Quantification of tissue Doppler, Strain and Strain rate normal values in a population of healthy newborns at term.


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Background: The first aim of the study was to quantify the normal values of tissue Doppler echocardiography (TDI), strain (S) and strain rate (SR) parameters to evaluate systolic and diastolic function in a sufficiently representative population of healthy infants born at term. The second aim was to standardize a protocol to obtain and analyze off line measurements from new advanced imaging techniques (TDI, S and SR derived from speckle tracking).

Methods: We prospectively enrolled 68 healthy infants (41 male) admitted to the neonatal center of Bergamo Ospedali Riuniti. The echocardiographic evaluation was performed before the first 72 hour of life. The TDI was acquired in the apical 4 rooms view placing the right ventricle and then the left ventricle in the center of the screen. The frame rates were always kept more than 200 FPR. Three cardiac cycles were recorded for offline analysis. The strain and strain rate were obtained with speckle tracking method (2DSTE). The grayscale images were acquired at frame rates of 65 to 85 FPR, optimizing them to precisely define the endocardium.

Results: The systolic function evaluated through systolic peaks waves is inferior in the left ventricle (LV) compared to the right (RV). The pulsed wave transmitral flow describe a diastolic dysfunction of first degree. We obtained lower S and SR normal value in the LV than in the RV. The data showed a significant regional variability in the same ventricle and between the two: the longitudinal S was higher in the apical segments than in the basal of LV; higher longitudinal S and SR in the RV than in the LV.

Conclusion: This study was the first that prospectively evacuate TDI, S, SR in a healthy population of newborns using color TDI and 2DSTE tecniques. Moreover, 2DSTE itself was used in an extensive way on newborns for the first time and we standardized a protocol for the echocardiographic laboratory.