

Long term outcomes of balloon aortic valvuloplasty in neonates, infants and children

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Introduction

Percutaneous balloon aortic valvuloplasty (BAV) is an established and efficacious treatment for the relief of aortic stenosis (AS). We aimed to describe its long term outcomes in children.

Methods

Patients >16 years who underwent primary BAV for AS at our institution between 2004 and 2017 were included. Exclusion criteria were; intended single ventricle palliation; predominant sub/supra-valvar AS; and predominant aortic regurgitation (AR). All patients were followed up until death or end of study period.

Results

Study Population 73 patients with median age 0.2 years (range 1 day – 15.2 years) underwent BAV. Patient demographics and echocardiography-derived parameters are summarised in Table 1. 39 (53%) were neonates, 11 (15%) were infants and 23 (32%) were older children. 16 (22%) had critical AS. Patients were growth restricted with a mean weight z-score of -0.7 ± 1.6 . The peak Doppler derived gradient was 71 ± 29 mmHg and mean was 38 ± 17 mmHg. There was no difference in severity between age groups, but neonates were more likely to have impairment of ventricular function. Prior to intervention, no patient had more than mild AR which was present in 6 (8%). Morphology was bicuspid in 39 (55%). **Immediate Results** Echocardiographic Doppler derived gradient was reduced from 71 to 36 mmHg ($P < 0.001$), 14 (19%) patients had a residual gradient of >50 mmHg. AR increased in 50 (68%) patients, to moderate in 14 (20%) and severe in 2 (3%). There was no procedural mortality.

Follow up results Median follow up was 5.3 years. Three late deaths occurred (3.8%), all in neonates. Patients showed catch up growth with an increase in mean weight z score from -0.7 ± 1.6 to 0.4 ± 1.7 ($P 0.36$) a median of 1.5 years post intervention.

26 (36%) patients required re-intervention, most commonly Ross procedure (n=11, 14%).

10-year Freedom from re-intervention was $66\% \pm 7\%$ (95% CI 61-86%) and median time to re-intervention was 9.3 years. Re-intervention was more commonly associated with critical AS ($P 0.05$) and lower aortic annular z scores.

Conclusions

BAV is effective and associated with low procedural mortality in children of all ages with a lengthy freedom from re-intervention. Re-intervention is more common in neonates with critical AS and impaired LV function.

Table 1. Patient demographics and echocardiography-derived parameters

	All	Neonates	Infants	Child	P
N (%)	73 (100)	39 (53)	11 (15)	23 (32)	
Age (y)	0.2 (1d-15.2y)	0.08 (1-30d)	0.5 (0.3-0.7)	7.2 (1-15.2)	-
Female n (%)	26 (36)	11 (28)	3 (27)	12 (52)	0.17
Weight (Kg)	11.5 ± 14.3	3.9 ± 1.2	6.1 ± 2.9	28 ± 17.3	-
Weight z-score	-0.7 ± 1.6	-1.0 ± 1.3	-1.4 ± 2.1	0.1 ± 1.5	0.01
Annulus z-score	-0.3 ± 1.6	-1.0 ± 1.6	0.4 ± 1.8	0.1 ± 1.5	0.28
Bicuspid n (%)	39 (55)	22 (52)	6 (55)	28 (53)	0.89
Peak gradient (mmHg) Pre	71 ± 29	72 ± 34	66 ± 31	71 ± 17	0.84
AR none/trivial/mild Pre	54/11/6	35/2/2	5/4/1	14/5/3	0.01
FS (%) Pre	34 ± 12	28 ± 12	40 ± 6	41 ± 9	<0.001
Normal LV function n (%)	50 (70)	20 (51)	8 (80)	22 (100)	0.005
Re-intervention	26 (36)	14 (36)	3 (27)	9 (39)	0.89
Peak gradient (mmHg) Post	38 ± 17	36 ± 16	38 ± 15	38 ± 20	0.35
AR none/trivial/mild n	11/21/23	3/11/16	2/5/2	6/5/5/7	0.19
AR mod/severe n	14/2	6/2	1/0	7/0	-