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Cardiac Mechanics Comparison between pmVSD post Percutaneous Transcatheter Closure

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Objective: Percutaneous transcatheter closure of perimembranous ventricular septal defect (pmVSD) with occluder has been most widely used in China. In this study, we aimed to analyze ventricle performance post percutaneous transcatheter closure of pmVSD.

Methods: 40 (21 males) pmVSD pediatric patients (age 6.0 ± 1.2 years) and 40 (25 males) healthy controls (age 5.8 ± 1.1 years) were recruited. All subjects were studied with conventional and tissue Doppler echocardiography. Strain and strain rate of left ventricle (LV) and right ventricle (RV) were assessed by 2D speckle tracking echocardiography (2D-STE).

Results: Mean diameter of pmVSD was 3.82 ± 0.59 mm, mean diameter of pmVSD occluder was 6.3 ± 1.0 mm, and mean time post percutaneous pmVSD closure was 3.22 ± 0.78 years. No significant differences were observed in LV ejection fraction, RV Tei index and transatrioventricular velocity (E and A) between pmVSD closure and control. More tricuspid regurgitation was observed in pmVSD closure subjects by measuring the ratio of tricuspid regurgitation jet area and right atrial area (TRJA/RAA) ($p=0.009$). Interventricular septal tissue Doppler image showed less early diastolic ($p=0.01$), more late diastolic ($p=0.04$) velocity and less e/a ratio ($p=0.005$) in pmVSD closure subjects. No significant difference in global longitudinal and circumferential strain and strain rate between pmVSD closure and control. For RV deformation, pmVSD closure subjects tended to be lower global longitudinal strain ($p=0.06$). For pmVSD closure cohort, the diameter of pmVSD occluder correlated negatively with LV longitudinal strain rate ($r=-0.324$, $p=0.044$) and circumferential strain ($r=-0.354$, $p=0.027$). Furthermore, TRJA/RAA correlated positively with diameter of pmVSD ($r=0.727$, $p<0.001$) and occluder ($r=0.777$, $p<0.001$).

Conclusion: 2D-STE provide valuable information on the quantitative assessment of ventricular function in children post percutaneous transcatheter closure of pmVSD. And it appears that percutaneous closure of pmVSD is safe and effective in selected pediatric patients.

Keywords: perimembranous ventricular septal defect, 2D speckle tracking echocardiography, strain, strain rate