Vendor Independent Evaluation of Three Dimensional Echocardiography of Right Ventricular Size and Function in Children

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Introduction: Quantification of right ventricular (RV) function has been difficult with 2-dimensional echocardiography; however, three-dimensional echocardiography (3DE) has emerged as a noninvasive tool to quantitate RV function and has been validated with cardiac magnetic resonance imaging. 4D-RV function 2 is a TomTec software that is vendor neutral and can generate RV size and functional parameters. This software has not been validated between different vendors in children. We sought to use this software on different vendors and to evaluate whether or not there are differences between vendors using this software in normal pediatric patients.

Methods: Thirteen children (median age 9yrs (5-14 yrs)) underwent 3DE evaluation using Philips EPIQ machine (X7 and X5 probes), GE E9 machine (4V probe), and Siemen's machine (4V probe) on the same day. 3D dataset were acquired and transferred onto the TomTec 4D-RV function 2 software to generate RV size and functional parameters. Analysis of variance was performed on these echocardiographic parameters.

Results: There were statistically significant differences found in the tricuspid annular plane systolic excursion (TAPSE) between Philips and the two other vendors (GE and Siemens) respectively. There were no statistically significant differences between vendors in 3DE parameters, RV strain, and fractional area change (FAC).

Table 1: RV size and functional parameters

	Philips	**Siemens**	**GE**	**p-value**
3D EDV	63.28 ± 41.11	62.75 ± 41.51	62.27 ± 41.22	0.6600
3D ESV	30.84 ± 20.81	30.50 ± 21.12	30.29 ± 21.29	0.7212
3D SV	32.47 ± 20.43	32.27 ± 20.53	31.98 ± 19.99	0.7451
3D EF	51.54 ± 2.85	51.81 ± 3.59	51.81 ± 2.32	0.5704
RVLS septum	19.55 ± 3.27	19.10 ± 3.58	18.10 ± 3.08	0.0624
RVLS free wall	26.51 ± 4.29	26.44 ± 2.87	26.22 ± 2.10	0.9366
TAPSE	16.14 ± 2.29	15.23 ± 1.74	14.86 ± 1.46	**0.0017†‡**
FAC	45.45 ± 6.30	46.21 ± 4.99	45.35 ± 2.79	0.7205

†Philips is significantly different from GE
‡Philips is significantly different from Siemens

Conclusion: RV size and function using the vendor neutral software in children can be generated from three different vendors. Although statistically significant differences were found in TAPSE between vendors, the differences are clinically not significant and can be explained by the low resolution from the big probe. This study highlights the need to develop pediatric 3D probe from different vendors and TomTec 4D-RV function 2 can be used in the quantification of right ventricle in children.