

Impact of Balloon size on outcomes in Neonates with Critical Aortic stenosis - An institutional experience

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Background: Transcatheter balloon aortic valvuloplasty (BAV) is the first-line of treatment for critical aortic stenosis in neonates. The balloon with optimal size relieves or decreases the gradient to mild and minimizes aortic regurgitation (AR). The optimal size of the balloon to achieve these goals has not been identified.

Methods: In this retrospective study, we reviewed our experience with BAV in neonates with critical aortic stenosis, with goals to define an acceptable residual pressure gradient across aortic valve and ascertain the balloon size that minimizes AR achieving the above goals.

Results: From the year 1999 through 2016, data from consecutive 19 neonates with critical congenital aortic valve stenosis, who underwent BAV in the first 15 days of life, was evaluated. The balloon size used were ≤ 6 mm (group 6; n=11) and ≥ 7 mm (group 7; n=8). Although the aortic valve annulus size in group 7 was larger than group 6 (7.78 ± 0.37 vs 6.67 ± 0.7 mm, $P=0.004$), frequent overlap in the absolute measurements between the two groups occurred. The gradients decreased significantly ($P<0.0001$) but similarly in two groups ($P=0.46$). Post BAV no or trace AR occurred in group 6 while in group 7 there was no or trace AR in 3 (37.5%), mild AR in 4 (50%) and moderate to severe AR in 1 (12.5%) ($P=0.004$, Fisher exact test). Residual peak pressure gradient of < 15 mm Hg post BAV was associated with 50% incidence of moderate to severe AR (3 out of 6 neonates) on echocardiogram at 2 months of age compared to 8% (1 out of 13) incidence of AR in those with residual gradient of 15 to 30 mm Hg ($P=0.07$). Longer follow up in group 7 (median follow up 13 years) revealed 4 out 8 patients (50%) needing surgical intervention for AR (3 had Ross operation and 1 had aortic valve repair) compared to 1 Ross operation (9%) in group 6 (median follow up 8 years). The remaining patients in group 6 continued to have mild to moderate AR at 5 years follow up. Increasing pressure gradient across aortic valve requiring repeat BAV occurred in 4 (36%) patients in group 6 compared to 1(12.5%) patient in group 7 ($P=0.33$).

Conclusion:

1. Conservative balloon size ≤ 6 mm is ideal to achieve adequate relief of pressure gradient (≤ 30 mm Hg) and minimize AR.
2. Repeat BAV may be expected with this conservative approach, but in the long run is preferable over surgical intervention for aortic regurgitation when larger balloon size was used.