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Case Report

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Treatment of Coarctation of the Aorta in a 40-Day-Old Infant through Angioplasty and Stenting: A Case Report

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Abstract

Background: Coarctation of the aorta is a congenital heart disease that can lead to heart failure and severe symptoms during infancy. In many cases, these infants are candidates for surgery or correction of balloon angioplasty of coarctation, which would often lead to the recurrence of stenosis. This article aimed to introduce a successful case of angioplasty and stenting in a 40-day-old infant with coarctation of the aorta and severe heart failure.

Case Report: A 40-day-old infant weighing 4300 g with tachycardia, acute respiratory distress, loud second heart sound (loud S2), and a mild systolic murmur was referred to the Kerman Cardiac Center. Echocardiographic evaluation revealed left ventricular cardiomyopathy, severe coarctation of the aorta, and ejection fraction (EF) of 30%. The pulmonary artery pressure gradient was 50 mm Hg, and the pulses of the lower limb were weak. Given the patient's conditions, low weight, and young age being less than 3 months, angioplasty with stenting was performed. Despite the infant's young age and low weight, the stent was placed successfully, and the patient was discharged after 48 hours in good condition, with no complications reported in the follow-ups.

Conclusion: Coarctation of the aorta is a congenital heart defect that will lead to heart failure and death if it is left untreated. Accordingly, early recognition and timely interventions are effective in managing infants with this disease. In this study, stent placement in the infant was safe, improved the patient's symptoms, and prevented interventions.

Keywords: Coarctation of the aorta, Angioplasty, Stent, Infant, Case report

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Introduction

Coarctation of the aorta is a congenital stenosis, or obstruction of the partial aortic arch or the upper part of the descending aorta close to the arterial duct, which causes a pressure difference. The prevalence of this disease is 4 per 10000 live births, which accounts for 8% of cardiac anomalies and is ranked fourth among lesions in terms of prevalence requiring treatment during infancy. Coarctation of the aorta can occur at any age, but it is often diagnosed during infancy and early childhood based on symptoms, such as heart failure and problems associated with left-sided heart failure. After childhood or in later years, the lesion can represent itself with hypertension, and diagnosis may be delayed until a later time. Untreated patients have a shorter lifespan than the general population and usually die in their 30s and 40s, with bacterial endocarditis, intracranial hemorrhage, and heart failure being the most common causes of their death (1,2).

Different treatments have been suggested for these patients, such as surgery, which has a low risk in children and even in low-birthweight infants. Different surgical methods, such as end-to-end anastomosis and the subclavian artery patch technique, are used with each of which has its own advantages and disadvantages. Balloon angioplasty is one of the alternative treatments that have been used since 1982, which is less invasive and has fewer complications than other treatments. This method has a higher rate of success with its lower mortality and morbidity rate; however, some complications, such as arterial injury, aortic wall restenosis, and aneurysm formation, are reported in the area after coarctation repair following balloon angioplasty (1,2).

Expandable balloons or stents used as alternative methods are acceptable in older patients. Stents were reported to be able to reduce aneurysm formation in the descending aorta as well as restenosis related to the arterial structure; in addition, they reduced the pressure difference in the region of coarctation of the aorta by 5 to 10 mm Hg. Indications of using stents in coarctation of the aorta generally include a long coarctation area, aortic aneurysm following previous treatments, tortuosity in the aortic arch and the descending aorta, recurrent coarctation, and

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severe stenosis or aortic arch hypoplasia (1,2).

The use of stents is recommended for older patients weighing over 20 kg, but their use is reported in few cases in young children. This study aimed to introduce a successful case of angioplasty and stenting in a 40-day-old infant with coarctation of the aorta and acute heart failure (1,2).

Case Report

The patient was a 44-day-old infant weighing 4,300 g, who was referred to a pediatric heart surgeon by a pediatrician due to the systolic murmur, tachycardia, and occasional breastfeeding. The infant had no symptoms at birth, yet it was predictable because in an infant with PDA, coarctation of the aorta would not be marked. There was no family history of congenital disease and no history of drug use in the mother during pregnancy. Evaluation of paraclinical findings showed the hemoglobin level was 10.5, which was considered the onset of physiological anemia according to the patient's age (40-day-old).

Examination of the patient showed paleness, presence of a pulse in the upper extremity in full, presence of a weak pulse in the lower extremity, tachycardia, severe respiratory distress, loud second heart sound (S2 loud), and a mild systolic murmur.

Echocardiography showed signs of severe heart failure that included ejection fraction (EF) of 30 to 35% with left ventricular cardiomyopathy and severe discrete coarctation of 10 mm below the subclavian artery. In addition, the pulmonary artery pressure gradient was 50 mm Hg. A chest X-ray showed cardiomegaly, and an ECG showed tachycardia as well as LVH. Accordingly, captopril and inderal were prescribed for the patient, and intervention was performed after 7 days. Since balloon angioplasty increases the risk of restenosis and aneurysm in patients younger than 3 months, angioplasty with stenting was performed. Figure 1 shows stent placement steps.

The patient's EF increased to 45-50% after the intervention. There was no gradient at the site of stenosis, and the infant was discharged in good general condition 2 days after the intervention without dependence on external oxygen. Besides, no complications were observed during the two-day follow-up. Aortic dissection is the most common complication of this intervention, so it will be clearly recognizable if it occurs. Therefore, the absence of symptoms means that the intervention has had no complications. A follow-up conducted 2 weeks later reported no complications, and the patient's EF was 60%.

Discussion

Surgery is the primary treatment in infants younger than 3 months who suffer from coarctation of the aorta. However, alternative treatment methods are used when the results of a surgical treatment are considered inappropriate, or when the patient has certain characteristics. Angiography and stenting have been proven to be appropriate in adults and children weighing over 25 kg, yet they are acceptable in children weighing less than that as well (3).

Ballooning, in infants younger than 3 months, is used as a treatment for recurrent coarctation cases, so it is proposed as a primary treatment. Stenting has limitations in infants for a few reasons. In a study, multiple procedures were performed on patients with hypoplastic left heart syndrome or borderline left ventricles. Stenting in the descending arch may be necessary for facilitating the return of blood flow to the aortic arch, so the stent duct should cover the distal aortic arch (4-7).

Clot formation at the site of coarctation surgery is rare and can be problematic. It will be possible to compress the clot on the wall of the artery if the stent is long enough to cover the entire clot (8). Stenting in infants with coarctation at a young age can be used quite safely to facilitate surgery in the final stages to prevent acute postoperative problems. Indications of stent placement in coarctation are very different at young ages, which are mainly used to stabilize the patient's condition. Although subsequent interventions are inevitable due to the patient's growth, lesion repair varies based on the duration of the defect and the time needed for removing the stent (9).

The issue of physical growth and the need for using stents with sizes commensurate with these changes has led to a controversy over the use of stents in infants and young children. Accordingly, it seems that the ideal stent in these cases is a small one able to be resized and expanded in proportion to the vessels (10). It should be noted that

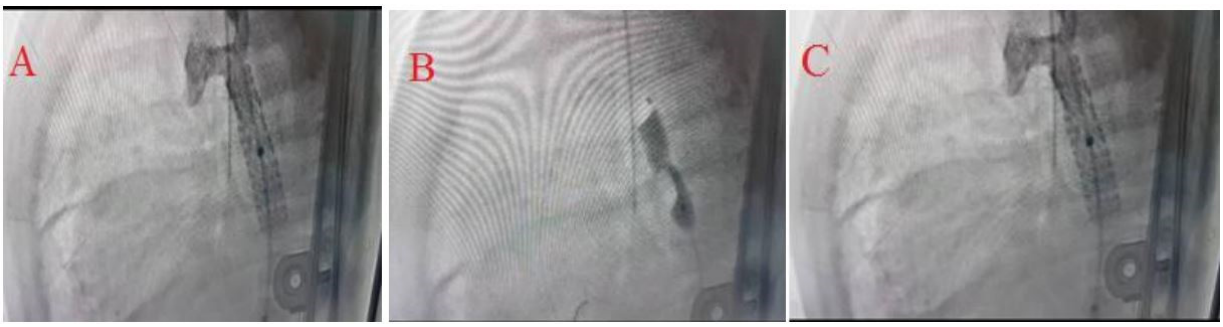

Figure 1. Stent placement steps using angiography in a child with coarctation of the aorta (A): The lateral view of the injection: discrete coarctation of the aorta and post-stenotic dilatation; (B): The lateral view of the injection: A balloon sized 6*20 mm was first prepared for pre-dilation; (C): The lateral view of the injection: The Formula stent (balloon extendable stent) sized 6*20 mm was successfully placed after injections

redilation is performed without open surgery and through angiography in the patient introduced in this study, in the case of recurrent stenosis. Besides, even in the case of recurrent stenosis in adults for the third time, it is possible for redilation by placing a covered stent without the need for open heart surgery.

The need for stent placement in critical clinical situations, where surgery is not possible or is a practical treatment, arises for those at a high risk of mortality (4). Therefore, it is possible to reduce complications and the treatment duration via surgical procedures and balloon angioplasty through providing appropriate conditions, patients, techniques, and tools.

Conclusion

Timely identification and treatment of infants with coarctation of the aorta are the primary steps in ensuring their survival. Stenting through angioplasty can effectively improve patients' symptoms and obviate the need for surgery in them. Gaining access to absorbable and biodegradable stents to be resized as children grow up promises access to more appropriate stents and modified indications for them in the near future.

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Authors' Contribution

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Competing Interests

The authors declare that they have no conflicts of interest.

Ethical Approval

This case report was approved by the Ethics Committee of Kerman University of Medical Sciences under ethical code: IR.Rums.REC.1399.182.

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