

Tissue Doppler and speckle tracking deformation measurements are not interchangeable in term neonates

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Introduction: Conventional echocardiographic indices often fail to detect impaired heart function in neonates. Strain and strain rate are new indices of heart function that describes deformation of the myocardium. It is possible to obtain these indices by colour tissue Doppler echocardiography (cTDE) and 2D-strain speckle tracking echocardiography (STE). cTDE enables high time resolution but gives false low values in poor-quality images. STE assess deformation within two dimensions. In this study, we compared left ventricle deformation indices by cTDE and STE in term neonates.

Methods: From apical four-chamber views, we assessed peak systolic strain (PSS), peak systolic strain rate (PSSR), early diastolic strain rate (ESR) and strain rate in atrial systole (ASR) by cTDE and by STE in the left ventricle at the same examination in 88 neonates the first day of life. We averaged measurements from three heart cycles and assessed indices by cTDE in one large segment from the septum and one large segment from the left wall and indices by STE (2D-strain) from one large region of interest covering the septum and the left lateral wall. We calculated left ventricle cTDE indices as the average of septum and left lateral wall measurements.

Results: Median frame rate (/s) was 192 (cTDE) and 77 (STE), and median heart rate was 116/min.

Table: Pairwise comparisons of strain and strain rate indices by cTDE and STE.

	cTDE		STE		p
	Mean	SEM	Mean	SEM	
PSS (%)	-15.2	0.5	-17.3	0.5	<0.001
PSSR (/s)	-1.21	0.05	-1.34	0.04	0.004
ESR (/s)	1.51	0.08	2.01	0.10	<0.001
ASR (/s)	1.47	0.07	1.22	0.05	<0.001

SEM: Standard error of the mean. p: p-value for difference between indices by cTDE and STE.

Conclusions: We found all cTDE and STE deformation indices significantly different in pairwise comparisons. It is therefore not feasible to use indices by cTDE and STE interchangeably in neonates.