DOI- https://doi.org/10.3329/cardio.v17i1.80002

Case Report

Sequential Dilatation of Endovascular Stent in Coarctation of Aorta: Follow-up Case Report

Nurun Nahar Fatema

Lab Aid Cardiac Hospital, Dhaka and Department of Pediatric Cardiology, Bangladesh Specialized Hospital, Dhaka

Keywords: *Coarctation of aorta, endovascular stent*

Abstract:

A 2.6-year-old girl weighing 10kg was diagnosed as Severe Coarctation of Aorta in October 2008. Subsequently, she underwent Balloon angioplasty in April 2009 & later stenting of coarct area was performed with a covered stent in April 2014. In January 2024 she came for follow up after a long gap and re-coarctation was noticed in echocardiography. Balloon dilatation of the covered stent was performed with a 16 × 40 mm Z-med balloon successfully at 17 years of age. Successful journey of this patient since her first admission to pediatric ICU till today led us to write this report.

(Cardiovasc j 2024; 17(1): 45-47)

Introduction:

Coarctation of the Aorta is a common congenital defect that comprises about 8% of all congenital cardiovascular lesions.[1] Despite being a discrete lesion coarctation may consist of long segment stenosis.[1] Surgical coarctation repair is gold standard treatment for native coarctation of aorta in infancy, balloon angioplasty of coarctation of the aorta is an alternative, minimally invasive and well-accepted treatment option for the coarctation of the aorta. In older children and adult, stenting of coarctation of aorta is more reliable option for good long-term outcome. Endovascular treatment of native and recurrent coarctation of aorta gained a widespread acceptance since mid-1990s specially in adolescents and adults. Intravascular stent treatment of Coarctation of the Aorta has proved successful in 96-98% cases considering long-term cure and outcome.[2] Significant improvement in both outcomes and avoidance of acute/ intermediate complications have been observed in treatment of coarctation of the aorta over the past 10 years.[3] Moreover, sequential dilatation is possible competing with the growth of the patient.

Case Report:

A 2.6 years old female child weighing 10 kg was admitted with the complaints of repeated cough and cold, breathing difficulty and failure to thrive to pediatric cardiac unit of Combined Military Hospital, Dhaka. On examination the child was ill looking, pale, dyspnoeic with visible chest indrawing and on auscultation ejection systolic murmur was identified in intrascapular area. Chest x-ray (CXR) showed cardiomegaly and electrocardiography (ECG) showed left ventricular hypertrophy (LVH).

Echocardiography showed, severe Coarctation of aorta with moderate LVH. So patient was planned for coarctation balloon angioplasty. On April 2009 Balloon angioplasty for coarctation was done, the patient was stable during the post-operative period and discharged.

In November 2009, echocardiography showed, severe re-coarctation of aorta with mild supra-aortic stenosis. Thus repeat balloon angioplasty was planned. But she again missed her appointment and reported on April 2014. As her weight was 18 kg and age was 9 years old, so she was accepted for stenting with covered stent (14

Address Correspondence: Prof. Dr. Nurun Nahar Fatema, Congenital and structural Interventionist, Lab Aid Cardiac Hospital, Dhaka, Bangladesh. Email: colfatema@hotmail.com

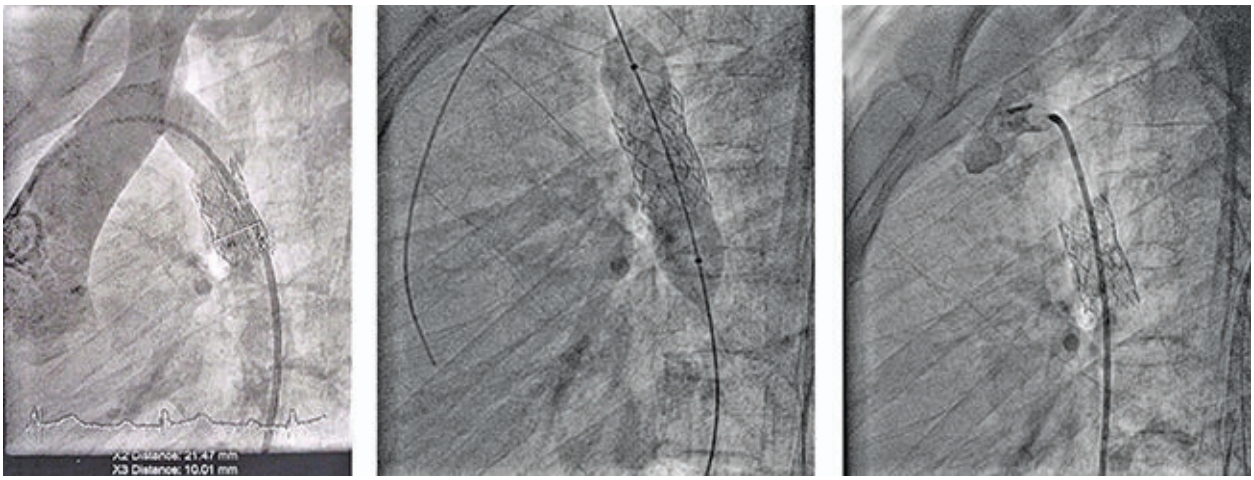

Figure 1: *A) Measurement of stent dimension and pressure gradient, B) Balloon dilatation of stent with 14*40 mm Z-Med high pressure balloon, C) No presurte gradient noticed above a7 below the stent after balloon dilatation*

× 30mm Advanta V12 balloon expandable covered stent). Her Coarctation stenting with Covered stent was done on 09.04.14.

On 07 June 2023, she came for follow up echo and moderate re-coarctation of aorta was noticed and balloon dilatation of stent was done.

Hardwires: Terumo wire 150cm, PTCA (Allstar wire), Pigtail catheter 6Fr, JR catheter 5Fr, Amplatzer-Superstiff exchange wire 260cm, Z-med high pressure balloon.

Mild narrowing of stent with moderate coarctation noticed, reasonable flow seen across the stent. Balloon dilatation of stent performed using 14x40 mm Z-med high pressure balloon over Amplatzer exchange wire. No residual stenosis was noticed. After balloon dilatation the pressure gradient above and below the stent was only 10 mm of Hg. A follow up echo was performed after 24 hours. Patient was discharged with antithrombotic medication and Beta blocker.

Discussion:

Coarctation of the aorta is a relatively common form of congenital heart disease, with an estimated incidence of approximately 3 cases per 10000 births. Coarctation is a heterogeneous lesion which may present across all age ranges, with varying clinical symptoms, in isolation, or in association with other cardiac defects. The first surgical repair of aortic coarctation was described in 1944, and since that time, several other surgical techniques have been developed and modified. But, transcatheter balloon angioplasty and endovascular stent placement offer less invasive approaches for the treatment of coarctation of the aorta.[4] In 1990 endovascular stents were introduced for native coarctation and re coarctation and since then they have become an alternative approach to surgical repair.[5]

With all forms of interventions for native CoA, repeat intervention may be required due to restenosis and/or aneurysm formation. Restenosis rates vary from 5% to 24% and are higher in infants and children and in those with arch hypoplasia.[6]

For infants and young children with recurrent coarctation, balloon angioplasty has been shown to be safe and effective with low incidence of complications. However, the rates of restenosis and reinterventions are high with balloon angioplasty alone.[6]

Stenting of a coarctation / re-coarctation of the aorta represents a safe alternative treatment without a significant mid-long-term complication.[7] Minimum weight required for such treatment varied in centres, in our centre it is 16 kg.

Unlike angioplasty, there is no need to over dilate the coarct segment during stenting. When a stent is implanted; the stent can be dilated to the desired diameter and further dilation can be done with larger balloon, if necessary.[7]

Balloon-expandable stents where re dilatation of stent is possible with growth of child is considered as a safe and very effective treatment modality in a significant subset of patients with coarctation of the aorta.[8]

In one study[9], twenty-five patients with aortic coarctation underwent stent implantation with covered stent. Coarctation diameter increased from (6.3 ± 3.5) mm to (14.4 ± 2.3) mm (P < 0.0001). Peak pressure gradient decreased from (25.3 ± 11.6) mm Hg to (2.5 ± 3.0) mm Hg (P < 0.0001). The stent achieved the desired diameter in all cases. There were no complications. At short-term median follow-up of 4.9 months, all patients were alive and well with no evidence of re coarctation or aneurysm[9]

Another study conducted, in between 1989 and 2005 by Congenital Cardiovascular Interventional Study Consortium (CCISC), a consortium of 17 centers where 588 stent implantation procedure for coarctation of the aorta was performed.[8] Among those 588 procedures, 580 (98.6%) were successful, as defined by reduction of the gradient to less than 20 mm Hg or increase of the ratio of the diameter of the coarctation area (CoA) to the diameter of the descending aorta to at least 0.8.[8]

Multivariate analysis found that age at operation is the only incremental risk factor for the occurrence of re-coarctation, late hypertension, and mortality. These sequelae can be avoided by elective aortic coarctation repair around 1.5 years of age. At that age, the probability of re-coarctation can be decreased to less than 3%, and the probability of upper body normotension and long-term survival will be optimal.[10]

Patients with CoA who reach adolescence after successful treatment demonstrate very good long-term survival up to age 60 years. Long-term morbidity is common, however, related largely to aortic complications and late hypertension.[11]

Above mentioned studies showed that the age at correction is the most important factor for the relief of hypertension and long-term survival.

Conclusion:

In conclusion, this case report justified the significance of early detection and management of coarctation of the aorta in children. Coarctation of Aorta is a congenital malformation that usually presents early in life and is often associated with congenitally abnormal aortic valve. Prompt diagnosis and intervention are crucial in preventing complications such as hypertension, heart failure and aortic aneurysm. With appropriate medical and surgical interventions, children with coarctation of the aorta can achieve positive outcomes and long-term disease free survival. Continued research and awareness are imperative to ensure timely identification and optimal care for children with this cardiac anomaly. Sequential angioplasty, stenting and dilatation of stent in this female patient was proved as an efficient nonsurgical technique to lead a normal life without any scar mark.

Conflict of Interest - None.

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