Paroxysmal atrial fibrillation (AF) is a common arrhythmia encountered in clinical practice. The pathophysiological substrate over which the triggers act thereby causing atrial fibrillation seems to be the disruption of the normal propagation of atrial excitation. P-wave dispersion has been suggested to represent this slowed and nonuniform progression of atrial impulse. P-wave duration in normal subjects has been reported to be influenced by the autonomic tone, which induces changes in atrial size and the velocity of impulse propagation. The Valsalva maneuver is known to terminate supraventricular tachycardia attacks by inducing changes in autonomic tone. There is currently no information on the effect of the Valsalva maneuver on the electrophysiologic properties of atrial musculature and their influence on P-wave duration and dispersion. This study compares the effect of the Valsalva maneuver on P-wave duration and dispersion in normal subjects and patients with paroxysmal AF.

The study group consisted of 27 consecutive patients with paroxysmal AF (15 men, 12 women, mean age 55 ± 10 years). The patients had ≥1 episodes of AF recorded either by 12-lead or ambulatory electrocardiography, and were in sinus rhythm. Patients with valvular or congenital heart disease, pre-excitation syndrome or bundle branch block, with diseases that may influence autonomic function like diabetes mellitus, and patients incapable of performing the Valsalva maneuver were excluded from the study. AF etiology included ischemic heart disease (3 patients (11%)), hypertensive heart disease (7 patients (26%)), chronic obstructive pulmonary disease (2 patients (7.5%)), idiopathic dilated cardiomyopathy (2 patients (7.5%)), and unknown (13 patients (48%)). Sinus bradycardia before AF was not seen. Patients experiencing AF for the first time were converted to sinus rhythm by cardioversion in 2 cases (7.5%) and with medical treatment in 3 cases (11%). No patient was receiving amiodarone and antiarrhythmic therapy was discontinued for 1 week before electrocardiographic recordings.

The control group consisted of age- and sex-matched healthy subjects (14 men and 13 women, mean age 51 ± 12 years) with no history of heart disease and normal findings in physical and laboratory examination. The demographic features of the patient and control groups are shown in Table I.

The simultaneous 12-lead electrocardiographic recordings were taken with Hewlett-Packard M 1709-A (Andover, Massachusetts) electrocardiographic machine on thermal paper at a speed of 50 mm/s and the gain was calibrated to 0.5 mV/cm. All the P-wave deflections were checked for noise and if any deflections were not clear of noise, the examination was repeated 10 minutes later. P-wave duration was measured manually under magnifying glass by 1 observer.
from the beginning of the P-wave deflection from the isoelectric line to the end of the deflection returning to isoelectric line as described previously.\textsuperscript{5,9,10} If the beginning or the end of the deflection could not be satisfactorily defined, that lead was not used. The difference between the maximum and minimum P-wave duration was taken as the P-wave dispersion.\textsuperscript{5} At least 10 leads were available in the assessment of P-wave dispersion. The Valsalva maneuver with simultaneous 12-lead electrocardiographic recording was performed by having the patients exhale into a mercury manometer with enough force to reach 35 mm Hg pressure and sustain it for 20 seconds.\textsuperscript{8,11} Analysis of the 20th P-wave's dispersion after the release of Valsalva maneuver was used (the maximum effect on RR interval was generally seen at this time) to assess the effect of the Valsalva maneuver on P-wave dispersion (Figure 1). Reproducibility analysis was carried on 15 electrocardiographic strips reviewed in 2 different occasions by the same observer. The intraobserver variability was demonstrated by a Bland-Altman plot (Figure 2). The relative error in P-wave dispersion was 10%. All patients were treated in accordance with the requirements of good clinical practice. The Declaration of Helsinki’s recommendations for guiding physicians in biomedical research involving human subjects were followed.\textsuperscript{12} Numerical parameters are reported as mean ± SD. Numerical values were compared with Student’s t test.
electrocardiographic leads seems to be the site-dependent inhomogeneous atrial impulse propagation. In our study, this P-wave dispersion was found to be increased in patients with paroxysmal AF, which agrees with the findings of Dilaveris et al.5 There is currently no study on the effect of autonomic tone changes on P-wave dispersion. In a study with normal patients, atropine induced a shortening of P-wave duration, but P-wave dispersion was not examined.7 According to our findings, the Valsalva maneuver seemed to increase P-wave duration and dispersion in normal subjects. Autonomic response to the Valsalva maneuver is complex and is examined in 4 phases. During the strain phase, there is an increase in intrathoracic pressure and a decrease in the cardiac venous return, cardiac output, pulse pressure, peak systolic pressure, and echocardiographic measurements of cardiac dimensions.13,14 During this phase, an increase of sympathetic tone and a decrease in parasympathetic tone causes an increased heart rate.13-15 The withdrawal of strain increases venous return, cardiac output and blood pressure, and causes sympathetic withdrawal and parasympathetic activation causing sinus bradycardia.

In our study, Pmax increased, Pmin decreased, and P-wave dispersion increased in controls, whereas the opposite was true for patients with paroxysmal AF patients. Yamada et al previously reported a prolongation of P-wave duration and dispersion in unselected patients with paroxysmal AF compared with controls. They also reported that P-wave dispersion may decrease with single-dose pilsicainide, thus predicting a lower recurrence rate for the arrhythmia under medical treatment. These findings imply that the Valsalva maneuver seems to decrease the heterogeneity of atrial impulse propagation due to changes in size and electrophysiologic properties of the atrium.

It was concluded that in unselected patients with paroxysmal AF P-wave duration and dispersion by surface electrocardiogram increased as compared with controls, and that the Valsalva maneuver normalizes these changes. This finding suggests the beneficial effects of medications that decrease sympathetic tone in converting AF to sinus rhythm.


Statistical significance was set at p = 0.05. Statistical analysis was performed with the Statistical Package for Social Sciences for Windows version 5.0 (SPSS Inc, Chicago, Illinois).

Heart rate, PR, and QRS duration were similar between groups (Table I). Maximum P-wave duration (Pmax) and P-wave dispersion was significantly increased in patients with paroxysmal AF compared with controls (Table II). Minimum P-wave duration (Pmin) was similar in the 2 groups (Table II). At the 20th beat after the release of the Valsalva maneuver, Pmax increased and Pmin decreased, increasing P-wave dispersion in the control group, whereas Pmax decreased and Pmin increased, decreasing the P-wave dispersion in the patients with paroxysmal AF. P-wave dispersion in the patients with paroxysmal AF was similar to controls after the Valsalva maneuver (Figure 3).

The cause of P-wave duration changes on surface
Significance of Accelerated Idioventricular Rhythm in Idiopathic Dilated Cardiomyopathy

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Accelerated idioventricular rhythm (AIVR) describes an ectopic rhythm with ≥3 consecutive premature beats with a rate faster than the normal ventricular intrinsic escape rate of 30 to 40 beats/min, but slower than ventricular tachycardia (VT). Of note, no consensus exists with regard to the upper rate limit for the definition of AIVR. Whereas some investigators arbitrarily defined an upper rate limit of 100 beats/min, others took 120 beats/min as cutoff for differentiation of AIVR from VT. Clinically, AIVR may occur in any form of heart disease, but may also be seen in the absence of apparent heart disease. In the setting of acute myocardial infarction, AIVR has been found to be a specific noninvasive marker for successful reperfusion during thrombolysis or acute angioplasty. In contrast to nonsustained VT, AIVR on Holter monitoring is considered to be a benign finding without prognostic relevance, although to date only few studies are available to support this hypothesis. A retrospective analysis of the Cardiac Arrhythmia Suppression Trial database revealed an increased mortality in postinfarct patients with AIVR at a rate of 100 to 120 beats/min, whereas AIVR <100 beats/min on Holter was not associated with an adverse outcome in either the active treatment group or the placebo group. In the setting of idiopathic dilated cardiomyopathy (IDC), several studies described the prognostic significance of nonsustained VT on Holter. None of these studies, however, investi-
Paroksismal Atriyal Fibrilasyonda Yüzey Elektrokardiyografik P Dalga Dispersiyonu Üzerine Valsalva Manevrasının Etkisi

Çalışmamızın amacı, P dalga süreleri ve dispersiyonu üzerine Valsalva Manevrasının etkisini araştırmak. Kontrol grubunda Valsalva Manevrası sonrası maksimum P dalga süresinde artma, minimum P dalga süresinde azalma ve P dalga dispersiyonunda artma saptanırken, seçilmemiş paroksismal atriyal fibrilasyonlu hastalarda bu bulguların tersi elde edildi. Sonuç olarak Valsalva Manevrası, paroksismal atriyal fibrilasyonlu hastalarda atriyum içerisindeki homojen olmayan iletiyi düzelterek, P dalga dispersiyonunu normale döndürdüğü düşünüldü.