

Stent Implantation for Native and Recurrent Coarctation of Aorta

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Abstract

Objective- This study was performed to evaluate the early results of stent implantation for aortic coarctation or recoarctation.

Methods- 19 patients with a mean age of 21 ± 12 years with aortic coarctation, 14 native and 5 recoarctations, were treated by stenting in our center over a period of two years. The mean peak systolic pressure gradient across the coarcted segment was $54 \text{ mmHg} \pm 14 \text{ mmHg}$.

Results- The procedure was effective in all 19 cases. Immediately after stent implantation the mean peak systolic gradient fell to $6\pm 4 \text{ mmHg}$ ($P < 0.001$). Complications occurred in 2 patients (stent migration in 1, edge dissection in another patient).

Conclusion- Stent implantation for aortic coarctation and native coarctation gives good immediate results. Non-invasive studies including spiral CT scan and echocardiographic study is recommended for follow-up after stent implantation in order to evaluate long-term results (*Iranian Heart Journal 2006; 7 (3):5-8*).

Key words: coarctation of aorta ■ stent implantation ■ recurrent coarctation of aorta

The optimal treatment for coarctation of the aorta is still controversial. Although balloon angioplasty of aortic coarctation gives acceptable immediate results, aortic dissection, aneurysmal formation and recurrent obstruction has been observed.¹⁻³ since the late 1980s, balloon expandable stents have been used in the treatment of peripheral and coronary artery disease.² after balloon dilatation, vessel recoil may lead to restenosis. Stents prevent this acute recoil of aortic wall after dilation of coarctation.⁴⁻⁹ In addition; the integrity of the vessel is maintained by preventing the extension of any vessel dissection that may have occurred after balloon angioplasty.

We report our experience of stent implantation in both native and post-operative coarctation of the aorta in adolescent and adult patients.

Methods

In a two-year period from 2005 to 2006, 19 patients underwent endovascular intervention. The mean age of the patients at the time of procedure was 21 ± 12 years. There were 11 males and 8 females; 14 patients had native coarctation and 5 had aortic recoarctation. Associated congenital cardiac defects were found in 3 patients. Two of them had small patent ductus arteriosus. One patient had mild aortic stenosis which had not required treatment at the time of the procedure. Indications for stenting included angiographic evidence of significant narrowing of the aorta and a peak systolic pressure gradient of more than 20 mmHg between the ascending and descending aorta determined at cardiac catheterization.

Written informed consent was obtained from the patients or their parents for the procedures.

Percutaneous puncture was made into the femoral artery for measurement of peak systolic pressure gradient between the ascending and descending aorta.

Aortic angiogram was performed in multiple projections (anteroposterior, left anterior oblique, lateral views) and the diameter of the aorta was measured at the level of the transverse arch, coarctation site and the descending aorta at the level of the diaphragm, as well as the length of the coarcted segment.

The technique used for stent implantation has been described previously.⁸⁻¹¹ A long 12-French Mullins sheath was advanced across the lesion over a stiff guide wire, then the stent was advanced inside the sheath to the coarctation segment. The balloon size chosen was nearest in size to the descending aorta at the level of the diaphragm.

Different stents were used depending on their availability in the market; most of them being Cheatan platinum 8-Zig stents which have capability of redilation. When the stent was carefully placed across the stenotic site, the long sheath was withdrawn to expose the stent-balloon assembly. The balloon was inflated using an ininflator.

After the stent was deployed, simultaneous pressure measurements and aortograms were made using the angiographic catheter and the delivery sheath (Fig. 1).

Antibiotics were given one hour before stent implantation and continued for 24 hours afterwards. All the patients received a heparin bolus (50 u/kg) during the procedure, and aspirin two days before the procedure and continued for six months.



Fig 1.

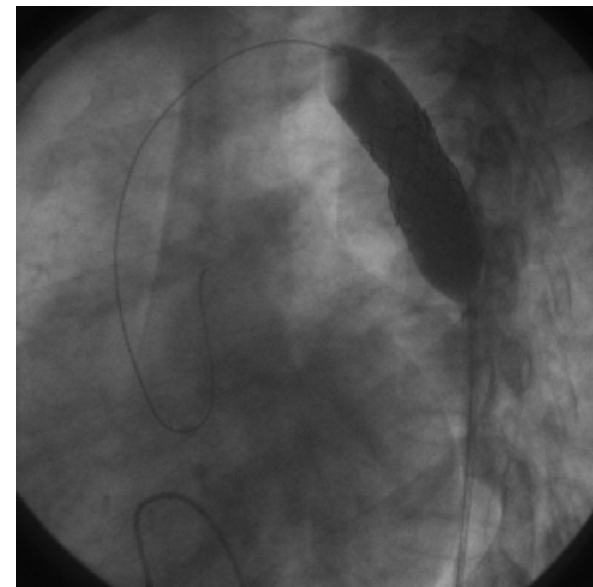


Fig 2.

Result

Twenty-one stents were implanted during procedures in 19 patients. The procedure was considered to be immediately successful in all patients. The peak to peak systolic gradient across the coarctation decreased from 54 ± 14 to 6 ± 4 mmHg ($P < 0.001$). The mean aortic diameter increased from 7.9 ± 2.4 to 17.1 ± 3.2 mm ($P < 0.001$). The mean fluoroscopy time for the procedure was eighteen minutes.

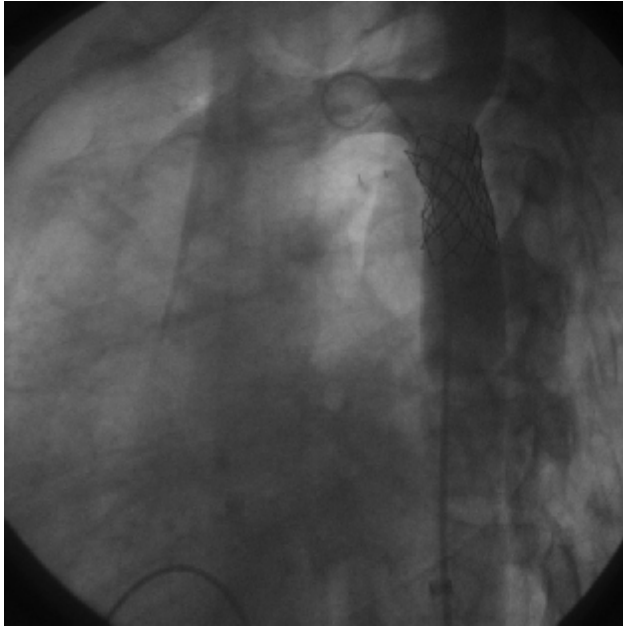


Fig 3.

Follow up

All patients underwent periodic clinical and paraclinical evaluation, including blood pressure measurement of the upper and lower limbs and echocardiography studies. CT angiography studies were obtained in 10 patients, which showed continued patency of the stent without any sign of aneurysm formation.

On follow-up, four patients were still taking anti-hypertensive agents, but blood pressure levels and the number of anti-hypertensive drugs were markedly reduced after the procedure.

Discussion

Aortic coarctation is a medical challenge and its approach needs to be reviewed. Previous studies of balloon angioplasty showed an improvement in the coarctation gradient¹²⁻¹⁵. The basic mechanism of balloon angioplasty is expansion of the constricted lumen, which produces tears and cracks in the intima and various degrees of split in the media.¹⁶ After balloon angioplasty, however, there are major limitations such as recoil and aneurysm formation and high restenosis rates.

Stent implantation for the treatment of coarctation of the aorta significantly reduces the systolic gradient and other complications of balloon angioplasty.⁸⁻¹¹

Data of our study are consistent with those previously reported by other operators. To achieve these results, we used Cheatan-platinum (CP) Eight-Zig stents (Numed Inc. Hipkinton, NY, USA) in all patients except in one patient in whom a Palmaz stent was used. We used CP covered stents in four patients. The CP stent is more radiopaque with rounded edges and less shortening after implantation. The CP stents were implanted using the balloon-in-balloon catheter (BIB, Numed Inc).

The most serious complication of stenting for coarctation is aortic dissection, and another complication is stent migration. The use of a BIB catheter may prevent this complication by providing better control during the inflation and positioning of the stent. No death occurred in our series.

Major edge dissection occurred in one patient, which was treated using a covered CP stent. A stent was dislodged in another level of the coarcted segment. This complication was corrected by implanting a second overlapping stent.

Vascular complications did not occur after the procedure.

Conclusion

Stent implantation for native coarctation and recoarctation is an effective and safe procedure and gives a good early and mid-term result. Long-term follow up is necessary to evaluate complications and continuity of its early results.

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