

Handheld ECG in analysis of arrhythmia and HRV in children with Fontan circulation.

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Objectives:

Although modifications have improved the Fontan operation, arrhythmia remains a frequent problem. The Fontan patient is, due to her/his significant hemodynamic abnormalities, susceptible to recurrent atrial tachycardia. Atrial tachycardia could be presented only with vague symptoms, as the heart rate will not be dramatically increased in presence of a 2:1 atrioventricular block. It is known that Fontan patients have reduced heart rate variability (HRV).

The aim of this pilot-study was to use an ambulatory short-term ECG system to study the prevalence of arrhythmia and to perform HRV analysis, using Poincaré plots.

Methods:

The device, Zenicor-ECG[®], is a small hand-held device with a display and two thumb sensors, providing for a bipolar extremity lead I. In the study the patient (and the parents) was instructed to apply the thumbs onto the sensors for 30 seconds for ECG registration. The assessment was performed during 14 day period - twice a day and if there were symptoms.

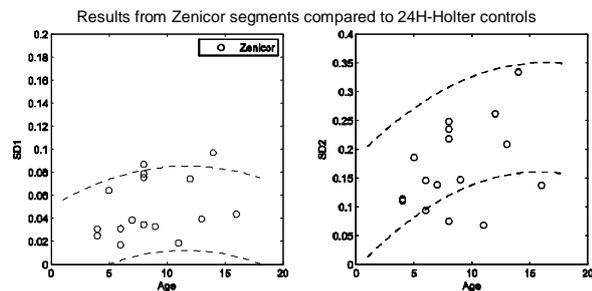
ECGs were analyzed for rhythm and arrhythmia. Each RR interval was plotted as a function of the previous RR-interval (Poincaré plot). Results were presented as SD1, SD2 and the ratio SD1/SD2. Two patients with a pacemaker were excluded from HRV-analysis. The results were compared to 24-h ambulatory ECG recordings in a control group of 66 healthy children.

Results:

18 patients, 5 girls and 13 boys aged 9.5 years (range 4.1-16.5) underwent short-time ECG-registration.

Fifteen of the patients were in sinus-rhythm, 1 patient had ectopic atrial rhythm, and 2 patients had intermittent pace-maker induced rhythm. We found no brady- or tachy arrhythmia, apart from in one patient where we found very frequent ventricular extra systoles in pairs and in bigeminia and 2 patients with frequent nodal replacement beats.

Poincaré plot shows the nature of RR interval fluctuations: four patients had lower SD2 than controls.



Conclusions:

Arrhythmia was not commonly found by handheld ECG. However, this pilot-study is too small to draw conclusions of the prevalence of silent arrhythmia. Four patients with Fontan circulation showed a decreased SD2 which may indicate reduced long-term variability. It seems like hand-held ECG can be used for this purpose, but larger studies are needed.

