

**An analysis of left ventricular strain in premature infants and full-term infants during the early postnatal period using Velocity Vector Imaging
-An investigation into the development of cardiac function in newborns-**

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Background: The cardiac function in newborns and, in particular, premature infants, is considered to be immature. However, few reports exist in which a detailed investigation was carried out into the development of cardiac function based on myocardial deformation data.

Purpose: To evaluate myocardial strain of the left ventricle and the rate of change in the cross-section of the left ventricle regarding premature infants and full-term infants using velocity vector imaging (VVI) and investigate the mode of development of the myocardial function in the perinatal period.

Subjects and methods: The subjects comprised 30 premature infants and full-term infants with no congenital heart disease or lung disease (gestational age 29 weeks and 3 days to 41 weeks and 1 day, 1 to 60 days old). The circumferential (CS) and longitudinal (LS) strain in the left ventricle was obtained using the left ventricular short-axis view (base and apex) and four-chamber view of the apex using VVI. Moreover, the left ventricular short-axis area of the base and the apex was measured by tracing the lining membrane, and the rate of change from the telediastolic phase to the peak value was respectively investigated. A correlation between the abovementioned data and the number of weeks of fixed gestation was identified.

Results: The CS of the apex and the systolic phase CSR showed a positive correlation with the number of weeks of fixed gestation ($r = 0.60$, $P < 0.001$ and $r = 0.54$, $P < 0.001$, respectively) and the diastolic CSR showed a negative correlation ($r = -0.48$, $P = 0.003$). Regarding the rate of changes in the cross-section, only the apex showed a positive correlation with the number of weeks of fixed gestation ($r = 0.58$, $P < 0.001$), with the base not exhibiting any correlation.

Conclusion: It is believed that such development of a deformation pattern of the apex may be a cause for the development of cardiac function in premature infants and full-term infants during the perinatal period and is thus considered to be important new knowledge regarding the cardiac function of newborns.