

# Prolonged T-peak to T-end Interval in Preadolescents with Severe Intrauterine Growth Restriction (IUGR) at Birth Compared to Controls

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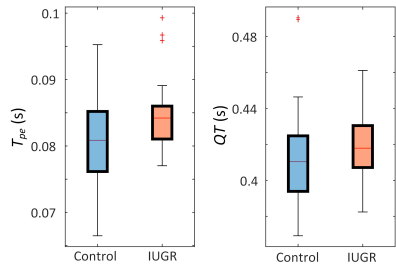
**Introduction:** Morphological changes in the ventricles as a consequence of intrauterine growth restriction (IUGR) lead to an increased left wall thickness. The aim of this study is to assess how increased wall thickness resulting from IUGR in preadolescents affects the T-peak to T-end ( $T_{pe}$ ) and  $QT$  intervals, which are biomarkers associated with susceptibility to ventricular arrhythmia.

**Methods:** 12-lead ECG from 24 subjects who had severe IUGR (birth-weight  $\leq$  3rd centile) and 53 control subjects are studied. Spatial principal component analysis was applied to the ECG data to emphasize the T-wave, followed by QRS detection and T-wave delineation to measure  $T_{pe}$ ,  $QT$  intervals and the ratio  $T_{pe}/QT$ . Additionally, we used a computational biventricular model based on a realistic heart and torso models and also generated a more globular model as observed in IUGR subjects, where the simulated  $T_{pe}$  and  $QT$  intervals were measured and compared with the clinical results.

**Results:** The IUGR group showed significantly longer  $T_{pe}$  interval compared to the control group. Both  $QT$  interval and the ratio  $T_{pe}/QT$  were higher in the IUGR group, but not statistically significant. The control and globular simulation results showed no differences in terms of  $T_{pe}$  (0.078 vs 0.077 s), which suggest to consider additional factors in the globular model to explain the observed IUGR-induced change in  $T_{pe}$ .

**Conclusion:** Our findings suggest that cardiac remodeling occurring in IUGR subjects increases  $T_{pe}$ , consistent with the previously reported increase in relative wall thickness. This increase in  $T_{pe}$  is associated with an increased transmural dispersion and a greater risk of ventricular arrhythmia.

	Control	IUGR	p-value
$T_{pe}$ (s)	0.081 (0.076 - 0.085)	0.084 (0.081 - 0.086)	0.022
$QT$ (s)	0.410 (0.393 - 0.424)	0.417 (0.407 - 0.431)	0.255
$T_{pe}/QT$ (s)	0.195 (0.187 - 0.208)	0.202 (0.193 - 0.209)	0.148



Box-plots for  $T_{pe}$  and  $QT$  interval distribution at IUGR and controls.