

TREATMENT OF A COARCTATION OF THE AORTA WITH SELF-EXPANDABLE STENTS: MIGRATION OF TWO STENTS AND ADEQUATE IMPLANTATION OF A THIRD STENT

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Balon anjiyoplasti ve stent implantasyonu aort koarktasyonu tedavisinde emin ve etkin bir tedavi seçeneğidir. Klinik çalışmalarda aort koarktasyonu tedavisinde kullanılan stentlerin büyük bir kısmı balon ekspandabildir. Buna rağmen self ekspandabil stentlerin kullanılması sporadiktir. Biz, ilk kez, aort koarktasyonu için iki adet Memotherm self ekspandabil stent migrasyonunu ve migrate olan stent ile overlapping üçüncü bir Memotherm

self ekspandabil stent implantasyonu ile koarktasyonun etkin tedavisine ait bir vakayı rapor etmekteyiz.

Anahtar kelimeler: Aort koarktasyonu, Stent, Self-ekspandabil stent, Stent migrasyonu

(Türk Girişimsel Kard. Der. 2006;10:34-37)

INTRODUCTION

Coarctation of the aorta (CoA) is a relatively common congenital heart disease. All patients with significant pressure gradient, whether symptomatic or asymptomatic, warrant surgery or endovascular intervention. Although surgery is effective, incidence of long-term complications is very high¹. That's why recently endovascular interventions using balloon angioplasty and stent implantation have been investigated as a treatment option for CoA. Balloon angioplasty was proved to be a feasible and effective therapeutic alternative to surgery². Endovascular stent implantation has improved the efficacy and safety of the balloon angioplasty³. The majority of the stents have been used for CoA in published reports were balloon-expandable stents^{4,5}. The clinical reports on self-expandable stent implantation have been sporadic^{6, 7}. We report here a clinical case with migration of two Memotherm self-expandable stents implanted for CoA and effective treatment of the coarctation with implantation of a third Memotherm self-expandable stent overlapping the migrated stents partially.

CESE REPORT

A 27-year-old man presented with dyspnea on

exertion as a chief complaint. He was detected to be hypertensive, and had been on treatment, with irregular compliance. He had no past history of rheumatic fever. Physical examination disclosed a blood pressure of 160/90 mmHg and a heart rate of 75 beats/min. Simultaneous palpation of the radial and femoral pulses disclosed a significant delay of the latter. Auscultation revealed a pansystolic murmur (III/VI) heard best at the apex; however, it was also heard well over the entire thoracic cage. An II/VI diastolic murmur at the left upper sternal border was heard. The remainder of the examination was normal. Electrocardiography showed left ventricular hypertrophy. Chest roentgenogram disclosed clear lung fields, with the cardiac silhouette at the upper limits of normal. The aortic arch demonstrated slight tortuosity. Transthoracic echocardiography revealed aortic root dilatation, mild left ventricular dilatation, symmetrical left ventricular hypertrophy and moderate mitral valve stenosis. The left ventricular systolic function was normal. Doppler showed mild mitral valve regurgitation and moderate aortic valve regurgitation. Coronary and peripheric angiography demonstrated a normal coronary arterial tree and a localized CoA distal to the origin of the left subclavian artery with pre and post-stenotic dilatation (Fig.1A). The gradient across the coarctation was measured as 65 mmHg through catheter using push-up pressure tracings. The diameters of the pre and post coarcted segment of the aorta and the coarcted segment were calculated as 19 mm, 22 mm and 6 mm, respectively. 11F and 7 F sheaths

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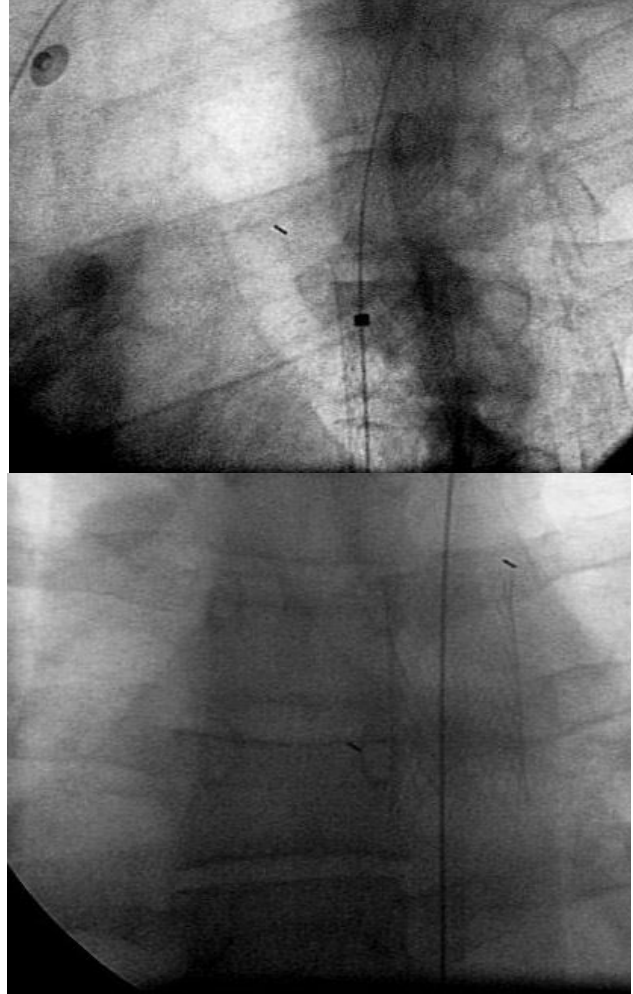
Figure 1: Angiograms showing coarctation of the aorta before (A), following (B) and 1 day after self-expandable stent implantation (C).



were introduced in the right and left femoral arteries respectively. The sheaths served as delivery systems for the balloons and stents. A self expandable Memotherm 4020 stent (40 mm in length with a maximum diameter of 20 mm. Bard Angiomed, GmbH&Co. Medizintechnik KG, Karlsruhe) was placed across the coarctation and the stent expanded after the sheath of the stent was withdrawn. Then, the stent was further dilated with two Optiplast 4010 balloons (Bard Angiomed, GmbH&Co. Medizintechnik KG, Karlsruhe) using kissing balloon angioplasty. Post-procedure angiogram showed satisfactory dilatation of the coarcted segment (now 15 mm in diameter) (Fig. 1B).

The gradient across the coarctation dropped to 6 mmHg after stenting. Post procedure diagnostic angiogram showed the stent to be in a good position

Figure 2: Angiograms following implantation of second and third self-expandable stents (A) and after six months follow up of coarctation of the aorta (B).



and to cover the coarctation segment adequately. After the procedure was finished, the patient was stayed at hospital. Chest pain was developed 1 day after the stent implantation and because of persisting of the chest pain, angiogram was reperformed. Angiogram showed the stent had slipped back just distal to the coarctation segment and restenosis of CoA had been developed (Fig. 1C). A gradient of 22 mmHg was measured across the coarctation. The diameters of the aorta at coarcted segment were calculated as 10 mm. Because of the significant gradient across the coarctation segment, a second Memotherm 4020 stent was placed across the coarctation site. The second stent slipped forth and expanded just proximal to the coarctation segment during the sheath withdrawal and remained in its position there-

after. Then, a third Memotherm 5018 stent was inserted across the coarctation segment to prevent restenosis of CoA and further migration of the implanted stents. The stent expanded and covered the coarctation segment adequately after the sheath withdrawal. The third stent overlapped the other two migrated stents partially and fixed them to the aortic wall. Balloons were not used for redilatation after second and third stent implantation. Post-procedure angiogram showed satisfactory dilatation of the coarcted segment (now 15 mm in diameter) (Fig. 2A). The gradient across the coarctation dropped to zero after stenting. Blood pressure came down to normal without antihypertensive medication and he was discharged on aspirin 300 mg/d alone. Thereafter, he was followed up for 6 months. He remained normotensive and his complaint of dyspnea was diminished. Electrocardiography, chest roentgenogram, transthoracic echocardiography and angiography were reperformed at the end the 6th month. Electrocardiographic and echocardiographic findings were about the same as the findings before the stents implantation. Chest roentgenogram showed the three stents to be in a good position, the central stent overlapping the other two stents, with no fracture or dislodgement. The follow up angiogram showed an aortic diameter of 16 mm at the coarctation site, and there was no pressure gradient across the stented area (Fig. 2B). There was no intimal hyperplasia or aneurysm formation.

DISCUSSION

In the typical form of the CoA there is isthmus narrowing of the distal segment of the aortic arc and poststenotic dilatation⁸. Most patients are asymptomatic and it is most often suspected during a routine medical examination when a systolic murmur heard or hypertension detected. All patients with significant pressure gradient, whether symptomatic or asymptomatic need treatment. Till recently, surgery was the only therapeutic option available for CoA. However, during the last decade, endovascular treatment using balloon dilatation proved to be successful, with less morbidity^{2,9}. To our knowledge, Singer et al. were the first to report use of balloon angioplasty for recoarctation of the aorta after surgical intervention in 1982¹⁰. Although, balloon angioplasty was used only for the treatment of recoarctation after surgery at past, it has gained acceptance in the treatment of native CoA as well, during last decade^{2,9}. Recently, implantation of endovascular stent to adult type CoA has been started and it was shown that stent implantation was more successful than balloon angioplasty alone³⁻⁵.

The majority of the stents have been used for CoA in published reports were balloon-expandable stents^{3-5,11,12}. In different series, it was reported that early and intermediate term results after balloon-expandable stent implantation were generally favorable^{3-5,11,12}. Although, self-expandable stents are easier to implant and have a similar efficacy in reducing coarctation as balloon-expandable stents, clinical reports on self-expandable stent implantation have been sporadic^{6,13,14}. Mangell et al. reported that, self-expandable stents incorporated within aortic wall better and risk of migration was lower than balloon-expandable stents. However, this study included not CoA but the aortic aneurysms¹⁵. Singh-Ranger et al. showed that, although the diameter of balloon-expandable stents remained the same, the diameter of self-expandable stents expanded further up to 6 months¹⁶. A medline search revealed only three reports on self-expandable stent implantation in CoA^{6,13,14}. Self-expandable Wallstents were used in these studies. However, in our study we have used self-expandable Memotherm stents. To our knowledge, self-expandable Memotherm stents have not been used in the CoA before. In our case, first and second self-expandable Memotherm stents migrated. However, third stent was implanted effectively. Migration of the stents may be partially due to small stent size and slippery noncompliant surface of the aortic wall. Increasing the size of the stent may reduce the risk of the stent migration.

Besides immediate gradient relief and patency after self-expandable Memotherm stent implantation, gradient relief and patency continued 6 months after procedure. Therefore, based on experience with this patient and that from other small case series, it appears that self-expandable stents might be a good alternative to balloon-expandable stent in treatment of CoA.

Conclusions: Self-expandable stents used for treatment of CoA may migrate during or after stent implantation. In case of stent migration, additional stent implantation besides treat CoA effectively, they can fix migrated stents to the aortic wall and prevent further migration. The short-term follow up of the patient has demonstrated continued gradient relief and patency.

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