

IMMEDIATE EFFECT OF TOBACCO CHEWING IN THE FORM OF 'PAAN' ON CERTAIN CARDIO-RESPIRATORY PARAMETERS

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(Received on May 17, 1987)

Summary : Immediate effect of tobacco in the form of chewing was evaluated in 40 healthy males (mean age 26.27 yrs.) not habituated to tobacco, who were given paan containing 200 mg of tobacco to chew (group T). Heart rate (HR), blood pressure (BP), forced vital capacity (FVC), FEV₁ and peak expiratory flow rate (PEFR) were measured twice for each subject, once before chewing and again immediately after completion of chewing. Another 24 age and sex matched controls (group C) were given paan without tobacco to chew and cardiorespiratory parameters were recorded as for group T subjects. Electrocardiography was recorded in 10 group T and 10 group C subjects. Effect of tobacco chewing was also evaluated in 10 habitual tobacco chewers. Results showed statistically significant increments in HR and BP as well as a decline in T wave amplitude in ECG following tobacco chewing (group T subjects). The changes in HR and BP lasted for 15-30 mins, as observed in 10 of group T subjects. The FVC, FEV₁ and PEFR showed marginal, though non-significant, increments after tobacco chewing. No significant difference in the cardiorespiratory responses to tobacco chewing could be seen between habitual and nonhabitual (group T) tobacco chewers. The changes in cardiovascular and respiratory parameters following paan (without tobacco) chewing in the control subjects were negligible and nonsignificant.

Key words : tobacco paan chewing heart rate blood pressure ECG
FVC FEV₁ PEFR

INTRODUCTION

Smoking has drawn world-wide attention and extensive work has been conducted on pathophysiological effects of smoking (1, 4, 6, 12). Cigarette has been reported to contain about 500 agents (6), out of which nicotine present in the tobacco has been thought to be the most offending one (6). Again, tobacco is taken in India in different ways like 'smoking', 'chewing' and 'snuffing' (6, 12, 13). Tobacco smoking is also done in different forms viz., cigarette, beedi, cigar and pipe (4, 6, 12). Similarly, tobacco chewing is also practised in different forms, taking tobacco as an ingredient of 'paan' being one of them. The effect of tobacco on the body is likely to be different depending on its mode of administration since the

agents acting on the body when tobacco is taken in different forms are not exactly the same ones viz., smoke and carbon monoxide which are present during smoking (8, 11) can be presumed to be absent during tobacco chewing.

The present work has accordingly been undertaken to study the cardio-respiratory effects of tobacco chewing when taken in the form of 'paan'. This form of tobacco chewing was preferred to pure tobacco chewing since this is the commonest form of tobacco chewing in the country; moreover, pure tobacco chewing is not well tolerated by subjects.

MATERIAL AND METHODS

The study was conducted on 74 healthy adult male volunteers residing, at least for the last three years, at Shimla located at an altitude of 2150 meters above mean sea level in the western Himalayas in Himachal Pradesh. Ten of these subjects were chronic tobacco chewers at least for the last two years, taking two to four paans containing tobacco per day. These subjects were grouped separately. The remaining (64) subjects were neither addicted nor habituated to tobacco in any form, and none of them was a regular paan eater. These subjects were divided into two groups i.e., group C (control) and group T (tobacco chewing), comprising of 24 and 40 subjects respectively. Body height and body weight were noted without shoes and with only light clothings for each subject. Consent was obtained from all the subjects before subjecting them for this study.

The volunteers were given physical rest before recording the parameters. The parameters recorded were blood pressure (BP) using a mercury sphygmomanometer, heart rate (HR) by auscultation of heart sounds, peak expiratory flow rate (PEFR) by using a Wright Peak Flow Meter (AIRMED, Essex), forced vital capacity (FVC) and forced expiratory volume in the 1st second (FEV_1) by using a 'vitalor' spirometer (Airshield, USA). The FVC and FEV_1 were converted to body temperature, pressure and saturation (BTPS) and $FEV_1\%$ was calculated. Additionally, electrocardiographic (ECG) records were taken using the three standard bipolar limb leads in 10 of the group C and 10 of the group T subjects. All these parameters were recorded twice for each subject, once before and again immediately after the subject was made to chew the paan. The values obtained before paan chewing were treated as control values for that particular subject to assess the effect of paan chewing. Records were taken with the subjects sitting comfortably on a chair. The respiratory parameters were recorded, after thoroughly explaining the subject about the nature of the tests, thrice for each subject during each recording session, preceded by two practice sessions for each subject. Only the best out of these three records was considered for analysis. The tests were done at the same time of the day every time to avoid the effect of diurnal variation. All the subjects were advised not

to eat anything for at least three hours prior to recording of the parameters. The ambient temperature ranged from 24.0-26.5°C throughout the course of the study.

Schedule of paan chewing : The paan given to each subject of both group C and group T contained, apart from betel leaf of approximately the same size and same quality, betel nut (supari), catechu (kattha) and lime (chuna). Additionally, 200 mg of tobacco of the same brand and same quality bought on the open market was added to each paan given to the group T subjects only. Each subject was asked to chew the paan completely within 15-20 min and was instructed to swallow the saliva during chewing and to avoid spitting as much as possible in order to get the maximum effect of tobacco. Some of the subjects who were not able to tolerate tobacco chewing and developed adverse symptoms were discarded and were not included in the present study.

Duration of effect : In 10 of the group T subjects, heart rate and blood pressure were repeatedly recorded at intervals of 5 min after the end of paan (tobacco) chewing till the HR and BP returned to the prechewing level.

Self-control group : Randomly selected 10 of the group T subjects were subjected to paan chewing for a second course during which they were made to act as their own control. Each of these subjects was given paan twice on two occasions - once paan without tobacco (control) and again paan containing 200 mg of tobacco (tobacco-chewing). The cardio-respiratory parameters were recorded as for the other subjects. The responses obtained were compared with those of group C and group T subjects respectively.

Habitual tobacco chewers : Another group of 10 subjects, who were habitually used to tobacco chewing in the form of paan, were also subjected to this study. Each of these subjects was given paan containing 200 mg of tobacco and the cardio-respiratory parameters were recorded as for the other subjects. The responses were compared with those obtained from group T subjects. All the subjects of this group were asked not to chew paan, nor to take tobacco in any other form, in the morning of the day of experiment till the parameters were recorded.

Statistical analysis : The responses obtained after paan chewing were compared with those obtained before paan chewing and the changes were subjected to Student's "t" test.

RESULTS

The group C subjects (control) were in the age group of 20-28 yrs and the mean \pm SEM age, body height and body weight were 25.35 ± 0.34 yrs, 170.48 ± 0.79 cm and 53.26 ± 0.57 kg

TABLE I : Cardiovascular changes after paan chewing in group C and group T subjects.

Parameter	Group C (Paan without tobacco)		Group T (Paan with tobacco)		Percentage change (%)
	Before	After	Before	After	
HR (beats/min)	72.3±0.94	72.9±0.95	72.1±0.96	84.3±0.92	16.9* ↑
SBP (mm of Hg)	115.8±1.35	116.5±1.44	116.8±1.42	132.6±1.51	13.5* ↑
DBP (mm of Hg)	74.5±1.31	73.6±1.30	74.4±1.29	86.2±1.31	15.9* ↑
MP (mm of Hg)	88.3±1.41	87.9±1.39	88.5±1.38	101.7±1.42	14.9* ↑
PP (mm of Hg)	41.3±1.07	42.9±1.05	42.4±1.01	46.4±1.20	9.4*** ↑

Values are Mean ± SEM

↑ = Increase

↓ = Decrease

* = P<0.001

** = P<0.02

TABLE II : Respiratory changes after paan chewing in group C and group T subjects.

Parameter	Group C (Paan without tobacco)		Group T (Paan with tobacco)		Percentage change (%)
	Before	After	Before	After	
FVC (ml)	4125.5±83.31	4122.8±83.90	4118.6±81.40	4291.6±82.70	4.2 ↑
FEV ₁ (ml)	3556.2±82.72	3566.2±82.83	3559.9±82.41	3730.8±82.95	4.8 ↑
FEV ₁ (%)	86.2±3.47	86.5±3.33	86.4±3.25	86.9±3.42	0.6 ↑
PEFR (L/min)	593.6±15.58	589.7±16.75	591.5±16.69	618.8±15.23	4.6 ↑

Values are Mean ± SEM

↑ = Increase

↓ = Decrease

respectively. The group T (tobacco chewing) subjects were in the age group of 20-30 yrs and the mean \pm SEM age, body height and body weight were 26.27 ± 0.29 yrs, 171.25 ± 0.81 cm and 54.32 ± 0.71 kg respectively. The habitual tobacco chewers were in the age group of 25-35 yrs.

The changes in heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean pressure (MP) and pulse pressure (PP) after chewing paan in both group C and group T subjects have been shown in Table I. Significant increments in the values of all these parameters immediately after chewing paan in group T subjects can be seen from this table. The ECG analysis following tobacco chewing showed tachycardia of a magnitude which was similar to the increase in HR for group T subjects as shown in Table I. Additionally, a decrease in the amplitude of T wave was seen in 7 out of the 10 group-T subjects. No significant ECG change could be seen in any of the 10 group-C subjects.

As regards the duration of cardiovascular effects following tobacco chewing, which was observed in only 10 of the group T subjects, the HR and BP came back to the prechewing level within 15-30 minutes after the end of chewing schedule.

The changes in FVC, FEV₁, FEV₁% and PEFR after chewing paan have been shown in Table II for both group C and group T subjects. The FVC, FEV₁ and PEFR show marginal and statistically nonsignificant increments after chewing paan in group T subjects, whereas FEV₁% remains unaffected.

The changes obtained in the self-control group were comparable with those obtained in group C and group T subjects respectively and no significant difference in the results could be seen. Again, the cardio-respiratory responses obtained immediately after tobacco chewing in the habitual tobacco chewers were also not significantly different from those obtained in the non-habitual group T subjects.

DISCUSSION

There is no report available in the literature on the effects of tobacco chewing on cardio-respiratory parameters. The authors, therefore, discuss the present results in the context of the available reports on tobacco (cigarette) smoking which are quite substantial. The results in the present study show that the observed changes in the cardio respiratory parameters are due to chewing of tobacco, since no change can be seen in the control (group C) subjects who chewed all the ingredients of paan except tobacco. Further, none of these cardio-respiratory responses could be due to the act of chewing *per se*, since no such response can be seen in the control subjects.

Tobacco chewing produced statistically significant increments in HR, SBP, DBP, MP and PP. Others (3, 5, 10, 13, 15, 16) have reported similar increments in HR, SBP and DBP immediately after smoking cigarettes. These effects of tobacco have been shown, in case of cigarette smoking, to be due to the nicotine which is present in the tobacco (6, 15). Nicotine, on its turn, has been reported to bring about these changes through sympathetic stimulation (5, 15), release of epinephrine and norepinephrine (15) and the consequent vasoconstriction (5, 15). The effects of tobacco chewing in the form of paan could be due to a similar mechanism.

The changes in HR and BP brought about by tobacco chewing lasted for 15-30 min after the end of tobacco chewing. In case of cigarette smoking, the changes in HR and BP produced immediately after smoking two standard-sized cigarettes have been shown (5) to return to the presmoking level in about 10-20 min after the end of smoking. The ECG changes immediately after tobacco chewing are also similar to those reported immediately after cigarette smoking (15), though the magnitude of diminution in the amplitude of T wave immediately after smoking two standard cigarettes (15) appears to be somewhat greater. No significant difference was found between non-habitual and habitual tobacco chewers as regards the HR, BP and respiratory responses immediately after tobacco chewing in the present study. Marshall *et al.* (10) also report lack of any significant difference between smokers and non-smokers in the responses of HR and BP immediately after cigarette smoking.

The values of FVC, FEV₁ and PEFR showed marginal but nonsignificant increments after tobacco chewing, whereas FEV₁% showed only a negligible change since both FVC and FEV₁ increased correspondingly. However, the percent increments in FVC, FEV₁ and PEFR were comparatively less as compared to the percent increments in HR and blood pressure values. Though sufficient works have been conducted on the long term effects of smoking on respiratory parameters (4, 6, 12, 14, 17), much less is known about the immediate effects of tobacco smoking (2, 11) and none about tobacco chewing.

A decline in vital capacity has been reported (11) immediately after smoking cigarettes. This response has been attributed to a reflex bronchoconstriction due to the cigarette smoke *per se* (11). On the other hand, vital capacity has also been reported to be unaffected even after smoking 3 cigarettes (2). While a similar pattern of cardiovascular response immediately after tobacco, both in the form of chewing and smoking, is understandable (nicotine being the only effective common factor acting in both the situations), the respiratory responses of tobacco chewing are likely to be different from those of tobacco smoking since at least some of the factors like tobacco smoke (11) and carbon monoxide of the smoke (8) which are present during tobacco smoking are nonexistent in the case of tobacco chewing.

Sympathetic stimulation (7) as well as release of epinephrine (9) are known to bring about bronchodilatation. The marginal, though statistically nonsignificant, broncho-dilatation as evidenced by an increase in the values of FVC, FEV₁ and PEF_R after tobacco chewing in the present study can thus be attributed to, possibly, a release of epinephrine or to a sympathetic stimulation or to both, coupled with the absence of any smoke which is otherwise a factor during cigarette smoking and which causes bronchoconstriction (11).

In view of the similarity between immediate effects of tobacco (cigarette) smoking (3, 5, 10, 13, 15, 16) and the immediate effects of tobacco chewing (as seen in the present study) on the cardiovascular responses like HR, BP and ECG, it would be of interest to conduct epidemiologic studies in chronic tobacco chewers to discern whether the long term cardiovascular effects like atherosclerosis and cardiovascular accidents commonly believed to be associated with cigarette smoking (1, 8) are also associated with chronic tobacco chewing. On the other hand, the pattern of respiratory responses immediately after tobacco chewing, as seen in the present study, indicate that the decline in various respiratory functions commonly found in chronic tobacco (cigarette) smokers (4, 12, 17) may not be seen in chronic tobacco chewers. This, however, can be ascertained through epidemiologic studies on chronic tobacco chewers.

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