

Late coarctation of aorta caused by protrusion of Amplatzer duct occluder – a case report of transcatheter treatment

Późna koarktacja aorty spowodowana przez zestaw zamykający przetrwały przewód tętniczy (Amplatzer) – opis przypadku i skutecznego leczenia interwencyjnego

Paweł Dryżek, Krzysztof W. Michalak, Tomasz Moszura, Jadwiga A. Moll, Andrzej Sysa

Department of Cardiology, Polish Mother's Memorial Hospital, Research Institute, Lodz, Poland

Post Kardiol Interw 2010; 6, 3 (21): 134-137
DOI: 10.5114/pwki.2010.16355

Abstract

A case of 9-year-old girl with Down syndrome and pulmonary hypertension, who has coarctation of aorta caused by protruded part of Amplatzer duct occluder implanted 3 years earlier.

We described successful method of interventional treatment, with reset of patent ductus arteriosus (PDA) occluder device to gain good local conditions for CP stent implantation into aortal stenosis place. After procedure, there was no pressure gradient in descending aorta, CP stent was in proper position and the duct occluder was in position forced by pulling it back via femoral vein approach.

Key words: PDA occluder device, coarctation of aorta, interventional treatment

Streszczenie

Opisano przypadek 9-letniej dziewczynki z zespołem Downa i pierwotnym nadciśnieniem płucnym, z koarktacją aorty spowodowaną przez wystający do światła naczynia fragment zestawu zamykającego przetrwały przewód tętniczy (ang. *patent ductus arteriosus*, PDA) (Amplatzer), który założono 3 lata wcześniej.

Przedstawiono skuteczną metodę leczenia interwencyjnego z przezskórnym ponownym ustawieniem zestawu Amplatzer, poprzez jego wsteczne pociąganie w kierunku tętnicy płucnej. Umożliwiło to uzyskanie dobrych warunków do implantacji stentu CP w miejsce zwężenia aorty. Po zabiegu stent znajdował się we właściwej pozycji, bez gradientu w aorcie zstępującej, z ustawieniem zestawu zamykającego PDA wymuszonym podczas procedury implantacji.

Słowa kluczowe: zestaw zamykający PDA (Amplatzer), koarktacja aorty, leczenie interwencyjne

Introduction

Percutaneous transcatheter occlusion of patent ductus arteriosus (PDA) is currently common and trusty method of treatment. This procedure has many well proved advantages – good early and late results of duct occlusion, fast and safe procedure (comparing to surgical correction), and low complications level – in majority of cases minor or moderate complications [1-4].

Coarctation of aorta caused by duct occluder is a rare complication because usually when protrusion of PDA occluder is observed during procedure, it is possible to pull it back using lasso device and close PDA by surgical

approach. In case of late diagnosed coarctation with significant gradient through stenosis surgical removal of the device is preferred [5-7].

We would like to present method of transcatheter treatment in case of aortic obstruction caused by improper position of duct occluder, when device removing using transcatheter approach is no longer possible.

Case report

Nine years old girl with Down syndrome and primary pulmonary hypertension was admitted to our department because of signs of hypertension arterialis with a significant

Adres do korespondencji/Corresponding author:

Krzysztof Michalak MD, Oddział Kardiologii, Instytut „Centrum Zdrowia Matki Polki”, ul. Rzgowska 281/289, 93-338 Łódź, tel.: +48 42 271 21 84; fax: +48 42 271 14 78, e-mail: krzysiekmichalak@interia.pl

Praca wpłynęła 9.08.2010, przyjęta do druku 28.08.2010.

pressure differences between upper and lower limbs (50 mm Hg). Three years earlier, because of hemodynamically significant patent ductus arteriosus, she was qualified for percutaneous closure of PDA. Because of additional factors associated with this congenital defect there were some controversies during qualifications for percutaneous implantation of duct occluder. Significant primary pulmonary

hypertension is usually a disqualifying factor for transcatheter closure of PDA but in this patient, hypertension was estimated during qualification as only flow hypertension. Flow through PDA was from aorta to pulmonary artery (left to right shunt) during diastole and systole and balloon occlusion trial before duct occluder implantation decreased significantly pulmonary artery pressure (78/40/59 mm Hg



Fig. 1. Coarctation of aorta caused by a part of duct occluder, which sticks out to the lumen of aorta

Ryc. 1. Koarkcja aorty spowodowana przez część zestawu zamykającego PDA, wystającą do światła aorty

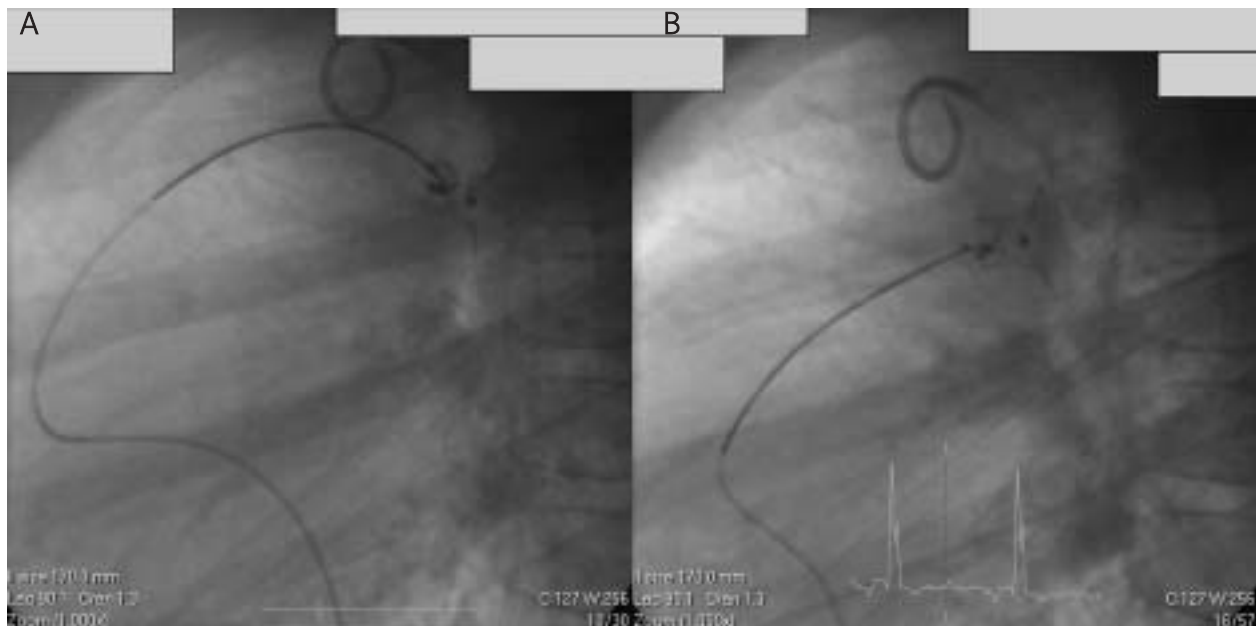


Fig. 2. Amplatzer duct occluder caught using Amplatzer lasso catheter device 10 mm (A) and pulled back to minimize its protruded part in aortic lumen (B)

Ryc. 2. Zestaw zamykający PDA uchwyciony zestawem Amplatzera z lassem 10 mm (A) pociągany wstecz przez tętnicę płucną w celu zmniejszenia części wystającej do światła aorty (B)

before occlusion, 44/18/27 during occlusion – systolic pressure/diastolic pressure/mean pressure accordingly). Patient underwent transcatheter implantation of Amplatzer duct occluder 8/11 mm through 7 F sheath with good results – confirmed in control angiography and trans-esophagus echocardiography – total PDA occlusion and no signs of aortic obstruction (no pressure gradient through aortal isthmus and laminar blood flow with speed of 1.1 m/s).

During current admission, patient was in good condition. However, on echocardiographic examination significant aortic stenosis of 4 mm was revealed (thoracic aorta diameter 10.5 mm) – with pressure gradient through obstruction of 74 mm Hg. Pulmonary hypertension – 75/45 mm Hg – was estimated using pulmonary and tricuspid insufficiency gradient in echocardiographic examination. Girl was qualified for catheterization, which confirmed stenosis size with significant pressure gradient (60 mm Hg). Stenosis was caused by a part of duct occluder, protruding to the lumen of aorta (fig. 1). There was no flow through ductus arteriosus. Pressure in pulmonary arteries was also significantly increased (71/29/49 mm Hg).

After consultation with surgeons we decide to implant a CP stent into stenosis place because there was no possibility to remove device percutaneously – it was rooted into vessel's wall. While the protruded part of Amplatzer device may cause an improper stent dilatation with some folds and fractures, we reset PDA occluder by pulling it back to gain good local conditions for stent implantation.

Right femoral vein and left femoral artery were cannulated. Via vein approach we reached pulmonary trunk and pulmonary part of ductus arteriosus. Using Amplatzer

lasso catheter device 10 mm we caught occluder thread and pulled it back to minimize its protruded part in aortic lumen (fig. 2). Arterial approach was used to introduce CP stent (8Z33). At the time when duct occluder was continuously pulled back in pulmonary direction, through



Fig. 3. CP stent implantation into aortic stenosis during continuous pullback of duct occluder in pulmonary direction

Ryc. 3. Implantacja stentu CP w miejsce zwężenia aorty podczas ciągłego pociągania zestawu zamykającego PDA w kierunku tętnicy płucnej

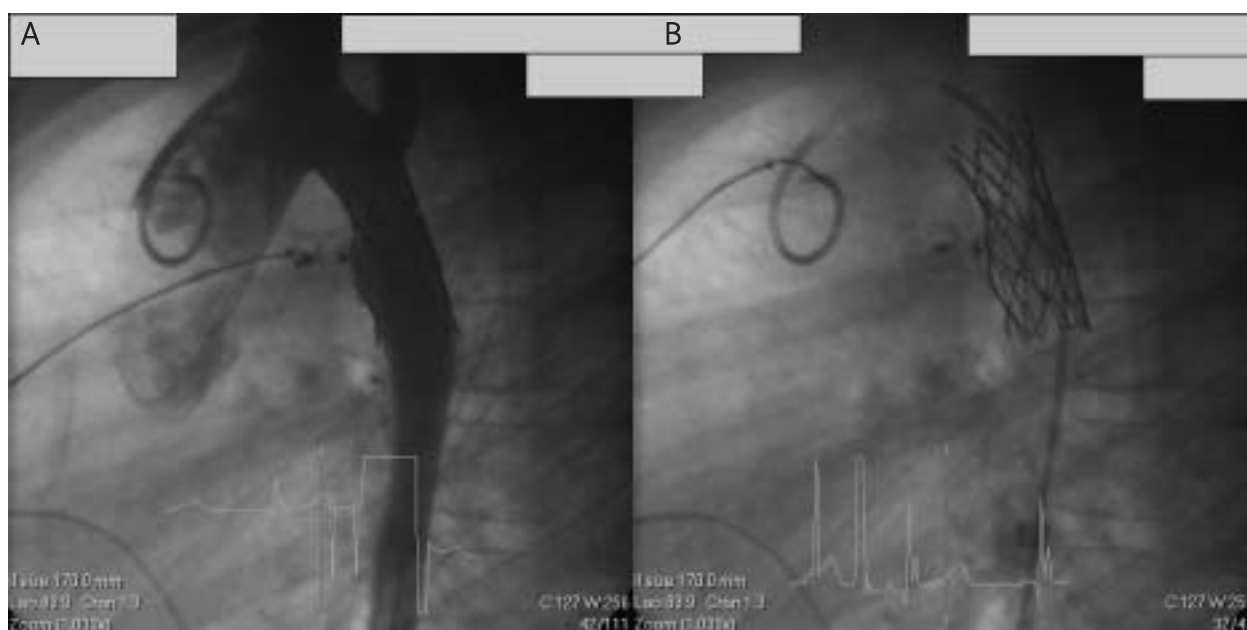


Fig. 4. Flow through aorta after CP stent implantation (A). CP stent implanted into aortic isthmus (B)

Ryc. 4. Przepływ przez aortę po implantacji stentu CP (A). Stent CP implantowany w cieśni aorty (B)

Mullins 11 F sheath, CP stent was implanted and expanded to 13 millimeters diameter using 14 × 40 mm balloon (fig. 3). Control angiography was performed – we didn't observe pressure gradient in descending aorta after procedure. Stent was in proper position and the duct occluder was in position forced by pulling it back.

We didn't observe any general or local complications during procedure; girl was dismissed in good condition and qualified for sildenafil treatment because of primary pulmonary hypertension.

Discussion

Coarctation of aorta caused by duct occluder in majority of cases occurs directly after device implantation. In this case it is possible to pull it back, try once more to implant it properly or just take it back and qualify patient for surgical closure of PDA. However, there is still a possibility that aortic stenosis arises late after implantation because of several local conditions, then treatment procedures should be chosen carefully and individually in each case. Late coarctation occurrence may be caused by specific anatomy of PDA's aortic end or growth of the vessels. In our case, the major reason of occluder protrusion was, in our opinion, significant pulmonary hypertension. Children with Down syndrome have some tendency to pulmonary hypertension which should be a disqualifying factor for duct occluder implantation [8, 9], but in such cases when all predictors indicate only flow hypertension this procedure is worth consideration.

There are few reports that in case of late aortic obstruction caused by PDA occluder the most effective procedure is cardiosurgical approach with device removal, ductus ligation, and repair of the coarctation [6, 7].

We decided to implant stent in coarctation to avoid surgical correction – in case of older children or adults such procedure is less traumatic and brings fewer complications. Of course protruded part of occluder may cause some troubles with proper stent deployment, but pulling it back via pulmonary artery helped avoid these problems.

CP stents are also enough resistant to endure the tension of released occluder and to hold it in set position.

Conclusions

Patients with implanted duct occluder should be followed-up regularly because of possible occurrence of coarctation of aorta – especially when pulmonary hypertension or atypical anatomy of PDA coexists.

Stent implantation in coarctation of aorta caused by protruded part of duct occluder is worth consideration when device cannot be removed because it is rooted into vessel's wall.

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