Effects of Using a Different Kind of Smokeless Tobacco on Cardiac Parameters: "Maraş Powder"

Farklı Bir Tip Dumansız Tütün Kullanımının Kardiyak Parametreler Üzerine Etkisi "Maraş Otu"

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Abstract

Objective: A plant powder called "Maraş Powder" has been used widely instead of cigarette in the South-Eastern region of Turkey. It was confirmed that this powder has been made of tobacco N. rustica L. Our aim was to investigate whether the use of Maraş Powder is as harmful as cigarette smoking or not.
Methods: Forty-five Maraş Powder users (Group I), 32 persons who smoked cigarette (control-Group II) and 30 healthy persons neither smoking nor using Maraş Powder (Group III) were included into the study. Laboratory investigations, electrocardiography and echocardiography were performed in all participants of the study. For evaluation of the ventricular repolarization parameters, 50 mm/sec ECG recordings were used. Echocardiographic investigation was performed for assessment systolic and diastolic function.
Results: No differences were found by means of ventricular repolarization parameters among the three groups (p>0.05). Echocardiographic investigation revealed similar systolic function results in all of the three groups. There was reduced early filling velocity of the left ventricle (p=0.03, p=0.02) and increased filling velocity of the atrial component (p=0.02, p=0.02) in group I and group II. When they were compared to group III, deceleration time was also increased (p<0.01, p<0.01). Isovolumetric relaxation time was higher in group I and group II than that of group III (p=0.02, p=0.03). In group I and group II, total cholesterol (p=0.03, p=0.02), LDL-cholesterol (p<0.01, p<0.01) and triglyceride levels (p<0.01, p<0.01) were found to be higher than those of group III, whereas HDL levels were lower (p=0.02, p<0.01).
Conclusion: As a result, we thought that Maraş Powder is as harmful as cigarette smoking and it has similar negative effects on cardiovascular system. In our opinion, "Maraş Powder" is a smokeless tobacco use. *(Anadolu Kardiyol Derg 2003; 3: 230-5)*
Key words: Maraş powder, echocardiography, serum lipids, smokeless tobacco

Özet

Amaç: Yurdumuzun Güneydoğu Anadolu bölgesinde "Maraş Otu" adı verilen bitkisel bir toz, sigara yerine yaygın olarak kullanılmaktadır. Bu tozun N. rustica L. tütününden yapıldığı tespit edilmiştir. Çalışmamız, Maraş Otu kullanımının sigara kadar zararlı olup olmadığını değerlendirmek amacı ile yapıldı.
Yöntem: Çalışmaya, 45 Maraş Otu kullanıcısı (Grup I) ve sigara içen 32 kişi (Grup II), kontrol grubu olarak sigara veya Maraş Otu kullanmayan 30 sağlıklı olgu (Grup III) dahil edildi. Ventriküler repolarizasyon parametrelerini değerlendirmek için tüm olguların 50 mm/sn hızında elektrokardiyografileri çekildi. Ayrıca sistolik ve diyastolik fonksiyon parametreleri değerlendirmek için ekokardiyografik ölçümleri yapıldı.
Bulgular: Her üç grupta da ventriküler repolarizasyon parametreleri arasında fark yoktu (p>0.05). Ekokardiyografik değerlendirmede üç grupta da sistolik fonksiyon parametreleri benzer bulundu. Grup I ve grup II'de sol ventrikül erken doluş zamanı kontrol grubuna göre daha düşüktü (p=0.03, p=0.02). Bu gruplarda, atriyal doluş zamanı (p=0.02, p=0.02) ve deselerasyon zamanı ise (p<0.01, p<0.01) kontrol grubuna göre daha yüksek bulundu. İzovolümetrik relaksasyon zamanı grup I ve grup II'de kontrol grubuna göre artmış bulundu (p=0.02, p=0.03). Grup I ve grup II'de total kolesterol (p=0.03, p=0.02), LDL kolesterol (p<0.01, p<0.01) ve trigliserid (p<0.01, p<0.01) düzeyleri grup III'den yüksek bulunurken HDL düzeyleri düşük bulundu (p=0.02, p<0.01).
Sonuç: Maraş Otunun en az sigara kadar zararlı olduğu ve kardiyovasküler sistem üzerine olumsuz etkileri bulunduğu kanısına vardık. Bize göre "Maraş Otu" dumansız bir tütün kullanımıdır.

Introduction

Cigarette smoking, which is known to have deleterious effects on cardiovascular system for a long time, is also known to be the cause of hypertension, hypercholesterolemia and coronary heart disease (1).

A number of studies demonstrated that cigarette smoking enhances the incidence of myocardial in-

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farction, sudden coronary death, stroke, peripheral arterial disease and aortic aneurysm risks (2-3). Morbidity and mortality are also increased in patients with coronary arteriosclerosis who are smokers (4-7). In our country a type of smokeless tobacco called Maraş Powder is widely used in the Southeastern region especially in Kahramanmaraş and Gaziantep cities and in many cases addiction is developed. Maraş Powder users of both sexes vary in age and education levels. Maraş Powder is used via oral route, instead of cigarette smoking. It is different from chewing tobacco. This powder is mostly preferred while trying to quit smoking or lessen it. The leaves of a plant known as "crazy tobacco" locally are powdered and this powder is mixed with the ash of wood especially oak, walnut or grapevine. It is obtained from a tobacco plant species known as Nicotina rustica L. First of all, sun-dried leaves of this plant are powdered and mixed with the ash in 1:2 or 1:3 proportions (tobacco and oak, respectively). Then, water is sprinkled onto this mixture for humidification. A small amount of this mixture (approximately 1gr) is applied between the lower labial mucosa and gingival for 4-5 min. This region of the mouth has many capillary vessels; therefore, nicotine is quickly absorbed into circulation. This procedure is repeated many times during the day; some people even sleep with this powder (8).

Public does believe that this smokeless powder which they take orally is less harmful than cigarette smoking. Most of them use it in order to quit smoking. Our study was planned to investigate whether Maraş Powder damages cardiovascular system as much as cigarette smoking.

Material and Methods

Forty-five Maraş Powder users who were admitted to various clinics with different non cardiac complaints (Group 1), 32 cigarette smokers (Group 2) and 30 healthy nonsmoker subjects and who were also no taking Maraş Powder (Group 3) participated in the study. History was taken and physical examinations were done in all subjects. Duration and frequency of Maraş Powder using, duration of cigarette smoking and number of cigarettes smoked throughout the day were recorded. Presence of congestive heart failure, chronic obstructive lung disease, malignancy, liver parenchyma and renal failure, and diabetes mellitus were the exclusion criteria from the study.

Blood samples of the patients were collected at 8.00-10.00 am following 24 hours of smokeless period and 12 hours of fasting state.

After resting period of 15 minutes, blood pressure was measured twicely in both arms with 10 minutes intervals, and mean values were recorded.

To evaluate ventricular repolarization parameters, all participants underwent 12-lead electrocardiogram (ECG) recordings with paper speed of 50 mm/sec. In all derivations, onset point of QRS complexes and TP isoelectric turning point of T wave was signed with hand and the distance between them was measured as QT interval. QT interval was corrected to heart rate in every patient using Bazett formula (QTc= QT/÷RR sec) and corrected QT (QTc) interval was established.

QT dispersion was calculated (QTd) as the difference between maximum QT interval in any of the derivations and minimum QT interval. In the same way, QTcd was calculated as difference between maximum QTc in any derivation and minimum QTc. All participants underwent echocardiographic evaluation (Aspen, Acuson Computer Sonography, Mountain View, California). M-mode echocardiography was used to measure left ventricular dimensions and 2-dimensional echocardiography was accomplished to evaluate ventricular wall motions. Diastolic mitral flow patterns were assessed by means of pulsed Doppler echocardiography and valvular regurgitation was evaluated using color Doppler echocardiography. Left ventricular ejection fraction (EF), fractional shortening (FS), interventricular septum diastolic thickness (IVSd) and posterior wall end-diastolic thickness (PWDd) were calculated. Diastolic mitral flow measurements were performed by pulsed Doppler echocardiography from apical four-chambers view through the level of mitral valve with further measurement of mitral E and A velocities, isovolumetric relaxation time, deceleration time and acceleration time (9).

After 12-hours of fasting period, venous blood samples were drawn for blood glucose, total cholesterol, LDL-Cholesterol, HDL-Cholesterol, triglycerides and fibrinogen analysis.

Statistical Analyses

Collected data are given as mean ± standard deviation. The differences in mean values among the

groups were investigated using analyses of variances (ANOVA). P value less than 0.05 was accepted as statistically significant.

Results

As can be seen from Table 1 there was no difference between groups according to age and mean heart rate. Maraş Powder and cigarette smoking durations were similar (p>0.05). Blood pressure in group I and group II was higher than that of group III, but it was not statistically significant (p>0.05).

Ventricular repolarization parameters are given in Table 2. QT and QTc values did not differ between groups (p>0.05). QTd and QTcd values were similar in group 1 and group 2 but were higher than those of group 3, though differences did not reach statistical significance (p>0.05).

Left ventricular dimensions and systolic function parameters are shown in Table 3. There were no significant differences among three groups regarding left ventricular dimensions, wall thickness and ejection fraction (p>0.05).

Diastolic function parameters are given in Table 4. In group 1 and group 2, there was a decrease in left ventricular early filling velocity (p=0.03, p=0.02), an increase in atrial filling velocity (p=0.02, p=0.02), a decrease in E/A ratios and lengthening in deceleration time when compared to group 3 (p<0.01, p<0.01). Isovolumetric relaxation time in group 1 and group 2 was found to be higher than that of group 3 (p=0.02, p=0.03). Nevertheless, diastolic pa-

Table 1. Demographic characteristics of the study groups.

	Group 1 (n=45)	Group 2 (n=32)	Group 3 (n=30)
Age (year)	45±10	47±8	44±7
Systolic blood pressure (mmHg)	132±8	130±7	125±6
Diastolic blood pressure (mmHg)	75±7	77±6	70±7
Pulse (beat/min)	82±5	85±6	78±7
Maraş Powder use duration (years)	15±8	-	-
Cigarette smoking duration (years)	-	16±7	-
*differences between groups are nonsignificant (p>0.05)			

Table 2. Ventricular repolarization parameters

	Group 1 (n=45)	Group 2 (n=32)	Group 3 (n=30)
QT (ms)	331±20	336±25	330±22
QTd (ms)	50±22	53±23	47±20
QTc (ms)	347±25	350±28	342±25
QTcd (ms)	35±16	37±18	30±14
*differences between groups are nonsignificant (p>0.05)			

Table 3. Left ventricular dimensions and systolic function parameters.

	Group 1 (n=45)	Group 2 (n=32)	Group 3 (n=30)
Interventricular septum (cm)	0.91±0.4	0.94±0.5	0.9±0.3
Posterior wall (cm)	0.88±0.3	0.91±0.3	0.89±0.2
Left ventricular end-diastole diameter (cm)	4.04±0.44	4.2±0.55	4.2±0.36
Left ventricular end-systole diameter (cm)	2.2±0.3	2.3±0.4	2.1±0.3
Ejection Fraction (%)	65±6	64±5	66±7
Fractional Shortening (%)	37±5	34±6	36±7
*differences between groups are nonsignificant (p>0.05)			

rameters were similar in group I and group II (p>0.05).

Laboratory values are displayed in Table 5. Fasting blood glucose levels were within normal limits in all groups. In group 1 and group 2, total cholesterol (p=0.03, p=0.02), LDL-cholesterol (p< 0.01, p<0.01), triglyceride (p<0.01, p<0.01) levels were higher than those of group III. HDL-cholesterol was found to be lower than that of group 3 (p=0.02, p<0.01). Fibrinogen levels in group 1 and group 2 were higher significantly than those of group 3 (p=0.02, p<0.01).

Discussion

Cigarettes have a widespread use and their smoke contains more than 4000 very toxic compounds, mainly nicotine (10). Various clinical and pathological investigations revealed that cigarette smoking gave rise to cardiovascular (11-14), respiratory, endocrine, urogenital and immune system disorders, and demonstrated that it increased morbidity and mortality (15-17). Moreover, as the number of cigarettes smoked increases, cardiovascular mortality increases by 1.5-2 times, the rate of coronary artery disease and overall mortality increases by 2-2.5 times (18). However, it is suggested that the prominent effects of smoking on cardiovascular system is atherosclerosis and direct toxicity over endothelium leading to endothelial damage (19, 20).

Maraş Powder is different from the chewing tobacco. Use of this powder represents a different type of tobacco use. It is made of a plant N. rustica L and as it is reported it does not differ from tobacco N. tobacum L by alcaloid composition (21). Nevertheless nicotine content of N. rustica L is higher about 6-10 fold than N.tobacum L (21). In this case, it is mostly probable that N.rustica L is preferred in the preparation of Maraş Powder because of its high nicotine content. It's accepted that the ash in this mixture transforms the alkaloids into the base form and provides the absorption of them from the buccal mucosa easily (22).

It has been shown that the average blood concentration of nicotine in regular smokers is 220 nmol/L and that the level can reach 440 nmol/L after consumption of a single cigarette (23,24). It has been estimated that the typical single dose of nicotine in chewing tobacco is 15 times greater than for an average-strength cigarette (25,26). When Maraş Powder is considered to have higher nicotine content, it is obvious that harmful effects should be more pronounced.

Table 4. Parameters of left ventricular diastolic function.

	Group 1 (n=45)	Group 2 (n=32)	Group 3 (n=30)	P1-3	P2-3	P1-2
Mitral E (cm/s)	55±12	52±15	75±12	0.03	0.02	NS
Mitral A (cm/s)	72±10	75±12	56±9	0.02	0.02	NS
E/A	0.73±0.1	0.69±0.15	1.3±0.1	<0.01	<0.01	NS
Acceleration time (ms)	155±25	158±20	160±25	NS	NS	NS
Deceleration time (ms)	192±32	195±30	145±27	<0.02	<0.03	NS
Isovolumetric relaxation time (ms)	110±18	114±20	86±13	0.02	0.03	NS
NS-nonsignificant						

Table 5. Laboratory parameters.

	Group 1 (n=45)	Group 2 (n=32)	Group 3 (n=30)	P1-3	P2-3	P1-2
Glucose (mg/dl)	82±12	87±10	85±11	NS	NS	NS
Total cholesterol (mg/dl)	230±25	235±29	175±24	0.03	0.02	NS
LDL cholesterol (mg/dl)	150±28	155±30	100±20	<0.01	<0.01	NS
HDL cholesterol (mg/dl)	32±8	30±7	42±8	0.02	<0.01	NS
Triglyceride (mg/dl)	212±22	215±20	200±17	<0.01	<0.01	NS
Fibrinogen (mg/dl)	350±35	360±41	330±30	0.02	<0.01	NS
NS-nonsignificant						

Active cigarette smoking and exposure to this environment give rise to endothelial dysfunction and increase in platelet aggregation (27,28). Thromboxane production is increased and plasma viscosity and fibrinogen levels are elevated (29). In our study, fibrinogen level is found higher in patients who use Maraş Powder and cigarette smokers than in healthy subjects. Level of fibrinogen was similar in both Maraş Powder and cigarette smoker's group.

It has been demonstrated that cigarette smoking increased total cholesterol and LDL cholesterol levels and decreased HDL cholesterol levels (30,31). This situation has a deleterious effect on the anti-atherogenic effect of HDL cholesterol. HDL cholesterol has a protective role against atherogenesis by at least two mechanisms. First, HDL cholesterol takes higher cholesterol away from the peripheral tissues such as blood vessels and carries it back to the liver, which is known as reversed cholesterol transport process (32). Secondly, it prevents the oxidation of LDL cholesterol (33). In our study, HDL cholesterol values were lower, while total cholesterol and LDL cholesterol levels were higher in patients who use Maraş Powder and smoke cigarettes than those of healthy subjects.

Echocardiographic evaluation demonstrated normal systolic function parameters in all groups. However, left ventricular diastolic function parameters in patients with Maraş Powder and cigarette smokers showed late relaxation pattern as compared with control group. We thought that this happens because of harmful effects of nicotine over coronary arteries.

Nicotine also increases incidence of arrhythmias. It is believed that nicotine leads to lethal ventricular arrhythmias ending with cardiac deaths (34,35). Increased QT dispersion demonstrates ventricular inhomogenity and gives rise to lethal ventricular arrhythmias (36). Previous studies showed that smoking influence ventricular repolarization parameters negatively (37). Our purpose was to assess ventricular repolarization parameters in Maraş Powder users. In the study, while QT and QTc values were found similar in patients who smoke cigarettes or using Maraş Powder, QTd and QTcd values were slightly increased without statistical significance. We believe that nicotine causes endothelial dysfunction leading to vasoconstriction of coronary arteries. Nicotine also leads to cardiac complications via overstimulation of catecholamines. Higman et al found that nitric oxide levels, which are produced by endothelial cells decreased in cigarette smokers (38). Kiowski et al concluded that the increase in the vascular tonus in chronic cigarette smokers was provided by the insufficiency of nitric oxide synthesis (39). In our study we did not measure nitric oxide but we think that nicotine, which is absorbed orally may lead to endothelial dysfunction as in the condition of cigarette smoking. Overstimulation of catecholamines as the cardiac side effect may also be due to nicotine, itself (23). Animal studies demonstrated that nicotine delayed ventricular repolarization by blocking type A channels of the heart (40). As a result of this, a number of arrhythmias occur.

Study Limitations

We should have compared the urinary cotinin levels and blood levels of nicotine in both groups, because amount of Maraş Powder used can not be quantified as in the case of smoking. But, we couldn't perform such a correlation since we did not assess the blood levels of nicotine and urinary cotinin levels due to technical insufficiency. This is an important limitation of our study. However, Maraş Powder use is an important public healthy problem due to common use in Maraş and surrounding cities.

In conclusion, Maraş Powder is as harmful as cigarette smoking leading to cardiovascular disorders and it warrants detailed studies on this subject.

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