Percutaneous treatment of totally occluded the coarctation of the aorta with angioplasty and stenting

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Abstract. – The coarctation of the aorta (CoA) is one of the most frequently encountered congenital heart diseases and in most of cases it is characterized with a discrete narrowing localized on the thoracic aorta just distal to the left subclavian artery. The incidence of totally occluded CoA is very rare. The treatment options for CoA include surgical approaches, transcatheter balloon angioplasty, or stent placement. Although stenting has been the preferred method for the treatment of CoA, few studies exist in the literature regarding the use of stenting approach in the treatment of total occluded CoA. Therefore, we aimed to present a CoA patient treated using material and techniques used in the standard treatment of chronic total occlusion of coronary arteries.

Key Words: Congenital heart disease, Coarctation of the aorta, Stent.

Introduction

The coarctation of the aorta (CoA) is one of the most commonly come across congenital heart diseases and it is reported to comprise 6-8% of all congenital heart diseases. CoA is distinguished with a discrete narrowing restricted to the distal thoracic aorta down to the left subclavian artery in 98% of the cases studied. Currently, the repair of CoA contains surgical approaches, transcatheter balloon angioplasty, or stent placement. The first surgical repair of CoA was performed in 1945. The balloon dilatation approach for the treatment of CoA was used for the first time in 1982 and later the first stent implantation was introduced in 1991 for the same goal. Stenting is presently preferred method for treatment of CoA.

The incidence of totally occluded CoA is very seldom and when it occurs, its standard treatment routinely consists of surgical repair. Even though stenting has been regarded as the ideal method for the treatment of CoA, few cases exist in the literature concerning the application of stenting approach in the handling of total occluded CoA. Consequently, we intended to present a CoA patient treated using stenting method used in the standard treatment of chronic total occlusion of coronary arteries in addition to describing the stages of the method we followed.

Case Report

A 22-year-old female patient presented with exertional dyspnea was admitted to our Cardiology Clinic in July of 2010. Her medical history revealed that she had hypertension and put on amlodipine 10mg/day for last two years. In addition, she had a thorax computed tomography (CT) and was diagnosed with CoA in another Hospital. Her physical examination at our clinic showed a blood pressure of 150/90 mmHg in upper limbs, a heart rate of 85 beats/minute and a 3/6 degree systolic murmur on all cardiac auscultation areas. Moreover, her femoral pulses were weakly palpable bilaterally and was markedly delayed in comparison to upper limb pulses. No other abnormal findings were detected with the patient at the transthoracic echocardiography except for the left ventricular hypertrophy. Percutaneous transcatheter intervention was planned for the repair of the CoA.

Percutaneous Intervention

A 6F sheath was placed in the right femoral vein, and through which a temporary pacemaker lead was inserted to the right ventricle of the patient. Af-
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Figure 1. Retrograde angiography shows total occluded the coarctation of the aorta.

termath, another 6F sheath was placed in the right femoral artery, through which a multipurpose catheter was delivered to the distal part of the coarcted segment on the descending aorta. Aortic angiography was performed by retrograde way; the coarcted segment was totally occluded (Figure 1). Furthermore, we reimaged the coarcted segment of the descending aorta antegrade from the left brachial artery and retrogradely from the right femoral artery at the same time (Figure 2). Thereafter, the 6F sheath in the right femoral artery was replaced with a 12F long sheath. An over-the-Wire balloon dilatation catheter (OTW) was then inserted into the multipurpose catheter. Finally, an extra-stiff guide-wire was delivered through the OTW balloon to the site of the coarcted segment of the aorta. After repeated attempts, the extra-stiff guide wire was passed through totally occluded coarcted segment (Figure 3). The plaque at the coarcted segment was compressed using a 3.0/15 mm OTW balloon and pre-dilatation was performed under a 12 atm pressure (Figure 4). Consequently, the OTW balloon was removed and pre-dilatation at 12 atm pressure was repeated using 4.0/15 mm monorail balloon (Figure 5). At the end, a 15/35 mm covered stent (Cheatham-Platinum, NuMED Inc, Hopkinton, NY, USA) was delivered to the coarcted segment and the stent was implanted with accompaniment of right ventricular fast pacing (Figure 6). At the end of the operation, the precise placement of the stent was checked with antegrade contrast injections and the antegrade angiography showed that almost complete aperture was established in the coarcted segment of the aorta (Figure 7). We faced no complications during the operation and the patient was discharged with Clopidogrel 75 mg/day and acetylsalicylic acid (ASA) 100 mg/day treatment after a 48 h observation period. Moreover, the follow-up examinations at the first and third months following the intervention indicated that the patient was healthy and free of complications.

Discussion

Percutaneous treatment of aorta coarctation is preferred to surgery approach because it is less...
invasive, providing a rapid recovery period with high success rates. Stent implantation is shown to have lower complication rate when compared to balloon angioplasty and surgery\textsuperscript{6,8}.

CoA is not a simple mechanical disorder consisting of only aortic narrowing. The medial layer in the coarcted segment contains intense fragmented elastic fibers, increased connective tissue, and decreased smooth muscle cells\textsuperscript{9}. The balloon dilatation method can result into serious complications such as formation of an aneurysm, aortic dissection or aortic rupture in the traumatized abnormal vessel wall\textsuperscript{10}. By contrast, these complications are rarely seen during stent implantation\textsuperscript{6,8,11}.

![Figure 3. Extra-stiff guide wire is being passed through total occluded coarcted segment.](image3)

![Figure 4. While performing predilatation with over-the-wire balloon.](image4)

![Figure 5. While performing predilatation with 4.0×15 mm monorail balloon.](image5)

![Figure 6. Stent positioning with accompaniment of right ventricular fast pacing.](image6)
The most serious complication seen during the stent implantation is the occurrence of aortic rupture, which is rarely seen and can be fatal if it cannot be treated timely. Rapid stenting of the ruptured segment with a covered stent is the choice of treatment after aortic rupture. The operator must be vigilant against the possibility of rupture formation during the operation and covered stents should be available in the catheterization laboratory

Moreover, all patients treated with stent implantation should be monitored closely for recurrence of hypertension. MRI or CT controls should be done for the evaluation of patients with late complications such as aneurysm and recurrent CoA

In the present case, there are two features making the current case unique. The first is the use of percutaneous method for the treatment of totally occluded aortic coarctation. The second is the utilization of the material and techniques used in the standard treatment of the coronary artery showing chronic total occlusions in this operation.

In interventional cardiology sometimes physician may attempt to dare to use different techniques in certain difficult cases in addition to routine approaches. In this context, our approach was successful in the treatment of total occluded CoA. The present case suggests that the use of the method and materials used in the standard treatment of chronic total occlusion of coronary arteries can be also efficient in the treatment of total occluded CoA.

References