

A Single Institution Review of Mitral Valve Repair & Replacement:
Outcomes and Associated Predictors
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Background: Surgical treatment of mitral disease in the pediatric population continues to persist as a challenge due to several issues: diversity in patient anatomy, a necessity to consider the requirement for growth potential, and the goal to avoid mitral valve (MV) replacement. We sought to assess clinical indications for surgical mitral valve repair and replacement, and to identify predictors associated with mortality, re-operation, replacement, and recurrent mitral disease.

Methods: The medical records, echocardiograms, and operative reports of patients who underwent surgical intervention for mitral valve repair or replacement at Children's Hospital of Wisconsin from 2006 through 2015 were retrospectively reviewed. Pre-operative variables from the cohort included demographic elements, mitral valve etiology and pathology, surgical indication, and pre-operative valve function. Valve function, as well as the primary outcomes of regurgitation, re-operation and mortality, was all obtained at specified follow-up time points of 3 months, 1 year, 2 years, and 5 years.

Results: 118 surgical patients with mitral valve disease were included for analysis, patients with single ventricle physiology and complete atrioventricular (AV) canals were excluded. 53% of patients were female (n=63), 49.2 % were children age 1 year to 18 years (n=58), 47.5% were infants age 30 days to 1 year (n=56) and 3.4% were neonates age 1 to 30 days (n=4). In pre-operative transesophageal echocardiograms (TEE), 32.2% (n=38) of patients had moderate or severe degrees of mitral insufficiency. 57% (n=67) of patients had undergone previous cardiac surgery. 32% (n=38) presented with a genetic abnormality with the most common being Trisomy 21 (n=15). The etiologies for mitral regurgitation congenital (56%, n=66), congenital isolated mitral leaflet clefts (23.7%, n=28), left heart obstruction-related (4.2%, n=5), endocarditis (4.2%, n=5), cardiomyopathy (2.5%, n=3), Marfan's Syndrome (1.7%, n=2), and 9 patients (7.6%) with unknown etiology. The primary diagnoses for operation were mitral regurgitation (28%, n=33), mitral stenosis (16.1%, n=19), supra-valvular mitral ring (3.4%, n=4) and other mitral indications such as cleft, endocarditis, valve mass, etc. (8.5%, n=10), as well as VSD (20.3%, n=24), aortic stenosis (5.9%, n=7), ASD (5.1%, n=6), aortic-associated diagnosis such as regurgitation, interrupted aortic arch, etc. (4.2%, n=5) and other (8.5%, n=10) which included assorted diagnoses such as DORV, conduit replacement, cardiac tumor resection, etc. Mitral valve repair or mitral valve replacement was the primary procedure for 62% (n=73) of patients, and the total number of patients who had concomitant procedures within surgery was 91 (77%). Mitral valve replacement was performed in 14.4% (n=17) patients, with replacement occurring most often in children (64%, n=11). Infants were more likely to have a higher number of procedures performed during surgery than children ($p < 0.0001$), along with having a longer post-operative length of stay (LOS) ($p = 0.04$). A total of 15 patients in the cohort (12.7%) underwent re-operation or replacement after their primary procedure within the follow up period, (with overall percentages of repair and replacement for patients requiring re-operation being 12.9% (13/101 patients) and 11.7% (2/17 patients) respectively.) 75% of neonates, 14.5% of infants, and 6.9% of children required re-intervention on the mitral valve in the follow-up period. Patients who experienced recurrent mitral regurgitation, mitral valve re-operation, mitral valve replacement, or pericardial effusions after surgery or who passed away in the follow-up period were more likely to have a longer post-operative LOS (days): 10.97 ± 16.5 vs 27.82 ± 39.29 ($p = 0.0026$). Eight deaths (6.7%) occurred in the post-operative period; 6 deaths were observed in hospital care, while 2 occurred in the observed follow up periods. A total of 6 deaths came from the infant population.

Conclusion: The study is currently ongoing, with the present data being comprised from more than half of the target patient population dating back through 2006. The total cohort will date back to 1973 and consist of a total of 249 patients. The existing data demonstrates the presence of an increased risk to infants and neonates undergoing mitral valve surgery. This younger patient cohort is also more likely to have longer hospital stays, as well as adverse outcomes including re-operation, with a higher risk of mortality. Unexpectedly the existing data also shows similar re-operation rates for patients needing primary repair versus replacement, but presents a strong case for the obvious need to pursue the surgical strategy that best considers the patient requirements of anatomy, age-wise timing, and growth potential.