Right Ventricular Systolic Function in Hypoplastic Left Heart Syndrome: A comparison of Velocity-Vector-Imaging and Magnetic Resonance Imaging

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Background: Velocity-Vector-Imaging (VVI) is an echocardiographic technique based on speckle tracking which has been validated in left ventricle. It has not been critically evaluated to assess the systemic right ventricle (RV) in patients with hypoplastic left heart syndrome (HLHS). The aim of this study was to evaluate whether VVI measurements reliably reflect RV systolic function in patients with HLHS using magnetic resonance imaging (MRI) derived ejection fraction (EF) as a gold standard.

Methods: Forty nine patients with HLHS underwent transthoracic echocardiogram and cardiac MRI under the same general anesthetic as part of routine assessment between the different stages of palliative surgery, both prior to and after completion of Fontan. Global RV fractional area change (FAC), strain (S) and strain rate (SR) were analyzed from apical 4-chamber view using VVI technique (Syngo USWP 3.0, Siemens). MRI EF was calculated in the usual manner from a short axis cine stack of images.

Results: All parameters measured with VVI correlated significantly with EF measured with MRI (FAC r=0.7, P<0.001; S r=0.5, P=0.001 and SR r=0.5, P<0.001). Intraobserver and interobserver reproducibility was high for all VVI-parameters (Intra/interobserver interclass coefficient for FAC 1.5%/5.7%, S 5.5%/9.6% and SR 3.0%/14.0%; respectively).

Conclusions: VVI provides a reliable tool for quantification of global RV systolic function in patients with HLHS.

Picture. Comparison of MRI derived EF and VVI derived FAC.