



Medically treated anorexia nervosa is associated with normal P wave parameters

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ABSTRACT

Anorexia nervosa (AN) is an increasingly common medical condition. Some studies have demonstrated an increased prevalence of atrial premature contractions and anatomical changes in AN patients. Our aim was to investigate P wave parameters and P wave dispersion, an electrocardiographic marker for supraventricular arrhythmias, and its effect on AN. The study group included 48 patients with AN, most hospitalized for a few weeks, and a matched control group. All participants underwent 12-lead electrocardiography (ECG) under strict standards. P wave length and P wave dispersion in each patient were computed from a randomly selected beat and an averaged beat, constructed from 7 to 12 beats, included in a 10-s ECG. There were no statistically significant differences found between the groups for minimal, maximal, average P wave duration and P wave dispersion, calculated either from a random beat or averaged beats. In conclusion, medically treated AN patients who have gained weight have normal P wave parameters, and therefore do not appear to have an increased electrocardiographic risk for atrial fibrillation compared with healthy controls. Further studies are required to evaluate the influence of different disease stages, electrolyte imbalance and other medical complications on P wave parameters and risk for supraventricular arrhythmias in AN patients.

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1. Introduction

Anorexia nervosa (AN) is a psychiatric condition which has become increasingly common in recent decades. This condition is characterized by a fear of gaining weight, failure to maintain a minimally normal weight, and a preoccupation with body shape (Chakraborty and Basu, 2010). Among the many psychiatric disorders, AN sufferers have the highest mortality rate (Zenker et al., 2010). AN was reported to be associated with reduced cardiac mass, and ventricular dysfunction (Galletta et al., 2005), although other reports have concluded that systolic dysfunction may not be observed (Gottdiener et al., 1978). In addition, it was reported that AN was associated with electrocardiographic abnormalities, such as abnormal repolarization (Takimoto et al., 2004).

Atrial fibrillation is a common arrhythmic disorder and an independent risk factor for early death and clinical complications (Falk, 2001; Page, 2004). P wave dispersion (Pd) is an electrocardiographic marker calculated from a 12-lead electrocardiogram (ECG) by

subtracting the shortest from the longest P-wave interval measured from a single beat. Calculation of Pd is based on the assumption that each surface P wave length correlates with the regional activation of the atria (Michelucci et al., 2002; Nussinovitch et al., 2010). It has been suggested that Pd could be used in evaluating the risk of developing supraventricular arrhythmias, and in particular, atrial fibrillation (Dilaveris and Gialafos, 2001). Hanci et al. reported that malnutrition (diagnosed according to serum albumin levels, and weight loss during the preceding 6 months) was associated with increased Pd values (Hanci et al., 2010).

Premature atrial contractions were reported in small cohorts of AN patients (Dec et al., 1987; Campanini et al., 1991). There are also anecdotal reports on atrial contractile abnormalities and electro-mechanical dissociation in AN (Mizuno et al., 1998). Therefore, our aim was to evaluate whether AN is associated with abnormalities of the Pd and other P wave parameters. To the best of our knowledge, no similar reports have been published on the subject.

2. Methods

2.1. Study design

A comparative case–control design was used. The study received approval by the local ethics committee and fulfilled the ethical guidelines of the most recent Helsinki declaration (Edinburgh, 2000). All participants gave written informed consent.

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2.2. Study subjects

The study group consisted of 48 patients (45 females), diagnosed with AN according to the DSM-IV-TR (American Psychiatric Association, 2000). Twenty-seven patients (56.25%) were diagnosed with anorexia nervosa binge-eating/purging type (AN-BP), and the rest were diagnosed with anorexia nervosa restricting type (AN-R). Thirty-nine patients were hospitalized, and nine were previously hospitalized ambulatory patients. All patients had undergone routine blood chemistry tests as part of the follow-up within the 2 weeks prior to enrollment. For ethical reasons, no unjustified blood tests were repeated at enrollment. Abnormal blood tests were exclusion criteria for AN patients.

Twenty-eight healthy volunteers, matched for sex and age, served as controls. The controls were recruited after attending the outpatient clinic for a routine health checkup.

Health status was determined following screening of medical records, an interview and complete physical examination. Any acute or chronic illnesses, use of medications and history of past hospitalization served as exclusion criteria for the control group.

2.3. Procedure

The study was conducted during the summer season. Participants were asked to avoid smoking, and drinking caffeinated or alcoholic beverages 3 h prior to the procedure. A digital scale was used to measure participants' weight. Body mass index (BMI) was calculated by dividing weight (kg) by height² (meters). The test was conducted between 1:00 pm and 5:00 pm to avoid circadian influences on the electrocardiographic parameters. Room temperature was maintained at 20–23 °C.

Participants were instructed to lie motionless in a supine position for 10 min. Electrodes were placed in anatomical positions according to routine procedure. ECG strips were recorded for 10 s with a standard device (Fig. 1). Poor quality ECGs were repeated. The onset of the P wave was defined as the first point of visible upward departure from baseline for positive waveforms, or as the first point of downward departure from baseline for negative waveforms. Return to baseline was considered the end of the P wave. P wave length was measured from all leads with custom-made computer software validated for accuracy and consistency. Accuracy was established by the high index of agreement between averaged blinded manual measurements of P wave lengths, and automated measurements. Maximal, minimal, and average lengths were computed. Pd was computed from one randomly selected beat taken in a steady state by subtracting the minimal from the maximal P wave length measured from the 12-lead ECG. In addition, 7–12 beats were averaged during 10 s of ECG measurements. P wave lengths and Pd were computed the same way. Similar measurements were performed on each study participant and control subject.

2.4. Statistical analysis

Data were analyzed with JMP version 7.0 (SAS Institute, Cary, NC, USA). Results are presented as means and standard deviations. Abnormal results were defined as more than 2 standard deviations from the normal range. Findings were compared by the Mann–Whitney–Wilcoxon test (normal approximation) and the Fisher's exact test. A *p* value lower than 0.05 was considered statistically significant.

Table 1

Clinical characteristics of anorexia nervosa patients compared to controls.

Parameter	Anorexia nervosa (N = 48)	Control (N = 28)	<i>P</i> value
Age (years)	22.8 ± 4.1	24.5 ± 7.7	NS
M/F	3/45	5/23	NS
Height (m)	1.63 ± 0.07	1.66 ± 0.09	NS
Weight (kg)	46.2 ± 7.2	62.0 ± 10.1	<0.001
BMI (kg/m ²)	17.5 ± 2.8	22.3 ± 2.6	<0.001
Smokers (%)	43.75%	14.29%	<0.01
s/p myocardial infarction (%)	0%	0%	NS
Diabetes (%)	0%	0%	NS
Hypertension (%)	0%	0%	NS
History of supraventricular arrhythmias (%)	0%	0%	NS

NS – nonsignificant (*p* > 0.05). BMI – body-mass index.

3. Results

Clinical characteristics of the study groups are outlined in Table 1. Four other AN patients were excluded from the study due to abnormal blood tests. All AN patients were observed following meals to exclude vomiting. Mean age at diagnosis was 17.6 ± 4.1 years old; mean hospitalization time for the hospitalized AN patients (*n* = 39) was 1.1 ± 1.0 months. Twenty-eight AN patients had been previously hospitalized (20.2 ± 22.3 months earlier). Minimal weight during the current hospitalization was 37.2 ± 11.2 kg.

No significant difference in age, male to female ratio, or height between the AN group and the controls was found. None of the patients had known ischemic or non-ischemic cardiac disease. Both groups had no history of diabetes, hypertension, supraventricular arrhythmias or other aberrant cardiac rhythm disorders. Weight and body-mass index (BMI) were significantly lower in the AN group compared with the controls. Smoking was significantly more common in AN patients than in the controls, although smoking was restricted to at least 3 h prior to the study. None of the patients had hypertension or valvular heart disease.

Comparison of P-wave parameters between AN patients and controls, either from a random beat or from an averaged beat, resulted in a lack of statistical difference in either parameter (Table 2). P wave measurement results for both groups were within the reported range for healthy individuals (Nussinovitch, 2012).

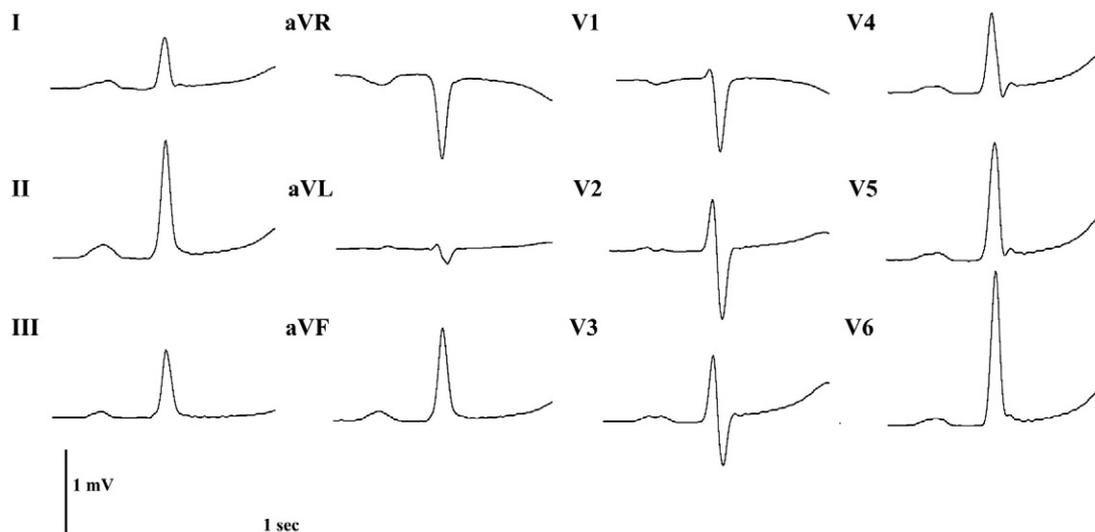


Fig. 1. A 12-lead ECG taken from a 25-year-old healthy volunteer (100 mm/s, 20 mm/mV). The onset and offset of the P waves are detected, and P wave lengths calculated.

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