

Analysis of the signal-averaged QRS complex width in healthy children and in children with hypertrophic cardiomyopathy

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Introduction:

Hypertrophic cardiomyopathy (HCM) is associated with ventricular arrhythmias and sudden death. Signal-averaged ECG (SAECG) analysis is used to detect electrical signals of small amplitude that are not otherwise evident. The aim of the study was to assess the SAQRS in healthy children and in children with HCM.

Material and methods: The study included 32 children with HCM (4-18 years; 14 girls) and 58 healthy children (4-19 years; 25 girls). In all patients physical examination was carried out, as well as echocardiographic examination and SAECG with the usage of high-pass filter settings with cut-off frequencies 25-250 and 40-250 Hz. Statistical analysis was carried out by means of Mann-Whitney test, Fisher's exact test and non-parametrical Spearman's rank correlation. Continuous variables were presented as median and IQR. A probability of <0.05 was considered statistically significant.

Results:

Late ventricular potentials (LP) occurred more frequently in children with HCM in comparison with control group (22% vs. 7%, $p<0.05$). The presence of HCM was associated with more frequent occurrence of LP (21,9% vs. 6,9%; $p=0.049$). In comparison with healthy children the SAQRS duration was significantly longer in children with HCM [25-250 Hz: 117.0 (102.0 – 124.5) ms vs. 92.0 (86.0 – 100.3) ms, $p<0.0001$; 40-250Hz: 114.0 (99.3 – 121.8) ms vs. 92.0 (85.8 – 98.3) ms, $p<0.001$]. The duration of SAQRS ≥ 114 ms occurred significantly more frequently in children with HCM (25-250Hz: 53% vs. 0%, $p<0.0001$; 40-250Hz: 47% vs. 0%, $p<0.0001$).

In the group of children with HCM significant correlations were observed between SAQRS duration (filters cut-off frequencies 25-250Hz) and ventricular septum thickness (25-250Hz: $r=0.44$, $p=0.012$; 40-250Hz: ($r=0.44$; $p=0.013$) and left ventricular mass index (25-250Hz: $r=0.52$, $p=0.002$; 40-250Hz: $r=0.49$; $p=0.005$).

Conclusions:

Cardiac remodeling observed in children with HCM is associated with more frequent occurrence of LP and increased duration of ventricular depolarization. Duration of ventricular depolarization in children with HCM depends on the ventricular septum thickness and left ventricular mass.