Balloon Angioplasty For Adults Coarctation Of Aorta: A Six Months Follow-Up Study

M Zade Shabestari, L Alizadeh, M Talaei-Khoei

Citation

M Zade Shabestari, L Alizadeh, M Talaei-Khoei. *Balloon Angioplasty For Adults Coarctation Of Aorta: A Six Months Follow-Up Study*. The Internet Journal of Cardiology. 2005 Volume 3 Number 2.

Abstract

Objectives: Balloon angioplasty for coarctation of aorta has become an acceptable alternative to surgical correction in the recent years. In this study, we evaluated the results of balloon angioplasty for aortic coarctation in nine adults immediately after and 6 months from the procedure

Methods: Nine documented coarctation cases with average age of 23 were chosen
Eight cases were male and one case was female. Balloon angioplasty of aorta was performed with number 15 pulmonary balloons. Patients were followed up for 6 months with echocardiography in order to document residual gradient and possible complications.

Results: Balloon angioplasty was performed without any acute vascular complication. After six months patients were evaluated for complications again. We also considered fluctuations in blood pressure levels. Average systolic blood pressure was dropped immediately from 180 ± 20 to 127 ± 8 (mmHg). Average diastolic blood pressure was decreased from 110 ± 10 to 86 ± 7 (mmHg) too. Average of systolic and diastolic blood pressures were 120 ± 10 and 85 ± 3 after six months. Gradient in coarctation region was dropped immediately from 60 ± 15 after balloon inflatation to13 ± 5 (mmHg). Average of gradient was 16 ± 5 (mmHg) after six months. All patients were free of anti-hypertensive drugs at the end of fallow up.

Conclusion: Balloon angioplasty of aortic coarctation without stents could be performed in adults with acceptable results without significant vascular complications and excellent blood pressure control after six months follow up.

INTRODUCTION

Congenital narrowing of the aorta may occur at any level of the thoracic or abdominal aorta [1]. It is usually found just beyond the origin of the left subclavian artery or distal to the insertion of the ligamentum arteriosum [1]. The coarctation may be localized or diffuse [1].

Operative treatment of coarctation and its associated anomalies may reduce the mortality rate [1]. Hypertension presented in the arms with weak or absent femoral pulses is a classic feature of coarctation. The pathogenesis of the hypertension may be more complicated than simple mechanical obstruction [2].

The lesion can be detected by two-dimensional echocardiography and aortography can prove the diagnosis. The obstruction should be corrected in early childhood either by surgery or by angioplasty [4]. Immediately after operation, whether surgery [3] or angioplasty, blood pressure may transiently rise even further (from baseline). These changes may reflect very high levels of renin-angiotensin and catecholamine [1].

Controversy exists about the role of balloon-angioplasty with or without balloon expandable stents in the treatment of native coarctation especially in neonates [5,6].

Occasionally in older children a stent can be placed if the balloon dilation fails to persistently increase the luminal diameter. In selected older children and adults, this has been very successful with an average reduction in the gradient from 25 to 5 mmHg in 32 patients at children hospital in Boston [8]. Although aneurysms-usually small- have been reported at the site of dilation in about 5 percent of cases, complications usually have been related to associated diseases [8]. Large catheters are necessary and trauma to the

femoral artery is not uncommon [7].

Patients, whose coarctations have been repaired, should be followed indefinitely. Significant recoarctation occurred in patients with a systolic blood pressure difference of 20 (mmHg)-or more-between the upper and lower extremities. Balloon angioplasty and/or stent placement is recommended for patients with significant recoarction [7].

PATIENTS AND METHODS

Nine cases with aortic coarctation documented by transthoracic echocardiography or aortography were chosen for this study. All of the patients were above twenty years old. Eight cases were male and one case was female. The average of their ages was 23 (Table 1). They all were hypertensive with variable peripheral symptoms such as claudication, fatigue, etc.

Figure 1

Table 1: Demographic and Hemodynamic Data

Mean age	23
Sex (Male to Female)	8 to 1
Gradient Pressure Preproc.	60 ± 15
Bp preproc.	180 ± 20 / 110 ± 10
Mortality	None
Acute Success	All*
Vascular Complication	None
Gradient postproc. (Acute)	13 ± 5
Gradient 6 months later	16 ± 5
BP postproc. (Acute)	127 ± 8 / 86 ± 7
BP 6 months later	120 ± 10 / 85 ± 3

* Immediate residual gradient less than 20 mmHg.

The study was performed between 2001-2003 in the Catheterization Department at Imam Reza Hospital in Mashhad/ Iran (http://www.erh.ir). After initial dilations with peripheral balloons, number 15 pulmonary balloons were used as the final method.

Evaluating the outcome, we also considered blood pressure response immediately and 6 months later. Patients were observed for early and intermediate complications such as dissection, aneurysm and sustained HTN.

RESULTS

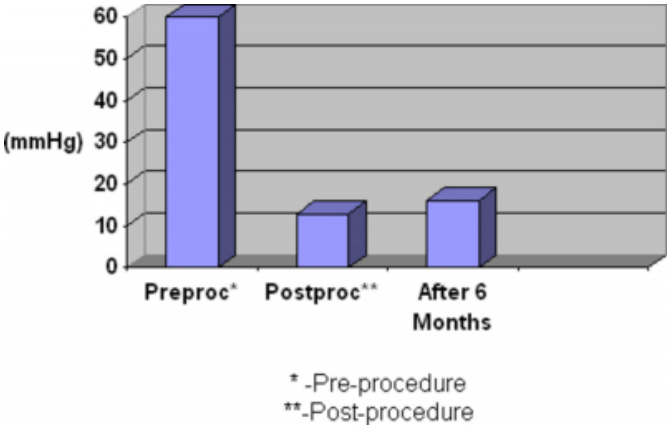
The gradient across the coarct segment dropped to less than 20 mm of Hg immediately after the balloon inflation. No case of dissection or pseudo-aneurysm was seen. There was no need to use stents in any of the cases.

Patients left catherization lab without any early vascular complications and with BP ranging 127 ± 8 in systole and 86 ± 7 (mmHg) in diastole. They were followed up 6 months after the procedure.

Systolic gradient in coarct area which was 60 ± 15 (mmHg) before angioplasty, dropped immediately to 13 ± 5 (mmHg) after the operation. After six months systolic gradient was 16 ± 5 mmHg (Figure-1).

Figure 2

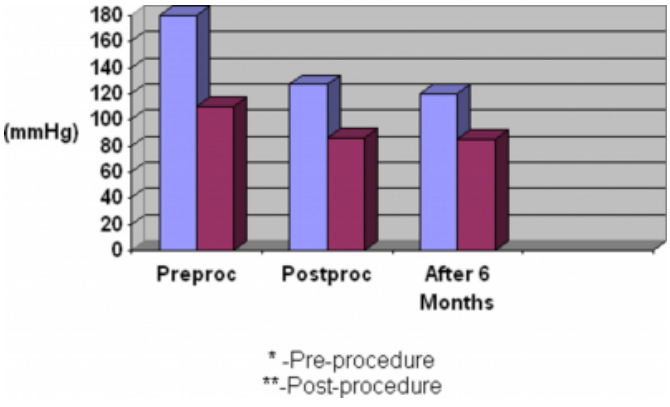
Figure 1: Changes in systolic gradient proximal and distal to coarctation area.



We were able to taper and discontinue anti-HTN drugs at the end of 6 months in all cases. Average of systolic blood pressure dropped from 180 ± 20 to 127 ± 8 immediately and to 120 ± 10 six months later. Diastolic blood pressure changed from 110 ± 10 to 86 ± 7 (mmHg) acutely after the procedure and to 85 ± 3 six months later (Figure-2).

Figure 3

Figure 2: Changes in systolic and diastolic blood pressures during the study.



DISCUSSION

Congenital coarctation of aorta, because of its complications, needs to be intervened. The conventional method for adult patients has been surgery with acceptable outcomes. Because

such a serious surgery and cardiopulmonary bypass are followed by common complications, and also because of economic problems, angioplasty of coarctation of aorta in adults has been grown up recently. Using aortic stents should always be considered.

A study done by Suarez de Lezo J et al evaluated the feasibility and immediate results of balloon-expandable stent implantation in 10 patients with severe coarctation of aorta. All of their study patients had an unfavorable anatomy for balloon angioplasty; 9 had isthmus hypoplasia. The angiographic stenosis disappeared in 7 patients and was markedly reduced in 3 [10]. In the Mendelsohn AM et al study, 59 children underwent balloon angioplasty of a native coarctation. It concluded that balloon angioplasty provides an effective initial treatment strategy for native coarctation in most children aged more than 12 months [11].

In this study, we followed the hypothesis that it is not always necessary to use aortic stents. While stents were deemed a worthy standby in all cases, we just used balloon angioplasty. There were no early complications and no need to use stents. Patients were followed up for six months for vascular complications and also to evaluate blood pressure.

Transthoracic echocardiography 2D and Doppler was performed; no evidence of re-coarct was seen at the end of six months (Recoarctation is interpreted as more than 20 mmHg recurrence of gradient at the procedure site [1]).

This method was also curative for secondary HTN in all cases. Final blood pressure of 110 ± 10 (mmHg) in systole and 85 ± 3 (mmHg) is interpreted normal or pre hypertensive by Join National Committee_7 [8].

Aaortic decoarctation in adult patients with PTA and stenting is a promoting alternative of treatment that can be safely accomplished.

This procedure has a very low morbidity and high success rate in terms of reduction of hypertension and normalization of hemodynamic parameters. This may eventually contribute to the reduction of the left ventricular mass after a successful intervention. L. Engles et al reports their preliminary experience in 15 patients in whom PTA alone was successful in 3 out of 6 of the patients and PTA with additional stenting did better in terms of gradient relief (9 patients out of 9 ones) [9]. Balloon angioplasty offers a satisfactory alternative to surgery for recurrent coarctation; both results and complications compare favorably with surgical therapy [12].

CONCLUSION

Native coarctation of aorta in adults can be successfully corrected using balloon angioplasty. The immediate and short-term results with regard to abolition of gradient and restoration of normal arterial pressure were excellent. Use of stents may be reserved for patients with complex anatomy or those who develop local complications.

Results were excellent without vascular complications. So it is a great hope for us to treat coarctations with this convenient and less expensive method and prevent irreversible damage from to happening to young people who have their whole lives ahead of them.

ACKNOWLEDGEMENTS

We are extremely grateful to cardiologists who referred their patients to us for angioplasty:

Dr. A. A. Dadgar M.D, Dr. A. A. Rafighdoost M.D, Dr. M. R. Abolfazli M.D and Dr. S. H. Danesh-Sani M.D.

We also wish to thank Dr. Mahmood K. Razavi at Stanford Medical Center for his useful comments and worthwhile suggestions.

References

1. Eugene Braunwald, Douglas P. Zipes, Peter Libby, Heart Disease: A Textbook of Cardiovascular Medicine (2-Volume Set). 6th ed. W B Saunders, 2001:965.
2. Ross RD, Clapp SK, Gunther S, Paridon SM, Humes RA, Farooki ZQ, Pinsky WW. Augmented norepinephrine and renin output in response to maximal exercise in hypertensive coarctectomy patients. Am Heart J. 1992; 123:1293-1299.
3. Stewart AB, Ahmed R, Travill CM, Newman CG. Coarctation of the aorta life and health 20-44 years after surgical repair. Br Heart J. 1993; 69:65-70.
4. deGiovanni JV, Lip GY, Osman K, Mohan M, Islim IF, Gupta J, Watson RD, Singh SP. Percutaneous balloon dilatation of aortic coarctation in adults. Am J Cardiol. 1996; 77:435-439.
5. Fletcher SE, Nihill MR, Grifka RG, O'Laughlin MP, Mullins CE. Balloon angioplasty of native coarctation of the aorta: midterm follow-up and prognostic factors. J Am Coll Cardiol. 1995; 25:730-734.
6. Cheung YF, Sanatani S, Leung MP, Human DG, Chau AK, Culham JA. Early and intermediate-term complications of self-expanding stents limit its potential application in children with congenital heart disease. J Am Coll Cardiol. 2000; 35:1007-1015.
7. Valentin Fuster, R. Wayne Alexander, Robert A. O'Rourke, Hein J. J. Wellens. Hurst's The Heart. 10th ed. McGraw-Hill Professional, 2001:1865.
8. James E. Lock , John F. Keane , Stanton B. Perry. Diagnostic and Interventional Catheterization in Congenital Heart Disease. 2th ed. Kluwer Academic Publishers, 1999:221.
9. L. Anglese et al. Endovascular treatment of aortic coarctation in adults. The basic course on revascularization. Euro PCR 2001: 385-390.

10. Suarez de Lezo J, Pan M, Romero M, Medina A, Segura J, Pavlovic D, Martinez C, Tejero I, Perez Navero J, Torres F, et al. Balloon-expandable stent repair of severe coarctation of aorta. Am Heart J. 1995; 129:1002-1008.
11. Mendelsohn AM, Lloyd TR, Crowley DC, Sandhu SK, Kocis KC, Beekman RH 3rd. Late follow-up of balloon angioplasty in children with a native coarctation of the aorta. Am J Cardiol. 1994; 74:696-700.
12. Hellenbrand WE, Allen HD, Golinko RJ, Hagler DJ, Lutin W, Kan J. Balloon angioplasty for aortic recoarctation: results of Valvuloplasty and Angioplasty of Congenital Anomalies Registry. Am J Cardiol. 1990; 65:793-797.

Author Information

Mahmoud Mohammad Zade Shabestari, M.D.
Department of Interventional Cardiology, Faculty of Medicine, Mashhad University of Medical Sciences

Leila Alizadeh, M.D.
Department of Interventional Cardiology, Faculty of Medicine, Mashhad University of Medical Sciences

Mojtaba Talaei-Khoei, M.D.
Department of Interventional Cardiology, Faculty of Medicine, Mashhad University of Medical Sciences