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CASE REPORT

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Late emergency arterial duct stenting in a patient with tetralogy of Fallot and occluded Blalock-Taussig shunt

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Abstract

Over the last decade or so, stent implantation to the arterial duct has achieved acceptance as an alternative to aortopulmonary shunt procedure. We present the case of a patient with tetralogy of Fallot with diminished pulmonary flow and complete proximal occlusion of a right-sided Blalock--Taussig shunt. Surgical repair was not possible because of relative contraindications, and the interventional shunt recanalisation attempt was unsuccessful. The coronary stent was implanted into arterial duct. This resulted in oxygen saturation increase with normal contrast flow to the left pulmonary artery and right pulmonary artery (prior to the procedure we suspected non-confluent pulmonary artery). This brief report evaluates the feasibility of this new therapeutical option in such special patients with duct-dependent pulmonary blood flow.
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Key words: stent, interventional cardiology, duct dependent circulation

Case report

A premature male, born during the thirty-fourth week of gestation, with birth weight of 2,700 g, had been diagnosed as having trisomia 21 and tetralogy of Fallot with duct-dependent pulmonary circulation. The patient was supported with continuous infusion of prostaglandins (alprostadil at a dose of 0.02 μg/kg/min) and mechanical ventilation, and was treated for thrombocytopenia. After 50 days of life, he underwent placement of a right modified Blalock-Taussig shunt (diameter 3.5 mm). Two weeks later, the patient was referred to our clinic with cyanosis and symptoms of infection (*Pseudomas aeruginosa sepsis*). He developed severe hypoxia with oxygen saturation decreased to 50–60%. Echocardiography revealed the small patent arterial duct with low velocity shunting and non-confluent left and right pulmonary arteries. The right-sided shunt was not visualized (Fig. 1).

The emergency catheterization was performed under general anesthesia with mechanical ventilation; a single-plane Philips Integris CV angiograph was employed. The patient was treated with intravenous meropenem 20 mg/kg/dose according to antibiogram. Stent implantation into arterial duct (AD) was an emergency, life-saving procedure, so we decided to perform it, despite the risk of endocarditis.

We used the femoral artery approach (4 F sheath). Heparin was administered intravenously (100 units per kg of body weight) after cannulation of the femoral artery. Angiography through a diagnostic 4 F Judkins catheter inserted into the subclavian artery was performed. Tissue plasminogen activator (actilyse) was not administered.

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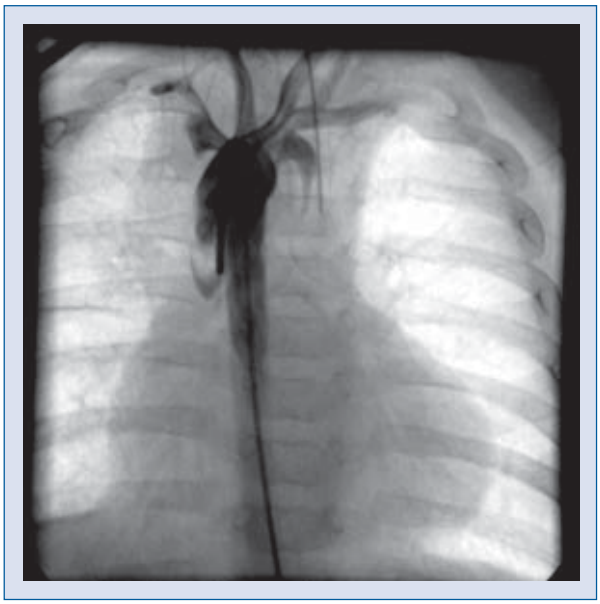

Figure 1. Angiographic view of the occluded right-sided Blalock-Taussing shunt.

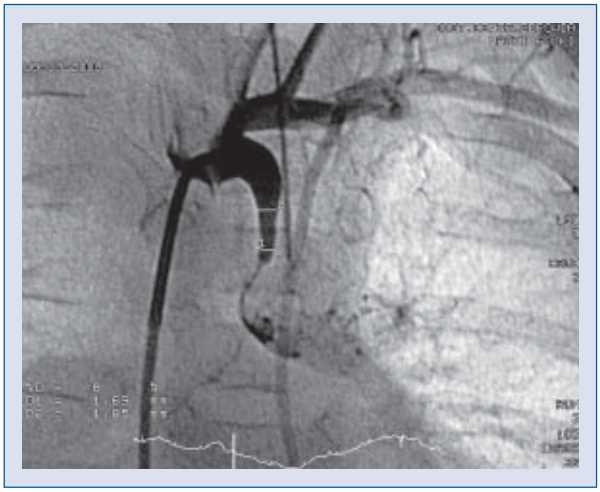

Figure 2. Angiographic view of the stenotic left-sided arterial duct.

Than we performed a selective angiography from the proximal part of the left-sided arterial duct. We noticed critical tubular duct stenosis (Fig. 2), and there was no contrast medium flow and communication between the left and the right pulmonary artery. We gently passed through the duct a soft coronary wire 0.014" and stabilized the distal tip in a left lower pulmonary branch. The balloon expandable low profile coronary stent (3.5 × 15 mm Chopin II manufactured by Balton, Warsaw, Poland) was delivered uncovered to the distal pulmonary circulation via a short vascular sheath (Fig. 3). The position of the stent prior to deployment was confirmed by comparison to a digital freeze frame of initial angiograms (the method described by Pass [1]).

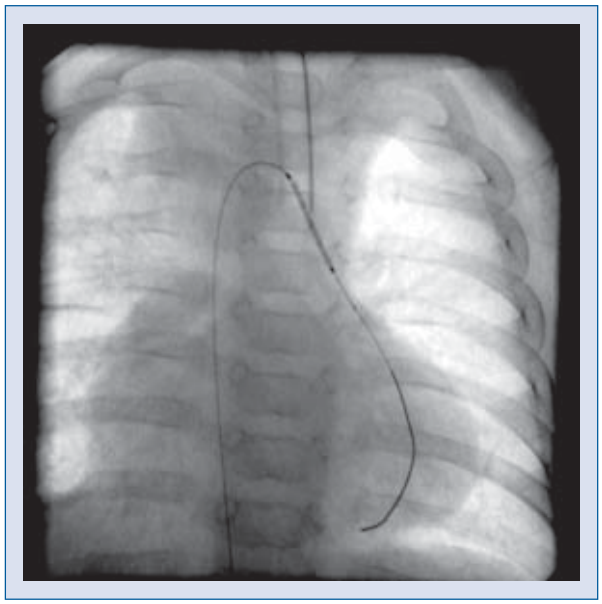

Figure 3. Fluoroscopy: positioning the flexible, pre-mounted coronary stent into the duct.

The position of the implanted AD stent is very important. We were trying to position the stent without changing the position of the angiographic table towards the radiographic lamp. This method allows only for approximate localization of the stent in arterial duct. An alternative (and more popular) method is to use a long vascular sheath or guiding catheter and perform an angiography in ductal orifice for exact localization of the stent in AD. However, this technique requires an arterial sheath of a larger diameter (5 F minimum), which can be a technical problem in infants and small children. In our case, stent implantation into AD was a 'quick palliation' for the patient's condition, a means of stabilization before qualifying for total surgical correction.

The stent was implanted more distally than usual because we suspected non-confluent left pulmonary artery (LPA) and right pulmonary artery (RPA). The external diameter of the stent was not oversized and was compatible with the proximal duct diameter. On the final aortography we noticed normal, non-restrictive contrast medium flow to left and right pulmonary artery (Fig. 4). Oxygen saturation increased from 65% to 91%. Four hours after completion of the procedure, 1 mg/kg of body weight low-molecular weight heparin (enoxaparin sodium-clexane) was administered subcutaneously and the patient was then maintained on oral acetylsalicylic acid 3 mg/kg of body weight once daily.

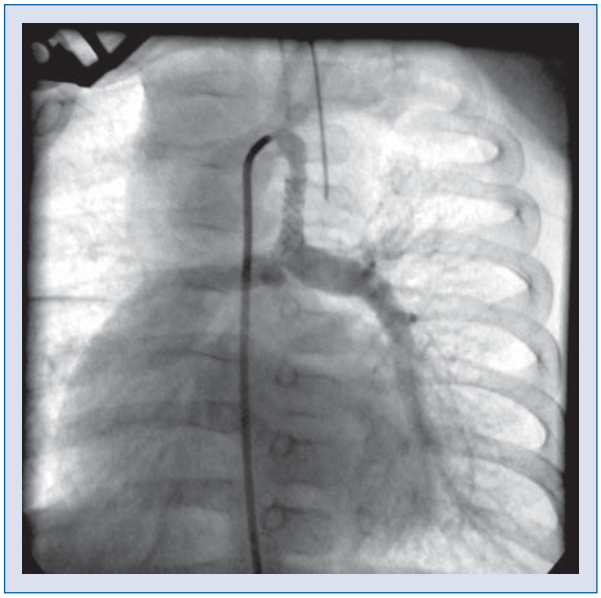

Figure 4. Contrast medium flow after the stent implantation.

Discussion

Arterial duct stenting in neonates with cyanotic congenital heart defects and duct-dependent pulmonary flow has been reported in many papers [2–6]. It has been proposed as an attractive alternative to the surgical shunt. According to the latest data published by Santoro and Palladino, such a procedure seems to be better than classic Blalock-Taussig anastomosis in avoiding any imbalance of lung perfusion with an increase of McGoon and Nakata indices [6].

In common with most interventional cardiologists, we prefer a pre-mounted coronary, flexible and low profile stent to stabilize the duct [3, 4]. The stent should cover the complete length of the duct [7]. The implantation procedure was performed without using a long vascular sheath.

We decided to implant the stent more distally than usual [7] due to specific anatomy:non confluent left and right pulmonary arteries (probably occlusion of the proximal LPA by ductal tissue) [8] and right-sided aortic arch. In our case, modified Blalock-Taussig shunt occlusion resulted in a sudden reduction of pulmonary vascular perfusion, causing a dramatic saturation decrease, cyanosis and deterioration in the patient's condition. This posed a direct threat to the child's life, so a coronary stent implantation to the critically narrowed duct was the rescue emergency procedure we chose. The access and position of the stent was easily achieved, with fluoroscopy time of 4.2 min.

Although some patients will need repeated cardiac catheterizations with subsequent stent re-dilatations due to intima proliferation, this procedure is worth considering [4–6, 9–11]. The latest data shows the benefit of using ropamicin-eluting stents (DES) for maintaining patency in critically duct-dependent patients [12].

In our case, the proximal part of LPA was probably tapered and covered by the ductal tissue, as in the histological examination published by Eizenga [13]. It might discontinue the pulmonary artery flow, and significantly increases the risk of total correction of tetralogy of Fallot.

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The authors do not report any conflict of interest regarding this work.

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