

# Successful balloon dilatation of an infolded polytetrafluoroethylene graft: An unusual cause of early Fontan failure

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## ABSTRACT

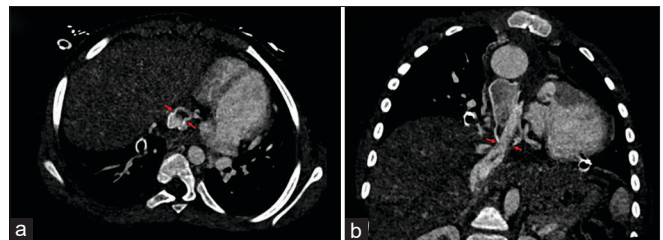
Despite optimal medical management, an 8-year-old boy had persistent pleural drainage following total cavopulmonary connection. Detailed evaluation, including computed tomography angiography, confirmed obstruction at the lower end of the circuit due to infolding of the polytetrafluoroethylene graft. Balloon dilation of the obstruction resulted in prompt resolution of pleural effusion with sustained relief at 1-year follow-up. The case demonstrates the importance of careful assessment in the diagnosis and successful nonsurgical management of an unusual cause of obstruction in the Fontan circuit.

**Keywords:** Balloon dilatation, Fontan failure, polytetrafluoroethylene graft, underexpansion

## CASE DETAILS

An 8-year-old boy with a double outlet right ventricle, nonroutable ventricular septal defect, and severe pulmonary stenosis underwent bidirectional Glenn surgery at 2 years of age. Echocardiography showed normal ventricular function with no atrioventricular valvar regurgitation. Following cardiac catheterization, with mean pulmonary artery pressure measured at 11 mmHg, he underwent extracardiac total cavopulmonary connection (TCPC) using a 19 mm nonring enforced expanded polytetrafluoroethylene (ePTFE) graft. Even after 3 weeks of surgery, pleural drainage persisted despite optimal medical management, including diuretics, dual pulmonary vasodilators, and dietary modification. There was no evidence of diaphragmatic palsy or lung pathology. Initially, based on preoperative computed tomography (CT) angiography, he underwent coil embolization of aortopulmonary collaterals. The

pleural drainage, however, persisted. Echocardiography showed obstruction at the lower end of the conduit with a gradient of 3 mmHg. The exact reason for obstruction, however, could not be clarified, and hence, a CT angiography was performed, which revealed narrowing at the lower end of the conduit with distorted noncircular



**Figure 1:** CT angiogram in the modified axial (a) and coronal (b) plane shows infolded lower end (arrows) of the ePTFE graft with partial thrombus. ePTFE: Expanded polytetrafluoroethylene, CT: Computed tomography

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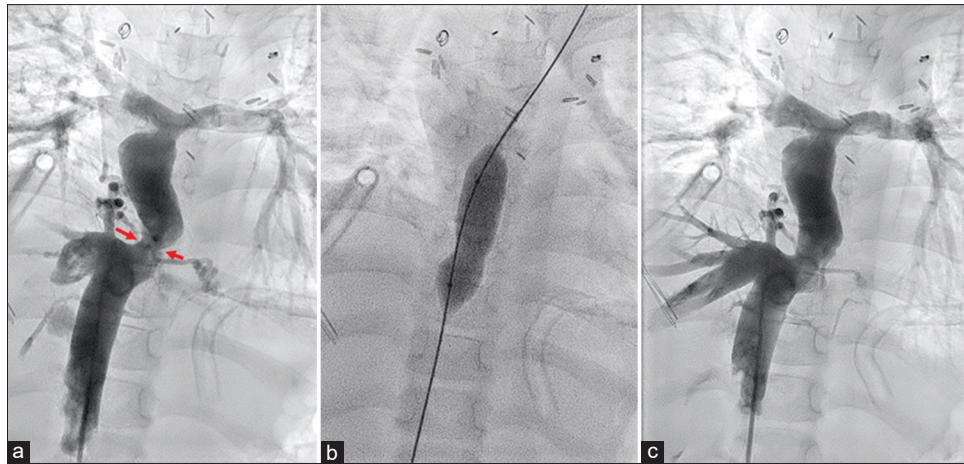
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**Figure 2: Catheter angiogram in posteroanterior projection before (a) and after balloon dilatation (c) at the lower end of the ePTFE graft. The narrowing (red arrows in panel a) disappeared following balloon dilatation (c). (b) The corresponding waist during balloon dilatation. ePTFE: Expanded polytetrafluoroethylene**

lumen at the site of anastomosis with the inferior caval vein [Figure 1 and Video 1]. Infolding of the ePTFE graft was deemed to be the cause of obstructed TCPC circuit. The patient was initially considered for surgical revision. However, considering the risk of redo cardiac surgery, focal narrowing, and graft infolding being the possible cause of Fontan failure, the patient was taken up for balloon dilatation of the lower end of the ePTFE graft.

Cardiac catheterization confirmed the obstruction with a gradient of 3 mmHg across the lower end of the graft. The mean pulmonary artery pressure measured 14 mmHg, while pressure in the inferior caval vein was 17 mmHg. There was no gradient between the conduit and pulmonary arteries. The angiograms also confirmed the narrowing at the lower end of the conduit [Figure 2a and Video 2]. Balloon dilatation was performed using 18 mm × 40 mm MAXI LD™ (Cordis, Florida, USA) at 6 atm for 20 s [Figure 2b and Video 3]. Postprocedure mean pulmonary artery and inferior caval vein pressure fell to 12 mmHg with no residual gradient. The angiogram also showed relief of stenosis and improved flow in the Fontan circuit [Figure 2c and Video 4]. The pleural drainage gradually decreased over the next 2 weeks, and patient was discharged home. At 1-year follow-up, the child is doing well with good effort tolerance and no evidence of obstruction on echocardiography.

In retrospect, we believe that the infolding of the PTFE graft could have happened secondary to an uneven suture line or infolding of the graft. The infolding was possibly more pronounced because the graft was nonringed. This also underscores the need for a thorough assessment of the conduit's lie and contour at the end of surgery. Any indentation or furling of the graft should be promptly rectified by simple outward traction or modifying the suture line.

The index case also demonstrates the importance of careful assessment in the diagnosis and successful management of an unusual mechanism of obstructed Fontan circuit. Should the mechanism remain unidentified, the patient would undergo a much riskier surgical revision or stent implantation across hepatic veins.<sup>[1]</sup> Complete resolution of obstruction and sustained relief of obstruction at 1-year follow-up substantiate the efficacy of balloon dilatation to relieve infolding of the PTFE graft although a suboptimal result or recurrence of obstruction would have warranted the placement of a stent.

#### **Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

#### **Conflicts of interest**

There are no conflicts of interest.

## **REFERENCE**

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