Effects of Smokeless Tobacco “Maras Powder” Use on Respiratory Functions

MEHMET AKIF BUYUKBESE, NURHAN KOKSAL,¹ AYTEKIN GUVEN² and ALI CETINKAYA

Department of Internal Medicine, ¹Department of Pulmonary Disease, and ²Department of Cardiology, Kahramanmaraş Sutcu Imam University, Faculty of Medicine, Kahramanmaraş, Turkey

BUYUKBESE, M.A., KOKSAL, N., GUVEN, A. and CETINKAYA, A. *Effects of Smokeless Tobacco “Maras Powder” Use on Respiratory Functions.* Tohoku J. Exp. Med., 2004, **204** (3), 173-178 — In Turkey, “Maras Powder,” which is a kind of powder yielded from the shields of tobacco, is widely used as smokeless tobacco through buccal mucosa or together with cigarette. *Maras powder*, composed of ash and a plant named *Nicotiana Rustica* Linn, is sometimes used to give up smoking. The present study was aimed to investigate the effects of *Maras powder* use on respiratory functions of healthy subjects who do not have any chronic disease. We found statistically significant differences in percentage of forced expiratory volume in the first second (FEV₁%) ($p = 0.001$), the ratio of FEV₁ to forced vital capacity (FEV₁/FVC) ($p = 0.024$), percent of maximum expiratory flow rate (FEF₂₅₋₇₅%) ($p = 0.002$) and percent of peak expiratory flow (PEF%) ($p = 0.037$) between cigarette smokers with *Maras powder* use ($n = 23$) and control subjects ($n = 24$). Likewise, when cigarette smokers ($n = 24$) and control subjects were compared, the differences for all these parameters were significant ($p = 0.022$, $p = 0.048$, $p = 0.011$ and $p = 0.047$, respectively). Only FEV₁% and FEF₂₅₋₇₅% were significantly lower in cigarette smokers with *Maras powder* use than in *Maras powder* users ($n = 28$) ($p = 0.011$ and $p = 0.022$, respectively). There was a negative correlation between forced vital capacity and *Maras powder* use ($r = -0.315$, $p = 0.03$). The present study suggests that *Maras powder* does not cause serious bronchial obstruction. This may be due to usage of the smokeless tobacco through buccal mucosa but not through inhalation as in case of cigarette smoking. ——— *Maras powder*; cigarette; pulmonary function tests; smokeless tobacco

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In Turkey a kind of powder -called “*Maras powder*”- which is yielded from the shields of tobacco, is widely used through buccal mucosa alone, instead of cigarette or together with cigarette (Erenmemisoglu et al. 1991; Ozkul et al.

1997; Erenmemisoglu 1999). It is also preferred by some individuals to reduce or quit cigarette smoking. This powder is known to be composed of ash of wood (especially oak, sometimes walnut) and dried leaves of a plant named *Nicotiana*

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Address for reprints: Mehmet Akif Buyukbese, M.D., Assistant Prof., Department of Internal Medicine, Kahramanmaraş Sutcu Imam University, Faculty of Medicine, 46050, Kahramanmaraş, Turkey.
e-mail: akif_buyukbese@yahoo.com

Rustica Linn (Erenmemisoglu et al. 1992). Half of the mixture is tobacco and the other half is *Maras powder*. Then water is sprinkled on this mixture for humidification (Erenmemisoglu et al. 1992). A teaspoonful amount of powder is placed solely or sometimes after being wrapped by a cigarette paper at upper or lower labial mucosa and kept there for about 5 to 10 minutes. The frequency of its use depends upon the degree of addiction so that some people repeat this throughout the day and even during the sleep, keeping the powder inside their mouths.

This study attempts to find out whether *Maras powder* did cause any unfavourable effects for the lungs by using pulmonary function tests (PFTs).

SUBJECTS AND METHODS

Subjects having cigarette and *Maras powder* either alone or together were collected from various clinics of Kahramanmaraş Sutcu Imam University, Faculty of Medicine between September 2001 and June 2004. Informed consent was obtained from all the subjects participated in the study.

Fifty-seven subjects who used *Maras powder* alone or together with cigarette were included in the present study. Lung diseases like chronic obstructive pulmonary disease (COPD), heart failure, hypertension, malignant disease, chronic liver or kidney failure, diabetes mellitus and use of any medication that may affect PFTs were the exclusion criteria of the study population. Therefore, 11 subjects (4 subjects with diabetes mellitus, 2 subjects with ischemic heart disease, 1 subject with hypertension, 1 subject with ankylosing spondylitis, 2 subjects with diabetes mellitus and hypertension together and 1 subject with COPD) were excluded because of their past chronic disease history.

Finally, the study population included 23 cigarette smokers with *Maras powder* use, 28 *Maras powder* users, 24 cigarette smokers, and 24 healthy subjects who neither smoked cigarette nor used *Maras powder* (as the control). Subjects'

age, duration and frequency of use of *Maras powder*, duration and package-year of cigarette smoking were all recorded. The same health technician performed PFTs by current sensitive dry spirometer (Sensormedics Vmax 20C, Yorba Linda, CA, USA) matching with the rules of American Thorax Society. Percentage of forced vital capacity (FVC%), forced expiratory volume in the first second (FEV₁%), the ratio of these two parameters (FEV₁/FVC), percent of maximum expiratory flow rate (FEF₂₅₋₇₅%) and percent of peak expiratory flow (PEF %) values were all assessed.

Statistical analyses

Data obtained from the study were given as mean $\pm$ S.D.. The differences between age and PFTs of the subjects were assessed by variance analyses. The comparisons were done by Turkey test as Post Hoc analysis for subjects who were statistically significantly different. The relationship between duration of smoking cigarette and using *Maras powder*, and parameters of PFTs were evaluated via Pearson correlation test. *P* values less than 0.05 were accepted as statistically significant.

RESULTS

Table 1 shows the demographic characteristics of the study participants. Mean ages of all subjects were 47.26 ± 12.77 years (22-78). Twenty three out of 51 subjects, who use *Maras powder* were both cigarette smokers and *Maras powder* users. 20 of them were male, while remaining 3 were female. Mean age of this group was 47.78 ± 11.28 years. Of remaining 28 *Maras powder* users, 3 subjects were female and 25 subjects were male with a mean age of 48.10 ± 13.04 years. Mean age of 24 cigarette smokers was 46.58 ± 11.99 years and they were 3 female and 21 male. Control subjects had a mean age of 46.45 ± 13.17 years. There were no statistically significant differences among subjects according to their age and gender ($p > 0.05$).

Statistically significant differences were not found when the comparison was done according

TABLE 1. Demographic features of study population

Features	Cigarette smoking + <i>Maras powder</i> (<i>n</i> = 23)	<i>Maras powder</i> (<i>n</i> = 28)	Cigarette smoking (<i>n</i> = 24)	Control (None) (<i>n</i> = 24)	<i>p</i>
Age (years)	47.78 ± 11.28	48.10 ± 13.04	46.58 ± 11.99	46.45 ± 13.17	> 0.05
Gender (F/M)	3/20	3/25	4/20	3/21	> 0.05
Cigarette (package/year)	20.17 ± 15.03	-	20.16 ± 13.67	-	> 0.05
<i>Maras powder</i> (duration; years)	17.39 ± 11.79	17.32 ± 11.96	-	-	> 0.05

Data were given as mean±S.D.

to duration of *Maras powder* use between cigarette smokers who also use *Maras powder* (17.39 ± 11.79 years) and only *Maras powder* users (17.32 ± 11.96 years) ($p > 0.05$). When the relationship between duration of *Maras powder* use and parameters of PFTs was evaluated, a negative statistically significant correlation was found between FVC and duration of *Maras powder* use ($r = -0.315$, $p = 0.03$) (Fig. 1).

Regarding with duration of cigarette smoking and amount (package/year), there was no difference between cigarette smokers with *Maras powder* use (20.17 ± 15.03) and only cigarette smokers (20.16 ± 13.67) ($p > 0.05$). While there was no statistically significant correlation between duration of cigarette smoking and parameters of

PFTs including FVC% and PEF% ($p > 0.05$), statistically significant negative correlations were noticed among FEV₁%, FEV₁/FVC and FEF₂₅₋₇₅% ($p = 0.026$, $p = 0.013$ and $p = 0.012$, respectively).

Parameters of PFTs were compared and the results were shown in Table 2. FVC% was not statistically different among the subjects ($p > 0.05$). The difference of FEV₁% between cigarette smokers with *Maras powder* use (83.7 ± 14.83) and control subjects (100.29 ± 9.6) was statistically significant ($p = 0.001$). This parameter was also statistically significantly different between cigarette smokers (88.33 ± 12.73) and control subjects ($p = 0.022$), and between cigarette smokers with *Maras powder* use and *Maras powder* users (96.35 ± 17.6) ($p = 0.011$).

Fig. 1. Negative correlation between duration of *Maras powder* use and FVC in solely *Maras powder* users ($r = -0.315$ and $p = 0.03$). Note that two *Maras powder* users with 5-year duration had FVC values 5.51 and 5.46, which are overlapping.

TABLE 2. Statistical analyses of differences of pulmonary function tests

Subjects	FVC%	FEV ₁ %	FEV ₁ /FVC	FEF ₂₅₋₇₅ %	PEF%
Cigarette + <i>Maras powder</i>	92.04 ± 11.53	83.7 ± 14.83	75.55 ± 9.86	65.34 ± 23.1	65.6 ± 21.47
<i>Maras powder</i>	99.25 ± 14.1	96.35 ± 17.6	79 ± 8.65	84.21 ± 27.38	72.71 ± 23.55
Cigarette	95.58 ± 12.34	88.33 ± 12.73	75.83 ± 6.58	69.12 ± 21.49	65.33 ± 13.51
Control	101.2 ± 11.03	100.29 ± 9.6	81.7 ± 4.74	90.04 ± 17.78	80.29 ± 17.89
<i>p</i> values					
Cigarette + <i>Maras powder</i> – Powder	0.172	0.011*	0.300	0.022*	0.575
Cigarette + <i>Maras powder</i> – Cigarette	0.762	0.677	0.991	0.942	0.989
Cigarette + <i>Maras powder</i> – Control	0.061	0.001*	0.024*	0.002*	0.037*
<i>Maras powder</i> – Cigarette	0.713	0.182	0.458	0.091	0.534
<i>Maras powder</i> – Control	0.941	0.751	0.591	0.797	0.511
Cigarette – Control	0.415	0.022*	0.048*	0.011*	0.047*

Data were given as mean ± S.D..

**p* < 0.05.

Regarding with FEV₁/FVC, statistically significant difference was observed between cigarette smokers with *Maras powder* use and control subjects (75.55 ± 9.86 and 81.7 ± 4.74, respectively) (*p* = 0.024). Significant difference was also seen between cigarette smokers (75.83 ± 6.58) and control subjects (*p* = 0.048).

Regarding with FEF₂₅₋₇₅%, statistically significant difference was seen between cigarette smokers with *Maras powder* use (65.34 ± 23.1) and *Maras powder* users (84.21 ± 27.38) (*p* = 0.022). Again, statistically significant differences were noticed between cigarette smokers with *Maras powder* use and control subjects (90.04 ± 17.78) (*p* = 0.002) and between cigarette smokers (69.12 ± 21.49) and control subjects (*p* = 0.011).

Taking into account of PEF%, there were statistically significant differences between cigarette smokers with *Maras powder* use (65.6 ± 21.47) and control subjects (80.29 ± 17.89), and between cigarette smokers (65.33 ± 13.51) and control subjects (*p* = 0.037 and *p* = 0.047, respectively).

DISCUSSION

Cigarette smoking does not only affect respi-

ratory and cardiovascular functions but almost all other body systems. A number of studies presented in the literature found that harmful effects of smokeless tobacco were less than the cigarette (Benowitz 1988; Christen 1992; Mitchell et al. 1999; Accortt et al. 2002).

In the region in which this study was conducted, a kind of smokeless tobacco called *Maras powder* is widely used and only few studies have been done demonstrating its detrimental effects (Erenmemisoglu et al. 1991, 1992, 1995; Erenmemisoglu 1999; Ozkul et al. 1995, 1997; Guven et al. 2003). Alkaloid composition of the powder which is composed of a plant named *N. Rustika* L is not much different than *N. Tobacum* L which is a culture tobacco for cigarette, but it has been reported that the content of tobacco is 6-10 fold higher (Shmuk 1953). Furthermore, the ash used during the composition of the powder makes the media alkali and let the alkaloids turn alkali which will give rise to higher amount of absorption through the buccal mucosa (Erenmemisoglu et al. 1991, 1992).

The study carried out by Cok and Ozturk (2000), revealed that levels of cotine which is a metabolite of nicotine in the urine was 3-fold

higher in subjects using *Maras powder* than in subjects who smoked cigarette. While cigarette smoking increased blood nicotine level up to 440 mmol/liter, the levels reached to 15-fold higher when oral tobacco use was performed (Benowitz 1988). Since main effects of cigarette smoking in the body other than respiratory system are provided by nicotine, chemical compounds and their metabolites in the tobacco, the effects of smokeless tobacco over systems other than respiratory system are additional (Mitchell et al. 1999; Bartal 2001). It is thought that deleterious effects of cigarette smoking over cardiovascular system mostly due to nicotine, and higher blood nicotine levels established in subjects who use smokeless tobacco will increase cardiovascular morbidity (Russell et al. 1981; Traber et al. 2000).

It is doubtless that cigarette smoking mainly gives rise to two groups of diseases. One of them is lung cancer and the other is COPD. Subjects who smoke cigarette also ingest approximately 4000 carcinogenic substances. Of these substances some are found in the tobacco and others take part in the smoke which is produced after burning of cigarette (Kuper et al. 2002a). Epidemiological and experimental studies revealed the relationship between smokeless tobacco and oral and pharyngeal malignancies (Bhide et al. 1984; Hoffmann et al. 1985; Bartsch et al. 1999; Kuper et al. 2002a, b). Similar relationship was also demonstrated between aforesaid malignancies and use of *Maras powder* (Erenmemisoglu et al. 1995; Erenmemisoglu 1999). Ozkul et al. (1995), studied sister-chromatide exchange on T-lymphocytes which is the indicator of mutagenicity in 50 subjects who used *Maras powder*. Levels were significantly higher in subjects who both used *Maras powder* and smoked cigarette together than the control group whose subjects were having none of the two (Ozkul et al. 1995). However, no study about the relationship between *Maras powder* and lung cancer was found in the literature.

Investigations are questioning the relationship for the effects of free radicals on the endothelium in subjects who use smokeless tobacco

and some evidence has already been found to be responsible from the systemic effects (Mitchell et al. 1999; Traber et al. 2000).

In this study, effects of *Maras powder* on PFTs were evaluated with spirometer. Among subjects no difference was seen according to FVC values. Evaluations in general outstanding signs of airway obstructions were FEV₁%, FEV₁/FVC, FEF₂₅₋₇₅% and PEF% values. The main difference was owing to cigarette smoking. Absence of significant differences were noticed between obstructive airway parameters although values obtained in *Maras powder* users were lower than control subjects. Two comparisons with control subjects were found to be statistically significant: Those were cigarette smokers with *Maras powder* use and cigarette smokers. However, these two groups had no statistically significant difference between each other. Cigarette smokers with *Maras powder* use and only *Maras powder* users had statistically significant differences in FEV₁% and FEF₂₅₋₇₅%. This difference was also attributed to cigarette smoking.

There was a negative correlation between FVC and *Maras powder* use. This is thought to be the result of systemic effects of the powder. Further studies are needed to explain which route or routes may give rise to changes in FVC and other PFTs.

Some of the subjects stated that they used *Maras powder* to quit cigarette smoking. Rodu (1994), indicated in his article -where his investigations were on different forms of tobacco use and its effects over public health- that smokeless tobacco would have less serious side effects than the cigarette itself and might be useful in the control of wide use of cigarette smoking. This logic matches with the treatment of nicotine replacement. But, it should be known that harmful systemic effects are still present. Significant negative correlation found in PFTs is consistent with the literature related to cigarette smoking, such as FEV₁, FEV₁%, FEV₁/FVC, FEF₂₅₋₇₅% (Rodu 1994).

In conclusion, effects of *Maras powder* use

and cigarette smoking on PFTs are different. *Maras powder* use did not cause significant bronchial obstruction. It is not a surprise to see minimal effect of *Maras powder* on the lung functions as the powder itself is not inhaled. Further large scale studies are needed to explore whether *Maras powder* may have serious effects for the other body systems or different routes of use of the powder itself may lead to different outcomes.

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