

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

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Aims: to study the prevalence of arrhythmia and to perform heart rate variability analysis, using a hand-held short-term ECG system.



Background:

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 arrhythmia.

Methods:

Hand-held (Zenikor[®]) ECG, is a small device with a display and two thumb sensors, providing for a bipolar extremity lead I. In the study the patients recorded ECG for 30 seconds twice a day and during symptoms for a 14 day period. ECGs were analyzed for predominant rhythm, and for rhythm and conduction disturbances. Heart rate variability (HRV) analyses were made by plotting each RR interval as a function of the previous RR-interval (Poincaré plot). An ellipse is fitted around the points with SD1 as the short axis, and SD2 as the long axis of the ellipse. SD1 represents the short term and SD2 represents the long term variability. Patients with pacemaker were excluded from HRV-analysis. HRV analysis was performed by pooling all data from all 30s episodes. The results were compared to 24-h ambulatory ECG recordings in a control group of 66 healthy children.

Update since abstract submission:

We have now included 25 patients, 9 girls and 16 boys.

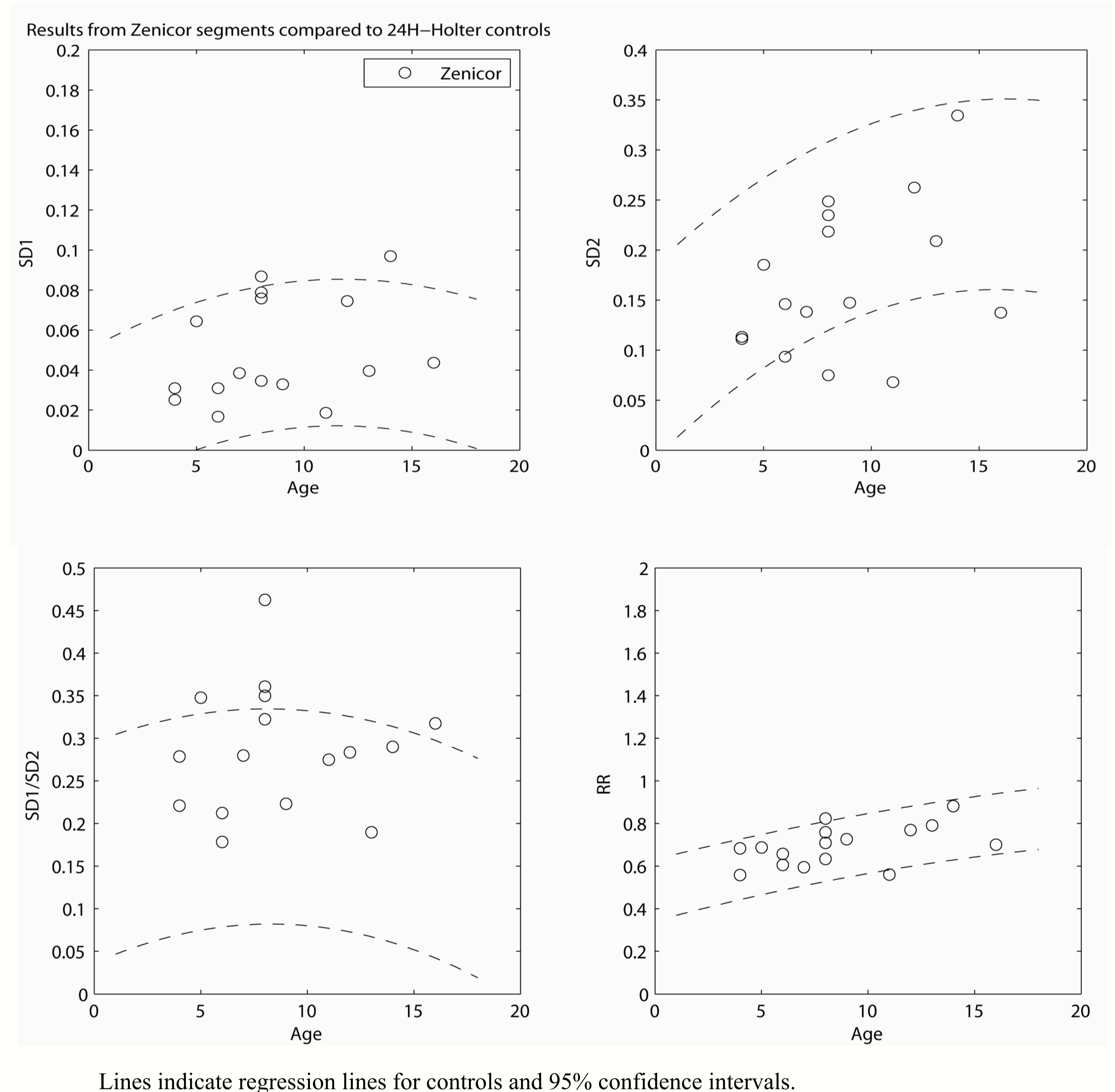
In one of the recently included patients we found an episode of supraventricular tachycardia. This patient reported palpitations and also showed a variable p-wave morphology.

Results:

18 patients, 5 girls and 13 boys aged 9.5 years (range 4.1 -16.5) underwent 30 (range 22-43) hand-held short-time ECG-recordings.

Fifteen of the patients were in sinus-rhythm, one patient had ectopic atrial rhythm, and two patients had pacemaker induced rhythm alternating with nodal rhythm. We found no brady- or tachy- arrhythmia. One patient showed very frequent ventricular extra systoles in pairs and in bigemina, and two patients showed frequent nodal replacement beats.

In four patients we found a lower SD2 than controls.



	Findings:	n
Rhythm	Sinus rhythm	16
	Ectopic atrial rhythm	2
	PM-induced and nodal rhythm altering	2
Extra systoles	None	17
	Supraventricular	3
	Ventricular	1
Arrhythmia	Both supraventricular and ventricular	3
	None	24
	Supraventricular tachycardia	1

Conclusions

- Arrhythmia was found in 1/25 patients.
- Four patients with Fontan circulation showed a decreased SD2 indicating reduced long term heart rate variability.
- HRV from hand-held ECG recordings can be used as a screening method for cardiac autonomic dysfunction.