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Esansiyel Hiperhidrozlu Hastalarda P Dalga Süresi ve Dispersiyonu

P WAVE DURATION AND DISPERSION IN PATIENTS WITH ESSENTIAL HYPERHIDROSIS

İrfan Barutçu, *Şemsettin Karaca, Ali Metin Esen, **Dayimi Kaya, *Mustafa Kulaç, Özlem Esen, **Mehmet Melek, **Ersel Onrat

Koşuyolu Kalp Eğitim ve Araştırma Hastanesi, Kardiyoloji Kliniği, İstanbul
**Afyon Kocatepe Üniversitesi Tıp Fakültesi, Dermotoloji Ana Bilim Dalı, Afyon*
***Afyon Kocatepe Üniversitesi Tıp Fakültesi, Kardiyoloji Ana Bilim Dalı, Afyon*

Özet

Amaç: Bu çalışmada, esansiyel hiperhidrozlu hastalarda ve sağlıklı kontrollerde P dalga süresi ve dispersiyonunu karşılaştırdık.
Materyal ve Metod: Esansiyel hiperhidrozlu yirmi birey (ortalama 28 ± 7 yaş) ve yirmi sağlıklı birey (ortalama 31 ± 8 yaş) çalışmaya alındı. Tüm katılımcılardan 50 mm/saniyelik kağıt hızında kaydedilmiş 12 kanallı yüzey EKG elde edildi. Maksimum ve minimum P dalga süresindeki değişim elle ölçüldü ve ikisi arasındaki fark P dalga dispersiyonu olarak tanımlandı. Tüm katılımcılara ayrıca transtorasik ekokardiyografik değerlendirme yapıldı.
Bulgular: Demografik özellikler bakımından iki gurup arasında fark yoktu. Ekokardiyografik değerlendirmede P dalga süresi ve dispersiyonu hiperhidrotik ve kontrol bireylerinde benzer bulundu (111 ± 10 ve 110 ± 6 ms $p = 0.6$, 64 ± 12 ve 67 ± 9 ms $p = 0.4$, sırasıyla). P dalga disersiyonu da hiperhidrotik bireylerle kontrol bireylerinde benzer bulundu (47 ± 8 ve 43 ± 9 ms $p = 0.1$).
Sonuç: Bu bulgular göstermektedir ki hiperhidrotik bireylerde P dalga süresi ve dispersiyonu sağlıklı kontrol bireylerine kıyasla artmamıştır ve bu hastalar atriyal ileti anomalilerine yatkın değildirler.

Anahtar kelimeler: Esansiyel hiperhidrozis, sempatik hiperaktivite ve P dalga dispersiyonu

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Summary

Background: In this study we compared P wave duration and dispersion (PWD) in patients with essential hyperhidrosis and healthy control subjects.
Methods: Twenty subjects (mean age 28 ± 7 years) with essential hyperhidrosis and twenty healthy control subjects (mean age 31 ± 8 years) were included to study. Twelve leads surface ECG recorded at a peper speed of 50mm/s was obtained from all participants. The change in maximum and minimum P wave duration was measured manually and difference between two values was defined as PWD. Transthoracic echocardiographic examination was performed in all participants.
Results: There was no difference between two groups in terms of baseline demographic properties. On echocardiographic examination no significant cardiovascular disorder was detected. Maximum and minimum P wave duration were found to be similar in hyperhidrotic subjects and healthy controls (111 ± 10 vs.110 ± 6 $p = 0.6$, 64 ± 12 vs. 67 ± 9 $p = 0.4$, respectively). PWD in hyperhidrotic subjects was also found to be identical in controls (47 ± 8 vs. 43 ± 9 $p = 0.1$).
Conclusion: These results suggested that hyperhidrotic subjects had no prolonged P wave duration and increased PWD compared to healthy subjects and these patients were not prone to the atrial conduction abnormalities.

Keywords: Essential hyperhidrosis, sympathetic overactivity and P wave dispersion

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CARDIOLOGY

Introduction

Essential hyperhidrosis, characterized by excessive sweating of the eccrine sweat glands, is a frequently encountered dermatologic and neurologic disorder [1]. The pathophysiology of this condition is poorly understood but it has been attributed to overactivity of the sympathetic fibers that pass through the upper thorasic sympathetic ganglia [2]. Endoscopic thoracoscopic sympathectomy is particularly considered an effective and safe treatment in refractory cases to conventional therapies [3-5]. Sympathetic fibers to eccrine glands of palms of the hand arise from stellate and upper thoracic ganglia which

Adres: *Dr. İrfan Bautçu, Koşuyolu Kalp Eğitim ve Araştırma Hastanesi, Kardiyoloji Kliniği, İstanbul*
e-mail: *irfanbarutcu@yahoo.com*

also innervate lung, heart, and blood vessels of the upper limb [6,7]. Therefore, it has been considered that essential hyperhidrosis is not only a local disturbance but also results from general dysfunction of the autonomic nervous system, also involving cardiac autonomic control. Accordingly, previous studies have showed that cardiac autonomic autonomic function is altered in patients with hyperhidrosis compared to healthy subjects [8,9]. Beta-blockers have also been proposed to reduce sweating in these patients [10]. Blood pressure response to cold test and handgrip in essential hyperhidrosis were lowered by sympathicolysis [9,11]. However, to date, only a few studies have investigated the effect of this disorder on cardiovascular system.

P wave dispersion (PWD) is a recent ECG marker that reflects discontinuous and inhomogeneous conduction of sinus impulses [12,13]. P wave duration and PWD have been reported to be influenced by the autonomic tone, which induces changes in the velocity of impuls propogation[14]. Prolonged P-wave duration and increased PWD have been reported to carry an increased risk for atrial fibrillation (AF)[12-15]. We have hypothesized that putative role of sympathetic overactivity may affect P wave duration and PWD in patients with hyperhidrosis. However, PWD and P wave duration, the markers of cardiac autonomic tone, have not yet been studied in patients with hyperhidrosis. Therefore, the purpose of this study was to investigate P wave duration and PWD in patients with essential hyperhidrosis and to compare those with healthy subjects.

Material and Methods

Twenty patients with bilateral severe palmar and axillary hyperhidrosis (8 male, 12 female mean 28 ± 7 years) and twenty healthy control subjects (10 male, 10 female mean age 31 ± 8 years) were included in this study. All subjects with hyperhidrosis were suffering from the excessive sweating at palmar and axillary region for a long time. This was also observed and confirmed by an experienced dermatologist. Later, diagnosis of essential hyperhidrosis was confirmed by ninhydrin sweat test on the hyperhidrotic regions [16]. The patients with the history of congestive heart failure, coronary artery disease, valvular heart disease, hyperthyroidism, chronic obstructive pulmonary disease, ventricular preexcitation, atrioventricular conduction abnormalities and those on medications known to alter cardiac conduction were excluded from the study.

A 12–lead surface electrocardiogram (ECG) was obtained from each subject in the supine position. The 12-lead ECG was recorded at a paper speed of 50-mm/s and 2mV/cm standardization. Measurement of P wave duration was carried out manually using a caliber. The onset of P wave was defined as the point of the first visible upward departure of the trace from the bottom of the baseline for positive waves and as the point of first downward departure from the top of baseline for negative waves. The return to the baseline of the bottom of trace in positive waves and the top of the trace in negative waves were considered to be the end of the P wave. At least three consecutive beats were measured in each lead. All P-waves were checked for noise and if it was not clear, the examination was repeated. When the end of the P wave could not reliably be determined these leads were excluded from the study. The difference between the maximum and minimum P wave duration was calculated from the 12-lead ECG and was defined as the PWD. In addition, all participants underwent echocardiographic examination to exclude valvular disorders and wall motion abnormalities.

Statistical Analysis

All data were presented as mean value ± SD. Comparison of clinical variables between two groups was performed with unpaired student t test for numeric variables and chi-square test for categorical data. Relation between variables was assessed using Pearson's correlation coefficient. Pearson's correlation coefficient was also used to assess intra and inter-observer variability for P wave duration and PWD, and yielded minimal variability ($r = 0.98$ $p < 0.0001$ and $r=0.96$ $p<0.0001$ respectively). A p value <0.05 was considered as statistically significant.

Results

Clinical characteristics of two groups are shown in Table 1. There was no significant difference between two groups in demographics of age, sex, heart rate, and blood pressure. On echocardiographic examination no valvular disorders, left ventricular hypertrophy, wall motion abnormalities and clinically significant valvular regurgitation were detected in any of the study subjects. All study subjects had sinus rhythm. The number of the leads in which P wave duration could be measured was similar in both groups (range 8 to 12 leads). Maximum and minimum P wave duration were found to be similar in hyperhidrotic subjects and healthy controls. (111 ± 10 vs.110 ± 6 $p = 0.6$, 64 ± 12 vs. 67 ± 9 $p = 0.4$, respectively). (Figure 1 and 2). PWD in hyperhidrotic subjects was also found to be identical in controls.((47 ± 8 vs. 43 ± 9 $p = 0.1$) (Figure 3). In addition, there was no significant correlation between the

Table 1. General characteristics of study subjects.

Variable	Hyperhidrotic patients	Control subjects	*p values*
number (male/female)	8/12	10/10	NS
Age, years	28 ± 7	31 ± 8	NS
Body mass index kg/m2	25 ± 5	25 ± 4	NS
Heart rate (beat/min)	77 ± 6	74 ± 5	NS
Systolic blood pressure, mmHg	120 ± 9	122 ± 1	NS
Diastolic blood pressure, mmHg	75 ± 8	73 ± 6	NS

NS = statistically not significant

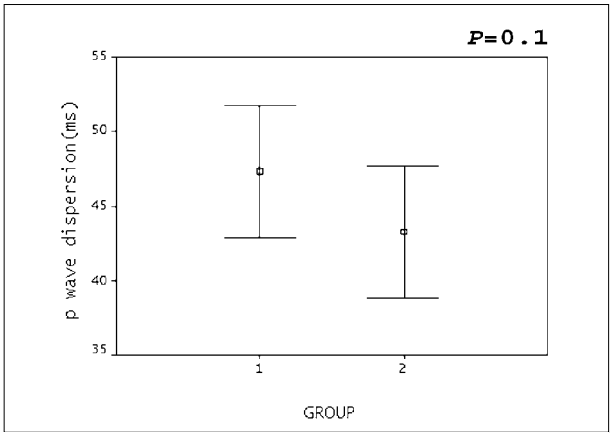

Figure 1. Comparison of the maximum P wave duration in hyperhidrotic patients (group-1) and healthy control subjects (Group-2).

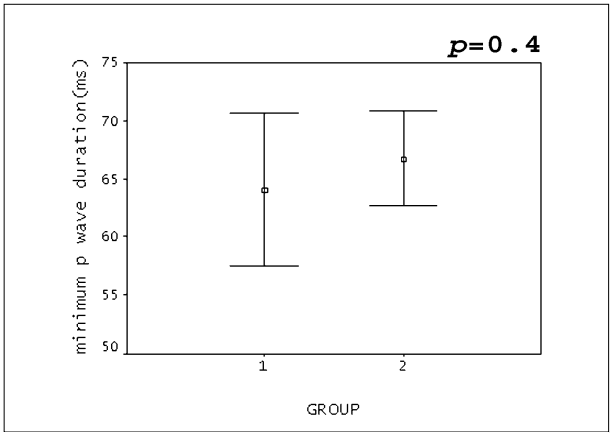

Figure 2. Comparison of the minimum P wave duration in hyperhidrotic patients (group-1) and healthy control subjects (Group-2).

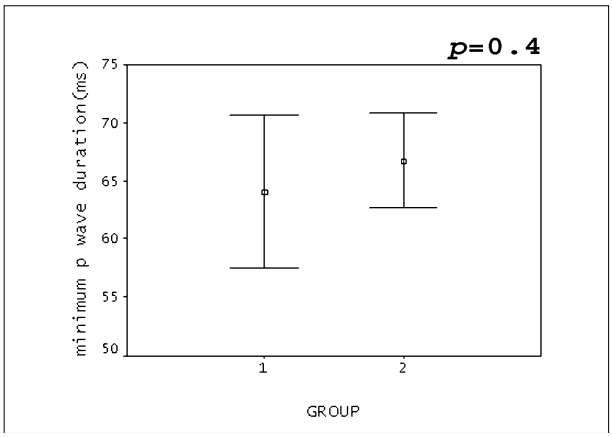

Figure 3. Comparison of the P wave dispersion in hyperhidrotic patients (group-1) and healthy control subjects (Group-2).

ECG variables and echocardiographic parameters.

Discussion

In the present study we attempted to compare PWD in patients with essential hyperhidrosis and healthy control subjects. We found no difference between those patients with essential hyperhidrosis and healthy control subjects with respect to P wave duration and PWD. To our knowledge no previous studies have compared P wave duration and PWD in patients with essential hyperhidrosis and in controls. Therefore, our study is the first that has investigated the P wave duration and PWD changes in patients with essential hyperhidrosis.

P wave dispersion and autonomic control of the heart: PWD is a new electrocardiographic marker that has been associated with the inhomogeneous and discontinuous propagation of sinus impulses and the correlation between the presence of intraatrial conduction abnormalities and the induction of paroxysmal AF has been well documented [14,17]. P wave duration and PWD have been reported to be influenced by the autonomic tone, which induces changes in the velocity of impulse propagation [14]. Prolonged P-wave duration and increased PWD have been reported to carry an increased risk for atrial fibrillation (AF) [12-15]. Therefore, PWD can be used to separate patients with a high risk of AF during sinus rhythm [15]. Accordingly, Tukek et al [18] suggested that increased sympathetic activity may cause significant increase in PWD. As they observed that PWD and Pmax were increased in patients with paroxysmal AF when compared with controls and that Valsalva maneuver normalized these changes, as supposed their finding could be related to beneficial effects of medications that decrease sympathetic tone in converting AF to sinus rhythm. Therefore, taking into account effect of autonomic system changes on P wave duration and PWD, we compared these parameters in patients with essential hyperhidrosis and healthy control subjects. Our results showed that P wave duration and PWD were not different in patients with essential hyperhidrosis than those of healthy subjects.

Previous studies in essential hyperhidrosis: Essential hyperhidrosis is a well known but poorly understood dermatologic, neurologic and social anxiety disorder. It is mainly a problem of the young people in the second and third decade of life, usually starting in puberty. Interruption of the sympathetic chain at T2-T4 level by thoracoscopic intervention is considered an effective and safe treatment for essential hyperhidrosis refractory to conventional local, systemic, or other treatments [5,19]. Beta-blockers have also been proposed to reduce sweating in these patients [10]. Sympathetic fibers to eccrine glands of palms of the hand arise from stellate and upper thoracic ganglia which also innervate lung, heart, and blood vessels of the upper limb [6,7]. Therefore it is probable that cardiovascular system functions may be affected from this disorder. However, there are only a limited number of studies that have investigated cardiac autonomic function in patients with essential hyperhidrosis in order to demonstrate putative role of sympathetic hyperactivity and controversial results have been reported concerning whether cardiac autonomic functions are altered in this disorder. Shih et al [9] reported that patients with denervation of T2-3 ganglia because of palmar hyperhidrosis showed altered sweating response on the whole body during physical exercise compared to normal subjects and

patients suffering from palmar hyperhidrosis. Hyperhidrotic subjects with intact ganglia also showed less bradycardia in response to the Valsalva maneuver, and a higher degree of cutaneous vasoconstriction in response to finger or cold immersion. The authors suggested an over-functioning of sympathetic fibers running through T2-3 as the cause of palmar hyperhidrosis, which leads to generalized autonomic dysfunction [9]. Other authors suggested that palmoplanter hyperhidrosis is only secondary to the hyperresponse to the mental and emotional stimulation of the sympathetic nervous system, and instead originates in cerebral cortex [20]. Noppen et al.[8], reported a higher peak heart rate in subjects with focal hyperhidrosis at physical exercise, which normalizes after sympathicolysis. The authors concluded that sympathetic overactivity relevant to cardiac function in hyperhidrosis is only evident during sympathetic stimulation [8]. Wiklund et al [21], using power spectral analysis of heart rate variability, have also assessed the immediate and long–term effects of endoscopic thoracoscopic sympathicotomy on autonomic modulation of the heart rate in patients with hyperhidrosis. These authors have concluded that patients with palmar hyperhidrosis have a sympathetic overactivty but also compensatory high parasympathetic activity and sympathicolysis results in initial sympathovagal imbalance with a parasympathetic predominance, which is restored on a long-term basis. In additon, transection of the sympathetic trunk between the first and second thoracic sympathetic ganglia, with diathermy coagulation of the lower end of the divided trunk, produces long-lasting ipsilateral sympathetic denervation of the upper limb, resulting in inhibition of eccrine sweat gland activity and an increase in forearm blood flow in 95% of the patients with essential hyperhidrosis [3]. On the other hand, Kingma et al [7] investigated effects of thoracic sympathectomy of T2-T4 on hemodynamics and baroreflex control of the heart and found that thoracic sympathectomy decreased mean heart rate and mean blood pressure, but autonomic function test outcomes did not alter, although measurable changes in cardiovascular control appeared, particularly in total peripheral resistance. Similarly, Birner et al [22] found no evidence of cardiac sympathetic dysfunction, but observed parasympathetic dysfunction at autonomic stimulation in hyperhidrotic subjects compared to normal subjects. More recently, Senard et al [23] assessed blood pressure and HRV at rest and during head-up tilt test in patients with essential hyperhidrosis and compared those of controls and observed at rest, a higher relative energy of low frequency band (LF) of systolic blood pressure in hyperhidrotic subjects in comparison with controls contrasting with the lack of difference in blood pressure, heart rate and in other spectral parameters. Authors concluded that in essential hyperhidrosis, sympathetic nervous system was not overactive [23]. Our results were in accordance with the finding of this study because we found no difference between the two groups either in P wave duration or in PWD, namely, our findings were in favor of the lack of sympathetic overctivity in hyperhidrotic patients compared to healthy subjects.

Study Limitations

In this study, we used rest ECG to compare P wave duration and PWD in patients with essential hyperhidrosis and control subjects. Indeed, we did not test the changes in P wave duration and PWD during sympathetic and parasympathetic maneuvers. However, our aim was only to investigate whether there was any difference between hyperhidrotic and healthy subjects regarding P wave duration and PWD measured at rest, which may reflect sympathetic overactivity. In addition, PWD measurement errors done with manual evaluation may be a potential bias for observed results. However, to improve accuracy all measurements were performed with magnifying lenses for defining the electrocardiogram deflection and manual measurement of P wave dispersion has been well accepted and used in several studies [13-16]. To minimize measurement errors all measurements were performed in duplicate on two separate days and by two independent observers blinded to order of ECG. Moreover, intra and inter-observer correlation test yielded minimal variability. In addition, we did not assess plasma noradrenalin level, which may indicate sympathetic overactivity. However, Senard et al.[23] already showed that there was no difference with respect to plasma noradrenalin levels between two groups either in resting or during Head-up tilt test. Also, we included only a small number of patients and therefore, our results should be interpreted with caution.

We observed that hyperhidrotic subjects had no prolonged P wave duration and increased PWD in comparison with healthy subjects on 12-lead surface ECG at rest. Our results may indicate that sympathetic nervous system is not active as high as to affect P wave duration and PWD, and that the patients with essential hyperhidrosis at least are not prone to atrial conduction abnormalities. However, further large-scale studies are needed in order to clarify effects of this disorder on cardiovascular system.

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