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**TITLE:** Perinatal left ventricular torsional mechanics in normal fetuses at term

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**ABSTRACT BODY:**

**Objectives:** Left ventricular (LV) twist and torsion are important aspects of cardiac mechanics and fundamental to normal ventricular function. The myocardial rotational mechanics of perinatal adaptation have never been previously explored. The aim of this study was to evaluate perinatal left ventricular (LV) rotational mechanics in normal fetuses at term.

**Methods:** A prospective study of 40 women with uncomplicated term pregnancies. Fetal and neonatal LV rotation data derived by 2D speckle tracking echocardiography in short axis views at the base and the apex of the heart were obtained days before and within hours of birth.

**Results:** There are three patterns of LV twist in term fetuses, from the lowest torsional values in reversed apex-type, through to infant-type LV twist and highest values in adult-type LV twist. The patterns of LV twist were significantly associated with cardiac geometry and functional indices. The increased right ventricle (RV) dimensions and less globular 'squashed' left ventricle were significantly associated ( $p < 0.0001$ ) with an increased negative clockwise basal rotation with both adult-type and reversed apex-type LV twists. Perinatal evaluation revealed two patterns - the infant-type and the adult-type of LV twist - in neonatal heart in the first hours after birth resulting in a significant increase in LV torsion in fetuses exhibiting reversed apex-type LV twist (0.1degrees/cm vs. 2.9degrees/cm,  $p = 0.01$ ) and a significant decrease in fetuses with adult-type LV twist (4.4degrees/cm vs. 1.2degrees/cm,  $p = 0.008$ ) following birth.

**Conclusions:** There are unique perinatal patterns of fetal LV twist that correlate to indices of ventricular geometry and myocardial function. Differences in patterns of LV twist may reflect compensatory myocardial adaptation to the physiological loading conditions of late gestation in fetuses and perinatal cardiac adjustments in neonates. The utility of the specific pattern of LV twist as a diagnostic marker of subclinical changes in fetal and neonatal myocardial performance might be a promising novel tool for monitoring high-risk pregnancies.

**Additional details**

**KEYWORDS:** Fetal heart, Fetal cardiac function, Echocardiography.

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