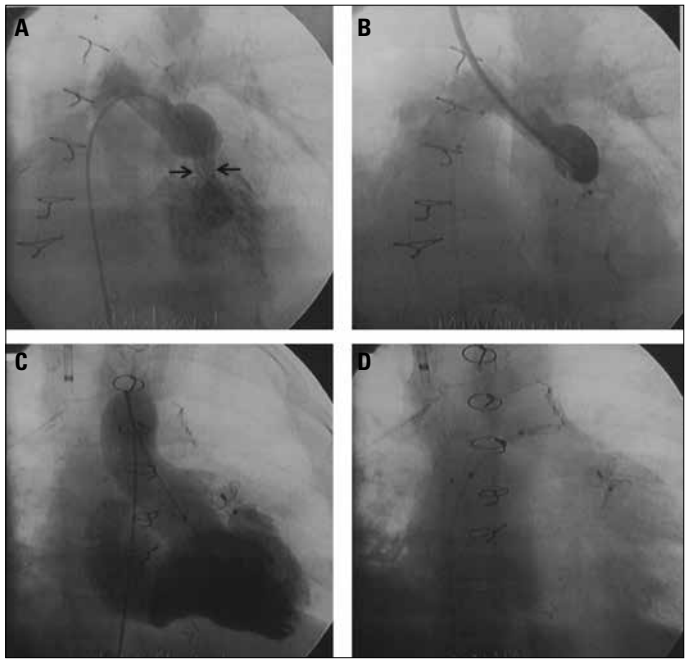

Figure 1. (A) ventriculogram showing antegrade pulmonary blood flow through stenotic infundibular area (arrows), (B) control angiogram through the delivery sheath confirming the site of device, (C) ventriculogram showing immediately complete occlusion after deployment of the device, (D) screening the device after release on fluoroscopy

Although several studies have reported that non-pulsatile pulmonary blood flow results in decreased capillary flow and increased vascular resistance (1), the preservation of antegrade pulmonary blood flow in a patient with a total cavopulmonary shunt may complicate the Fontan procedure, resulting in persistent pleural effusions or progressive ventricular failure (2). Therefore, the benefit of additional sources of systemic to pulmonary artery flow remains controversial.

Desai et al. (2) and Petko et al. (3) showed that transcatheter closure of ventriculopulmonary artery communication was a safe and effective technique for the treatment of selected patients after cavopulmonary shunt. Our opinion is also that transcatheter closure of pulmonary flow is an alternative to surgery because it is less invasive, easy to perform, reliable, and more comfortable. Madan et al. (4) reported an 8 year-old boy with thrombus in the pulmonary artery stump after a Fontan operation that included ligation of the main pulmonary artery distally to the pulmonary valve. Devices can be placed across the pulmonary artery band, across pulmonary valve tissue, and above the valve in a relatively large homograft without any focal narrowing (3). However, a thrombus may form if a room remains between the pulmonary valve and the device that can create stasis after the intervention. In this case, our preference is to deploy the device in the infundibular area.

Transcatheter closure of antegrade pulmonary blood flow seems a safe and effective alternative method to surgery in the treatment of selected patients who have undergone a Fontan procedure and show early complications such as pleural effusion due to excess pulmonary blood flow.

Tevfik Karagöz, Mustafa Gülgün[1], Metin Demircin*, Hayrettin Hakan Aykan, Alper Akın
Departments of Pediatric Cardiology and *Cardiovascular Surgery, Faculty of Medicine, Hacettepe University; Ankara-*Turkey*
[1]Department of Pediatric Cardiology, Gülhane Military Medical Academy; Ankara-*Turkey*

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Address for Correspondence: Dr. Mustafa Gülgün, Gülhane Askeri Tıp Akademisi Pediyatrik Kardiyoloji Bölümü, 06010, Etlik, Ankara-*Türkiye*
Phone: +90 312 304 43 93
E-mail: mustafagulgun@yahoo.com, mgulgun@gata.edu.tr
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