

Triplane Measurement of Fractional Area Change to Assess Single Right Ventricular Function

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Background: Echocardiographic (echo) functional assessment of single systemic right ventricle (RV) lacks a reliable parameter and does not provide a substitute of volumetric ejection fraction (EF). RV volumes by 3D-echo are challenging and not widely used. Apical RV fractional area change (FAC) has shown some relation to CMR EF, but the strength of correlation has been suboptimal. Adding additional planes to apical FAC may improve this correlation. Our objective was to assess correlation of triplane FAC (apical, short-axis, and inflow-outflow) with CMR EF and to compare the tri- and single plane methods of measuring FAC to each other.

Methods: Subjects with hypoplastic left heart syndrome (after superior or total cavopulmonary anastomosis) were prospectively recruited. CMR was performed and right ventricular ejection fraction was calculated. Transthoracic echo studies were performed close to the time of the CMR scan (median interval: 1 d). FAC was measured in apical 4-chamber view, parasternal short axis view at the mid ventricular level, and para-apical right ventricular inflow-outflow view. Triplane FAC was calculated by the average of the three FAC. Comparison was made between FAC and CMR-derived ejection fraction.

Results: A total of 25s subjects underwent testing. Triplane FAC could not be assessed in 5, due to lack of optimal acoustic windows. Mean age was 10 ± 8 y (range 9 m to 24 y). Out of the uniplanar methods, apical FAC had the closest relationship to CMR EF. Triplane FAC showed even better correlation coefficient and R^2 values; although in this small group the difference did not reach significance. Results are summarized in the Table.

Conclusion: In patients with single systemic RV, triplane FAC offers improved correlation with CMR EF relative to single plane evaluations. This approach may be useful if 3D echo is unavailable or of suboptimal quality and warrants further study.

	Mean \pm SD	p-value	Correlation Coefficient	R^2 value
CMR Ejection Fraction	50 \pm 10%	-	-	-
Apical FAC	37 \pm 7%	<0.001	0.73	0.53
Short axis FAC	43 \pm 9%	0.006	0.55	0.30
RV inflow-outflow FAC	34 \pm 7%	0.009	0.57	0.32
Triplane FAC	37 \pm 8	<0.001	0.81	0.66