

## Echocardiographic assessment of prosthetic mitral valve in children

Hayashi T. (1), Inuzuka R. (2), Ono H. (1), Kato H. (1)

Division of Pediatric Cardiology, National Center for Child Health and Development, Tokyo, Japan (1); Department of Pediatrics, Graduate School of Medicine, University of Tokyo, Tokyo, Japan (2)

### Introduction:

Although the diagnostic utility of Doppler-derived hemodynamic parameters of prosthetic mitral valve (PMV) for detecting prosthetic dysfunction has been demonstrated in adults, interpreting these parameters in children is difficult, as the relative size of PMV varies more greatly in them than in adults. We aimed to elucidate how the Doppler-derived hemodynamic parameters change as the PMV size decreases relative to the somatic growth of children. We also evaluated the diagnostic utility of the parameters for detecting prosthetic obstruction.

### Methods:

We reviewed 26 echocardiographic examinations of 15 mechanical PMVs in 12 children. The median age at echocardiographic examination was 6.6 (0.6–18.1) years. The PMV functioned normally in 24 examinations, but was obstructed due to intraoperatively confirmed PMV thrombosis in 2 examinations. PMV size ranged between 16 and 25 mm, which was standardized to body surface area (BSA) at the examination by calculating z-scores based on previously published normative data of mitral valve diameter. We assessed the Doppler-derived hemodynamic parameters, namely peak E velocity, mean pressure gradient (PG), and pressure half time (PHT) of the transprosthetic flow, the velocity-time integral (VTI) ratio of the PMV inflow to the left ventricular outflow, and BSA-indexed effective orifice area (iEOA) of the PMV calculated by using the continuity equation. The correlation between the PMV size z-score and Doppler-derived hemodynamic parameters of the normally functioning PMVs was evaluated by using the linear regression analysis. The measurements in the obstructive PMVs were compared with the predictive values derived from the regression equations. A p-value of <0.05 was considered statistically significant.

### Results:

All parameters of the normally functioning PMVs had a statistically significant correlation with PMV size z-score (Pearson correlation coefficients: peak E velocity, -0.68; mean PG, -0.71; PHT, -0.82; VTI ratio, -0.76; and iEOA, 0.79). Multivariate analysis revealed that PHT and iEOA were independently correlated with PMV size z-score. iEOA was the sole parameter with which both cases of obstructive PMV exceeded  $\pm 2$  standard errors of the predictive value.

### Conclusions:

iEOA strongly reflects BSA-indexed PMV size. Deviation from the expected iEOA, based on relative PMV size, may indicate prosthetic obstruction in children with PMV.

