

# Clinical appearance of lesions associated with the use of loose and portion-bag packed Swedish moist snuff: a comparative study

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The aim of this study was to register and compare clinical oral mucosal lesions and gingival recessions associated with the use of two different smokeless tobacco products, loose snuff and portion-bag packed snuff. Selected for the study were 252 men (mean age 36.3 yr) of whom 184 (mean age 36.0 yr) used exclusively loose snuff and 68 (mean age 36.9 yr) exclusively portion-bag snuff. Oral mucosal lesions were registered according to a four-grade clinical scale. There was a significantly larger proportion of less pronounced lesions, Degrees 1 and 2, among the users of portion-bag snuff compared with the users of loose snuff. This was also valid when differences in consumption data were considered. Smokeless tobacco-associated gingival recessions were found in 42 (23.5%) subjects among the users of loose snuff and in 2 (2.9%) subjects among the users of portion-bag snuff. The results of this study support previous preliminary assessments that clinical changes of the oral mucosa and the gingival margin are less pronounced among those who use portion-bag snuff than among those who use loose snuff.

Key words: gingival recessions; mucosal lesions, oral; portion-bags; snuff; tobacco, smokeless.

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Oral mucosal changes associated with the use of snuff have been described in many studies (1-11). In a survey on the prevalence of oral mucosal lesions in Sweden, a well-recognized mucosal reaction, snuff dipper's lesion, was commonly registered in the area where a quid of moist snuff was regularly placed (12). This lesion has also been referred to as leukoplakia (1, 4). In a study on premalignant changes in Danish snuff-induced oral leukoplakias it was pointed out that not all snuff brands possess the same chemical composition which might explain reported differences in tissue changes (4). The severity of the clinical appearance of snuff dipper's lesion may be related to the hours of daily snuff use, the amount

used daily, duration of snuff habit and brands used (6, 7).

The prevalence of gingival recessions

associated with the use of smokeless tobacco has been reported in a few studies (13-15). The risk that such us-

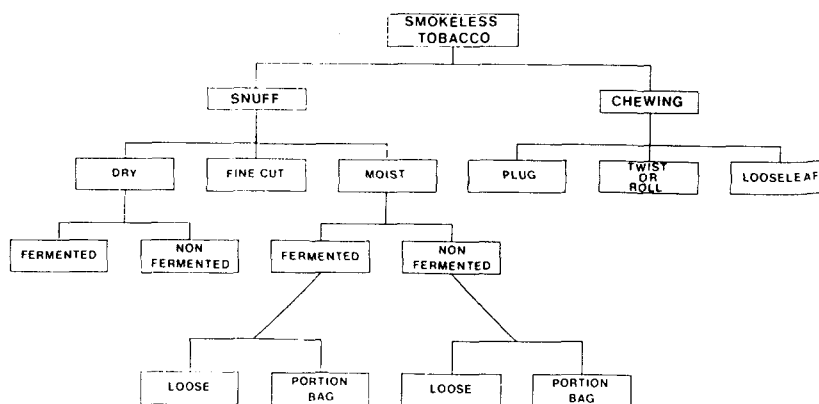


Fig. 1. Classification of smokeless tobacco.

Table 1. Age distribution and some snuff exposure data in different fractions of a construction worker population ( $n = 569$ ).

	Fractions of population				
	Did not answer $n = 109$	Did not want to attend $n = 67$	Mixed habits $n = 215$	Excluded at visit $n = 13$	Finally included $n = 165$
Mean age, yr	32.4±10.4	38.8±13.2	38.0±10.9	36.5±10.0	36.7±10.6
Age range, yr	19-65	21-68	21-74	20-50	18-66
Years with regular snuff habit	10.0± 7.5	10.2± 8.8	10.2± 9.1	11.2±11.4	10.9± 8.4
Grams of snuff used daily	18.8±13.6	15.7±13.4	12.1± 7.9	20.1±13.4	21.3±12.5

Table 2. Age and snuff exposure data.

	Product		Total $n = 252$
	Loose snuff $n = 184$	Portion-bag snuff $n = 68$	
Mean age, yr	36.0±11.6	36.9±9.9	36.3±11.2
Range, yr	19-80	17-66	17-80
Hours of daily snuff use	10.8± 3.8	10.3±3.2	10.6± 3.6
Grams of snuff daily	23.6±12.2	11.3±4.9	20.3±12.0
Years with regular snuff habit	13.1± 8.2	3.1±2.5	10.4± 8.4

ers run of developing these recessions has been estimated to be nine-fold greater than that of non-users, provided gingivitis was present (15).

During the last decade consumption of snuff has increased steadily in Sweden, especially among young people. Concomitantly risks for the development of oral cancer and other deleterious side effects have been widely discussed (11, 16-18).

Snuff is manufactured in many different forms (Fig. 1). Loose snuff is marketed in containers made of paper or aluminium. Usually a pinch of 1-2 g snuff is formed with the fingers and placed in the mouth. In Sweden the overwhelming majority of users place the quid in the vestibular area inside the upper lip.

About 10 yr ago a new smokeless tobacco product, the portion-bag packed snuff, was introduced on the Swedish market. Portions of 0.5 or 1 g snuff are wrapped in bags made of non-woven paper-like material not dissolving in saliva but permitting diffusion. The sales figures have increased steadily and comprised about 10% (470 tons) of the total smokeless tobacco sold in 1987 (19). This product has then been introduced in several other countries.

Oral mucosal lesions associated with the use of loose snuff have been described in several studies, while no report has been published about whether

portion-bag snuff causes oral mucosal changes and, if it does, the nature of such changes. As severe local changes may possibly be associated with the use of snuff, it seems worthwhile to investigate lesions related to this new product.

The aim of the present study was to register clinical changes in the oral mucosa and the gingival margin associated with the use of Swedish non-fermented moist snuff and to compare those clinical changes found among users of loose and portion-bag snuff.

### Material and methods

**Sampling procedure.** Recruited for the study were individuals from three populations: 1) construction workers; 2) shipyard workers; and 3) outpatients at the School of Dentistry in Malmö.

A health screening organization for construction workers was established in 1969. Each person within this organization is called for examination every second year. The frequency of participation is about 75%. At the examination questions about tobacco habits are included. About 22% have referred to daily consumption of snuff. Up to 1987 about 300,000 members have been examined throughout Sweden. In the south of the country (Skåne/Scania), where the present study was undertaken, about 3,000 members are examined every year. Of these, 569 consecutive

habitual snuff users examined in 1986 were invited to have a check of the condition of their oral mucosa.

At a shipyard (Kockums, Malmö) snuff users were offered a check of their oral mucosa. A total of 43 attended.

Fifty-four patients were recommended by others (dentists, other participants, acquaintances) to ask for a check up at the Department of Oral Surgery and Oral Medicine at the School of Dentistry in Malmö.

**Inclusion and exclusion criteria.** Included in the study were all who had no other tobacco habit than snuff and who reported on daily snuff consumption for, at least, the last 3 months. Excluded was anyone with serious disease and/or medication that might influence the local reaction of the oral mucosa.

**Non-participants.** Two hundred and fifteen of the construction workers had mixed tobacco habits and were excluded, 67 did not want to attend, and 109 did not answer; 178 came for examination. Data of age and snuff consumption in this fraction of studied population are shown in Table 1.

A total of 275 individuals from the three populations attended for examination. At their first visit 23 were excluded after further checking of inclusion and exclusion criteria: 10 people used cigarettes as well as snuff, four used loose as well as portion-bag packed snuff, two had stopped using smokeless tobacco when they came for the examination, one was excluded because of heavy treatment with steroids and four were women. Two further subjects were excluded because the photographs taken were not adequate.

**Included subjects.** Finally included in the study were 252 subjects. Their mean age was  $36.3 \pm 11.2$  yr. Loose snuff was used by 184, mean age  $36.0 \pm 11.6$  yr, and portion-bag snuff was used by 68, mean age  $36.9 \pm 9.9$  yr.

**Examination procedure.** All subjects were examined during 1986-87 according to a standardized program. An interview was performed including questions on snuff habits, e.g. package form, brand of snuff, years with habit, daily consumption of snuff, placing the quid at one or more sites. Age and some snuff exposure data are given in Table 2. Information was also collected on other and/or previous tobacco habits, consumption and frequency of wine and/or liquor. Questions were also asked on previous and/or present diseases and medication.



Fig. 2. Snuff-related gingival recession at maxillary left central incisor. Note confluence between recession and snuff dipper's lesion.

A thorough clinical examination was carried out. Lesions on the site(s) where snuff was regularly placed were registered according to the following four-grade clinical scale suggested by Axéll *et al.* (6).

**Degree 1** – A superficial lesion with a color similar to the surrounding mucosa and with slight wrinkling. No obvious mucosal thickening.

**Degree 2** – A superficial, whitish or yellowish lesion with wrinkling. No obvious thickening.

**Degree 3** – A whitish-yellowish to brown, wrinkled lesion with intervening furrows of normal mucosal colour. Obvious thickening.

**Degree 4** – A marked yellowish to brown and heavily wrinkled lesion with intervening deep reddened furrows and/or heavy thickening.

Gingival recessions were also registered. To be registered as a snuff-related recession, the borderline of the vestibular snuff dipper's lesion should be in contact with the retracted gingival margin (Fig. 2).

All mucosal and gingival lesions were photographed in color using a Nikkomat camera with 100 mm macro lens and an extension ring permitting a registration of 1:1. Light was from a Minolta ring flash, the film was Kodachrome 64.

Most of the examinations were carried out by one of the authors (GA) and a few (about 15%) by two other

examiners after calibration. After collecting the total material, coded intra-oral photographs were evaluated and classified by the other author (TA), who had no access to information about the tobacco habits of the subjects.

The final clinical grading was based on the initial registration and the analysis of the photographs. Inter-examiner agreement in the classification was about 95%.

**Statistical methods** – Chi-square tests were used to test the difference between frequencies and student's *t*-test for the differences between means. Stepwise logistic regression was applied to study the relative risk for developing clinical lesions in relation to package form, exposure data and age.

## Results

Loose and portion-bag packed snuff was used by 184 (73%) and 68 (27%) persons, respectively. Snuff-exposure data are given in Table 2. Loose snuff and portion-bag snuff were, on average, kept in the mouth for about the same number of hours daily. However, greater daily amounts of loose snuff were used, and had been used for more years than portion-bag snuff. Table 3 shows exposure data for users of loose and portion-bag snuff related to clinical grading. Clinical grading of lesions is shown in Table 4. Users of loose snuff

had a higher proportion of Degree 3 and 4 lesions ( $P < 0.001$ ). Degree 4 lesions were encountered only in persons using loose snuff.

Clinical grading of lesions by snuff brands is shown in Table 5; six brands were used by 232 people (92.1%), the remaining 20 used eight different brands. The average scores for clinical grading were lower for the portion-bag brands compared with the corresponding loose variants. For the brands General and Ettan these differences were statistically significant ( $P < 0.001$  and  $P < 0.05$ , respectively).

Among those who used loose snuff, 112 (60.9%) regularly placed the quid at the same site. The corresponding figure for users of portion-bag snuff was 48 (70.6%).

Table 6 shows the relative risk of the influence of some factors on the development of more severe clinical lesions. The most important factor for increasing risk was the package form, followed by placing of the quid, daily hours of use, amount, duration of regular snuff habit and age of the subject.

Information on previous tobacco habits was available for 241 subjects, 179 loose snuff users and 62 users of portion-bags. Only four users of loose snuff reported that they had earlier used another smokeless tobacco product while 36 of the portion-bag users had previously used loose snuff. Previous smoking habits were reported by 103 (58%) users of loose snuff and 24 (39%) portion-bag users.

Whether the pattern of previous smoking habits had influenced the differences in clinical gradings between users of the two package forms of snuff was tested. Even when stratifying by previous smoking habits there was still a significant difference between users of loose snuff and portion-bag snuff in the distribution of clinical grading ( $P < 0.001$ ).

Wine and/or liquor consumption was reported to be rather infrequent, once a week or less in both groups of snuff users. Ten (5.4%) users of loose snuff and 6 (8.8%) users of portion-bag snuff consumed wine or liquor twice a week. No participant referred to daily consumption of wine or liquor.

Gingival recessions were found in 44 (17.8%) of 247 subjects. Five users of loose snuff were excluded because of full upper and lower dentures. Among users of loose snuff 42 (23.5%) subjects showed gingival recessions while only 2 (2.9%) cases were found among users

Table 3. Cross tabulation of clinical grading versus exposure data of loose and portion-bag snuff.

	Clinical degree								
	Loose				Total n = 184	Portion-bag*			Total n = 68
	1 n = 10	2 n = 33	3 n = 130	4 n = 11		1 n = 13	2 n = 31	3 n = 24	
Age, yr	40.2±8.9	34.0± 9.9	36.0±12.0	38.5±13.7	36.0±11.6	37.2±14.1	35.9±7.6	38.1±10.4	36.9±9.9
Hours of daily snuff use	7.1±4.5	9.1± 4.1	11.3± 3.4	12.2± 3.5	10.8± 3.8	8.4± 3.6	10.5±2.9	11.1± 2.9	10.3±3.2
Grams of snuff daily	10.6±6.7	19.3±10.4	24.9±11.8	32.6±13.6	23.6±12.2	10.8± 3.8	10.7±4.8	12.4± 5.5	11.3±4.9
Years with regular snuff habit	10.5±5.7	10.3± 6.0	13.9± 8.8	14.3± 6.7	10.4± 8.4	4.3± 3.4	2.8±1.9	3.0± 2.6	3.1±2.5

\*No clinical Degree 4 lesion was encountered among users of portion-bag snuff.

Table 4. Cross tabulation of clinical grading versus package form of snuff.

Package form	Clinical degree									
	1		2		3		4		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Loose snuff	10	5.4	33	17.9	130	70.7	11	6.0	184	100
Portion-bag snuff	13	19.1	31	45.6	24	35.3	—	—	69	100
Total	23	9.1	64	25.4	154	61.1	11	4.4	252	100

Table 5. Cross tabulation of clinical grading versus brands of snuff.

Clinical degree	General loose	General portion-bag	Grovsnus loose	Grovsnus portion-bag	Ettan loose	Tre Ankare* portion-bag	Row total	All brands
1	5	7	3	2	—	4	21	23
2	17	13	10	8	1	8	57	64
3	94	10	16	5	9	9	143	154
4	10	—	1	—	—	—	11	11
Total n	126	30	30	15	10	21	232	252
Total %	50.0	11.9	11.9	6.0	4.0	8.3	92.1	100
Arithmetical mean of clinical gradings	2.87	2.10	2.50	2.20	2.90	2.24	2.62	2.61

\*The portion-bag packed form of Ettan.

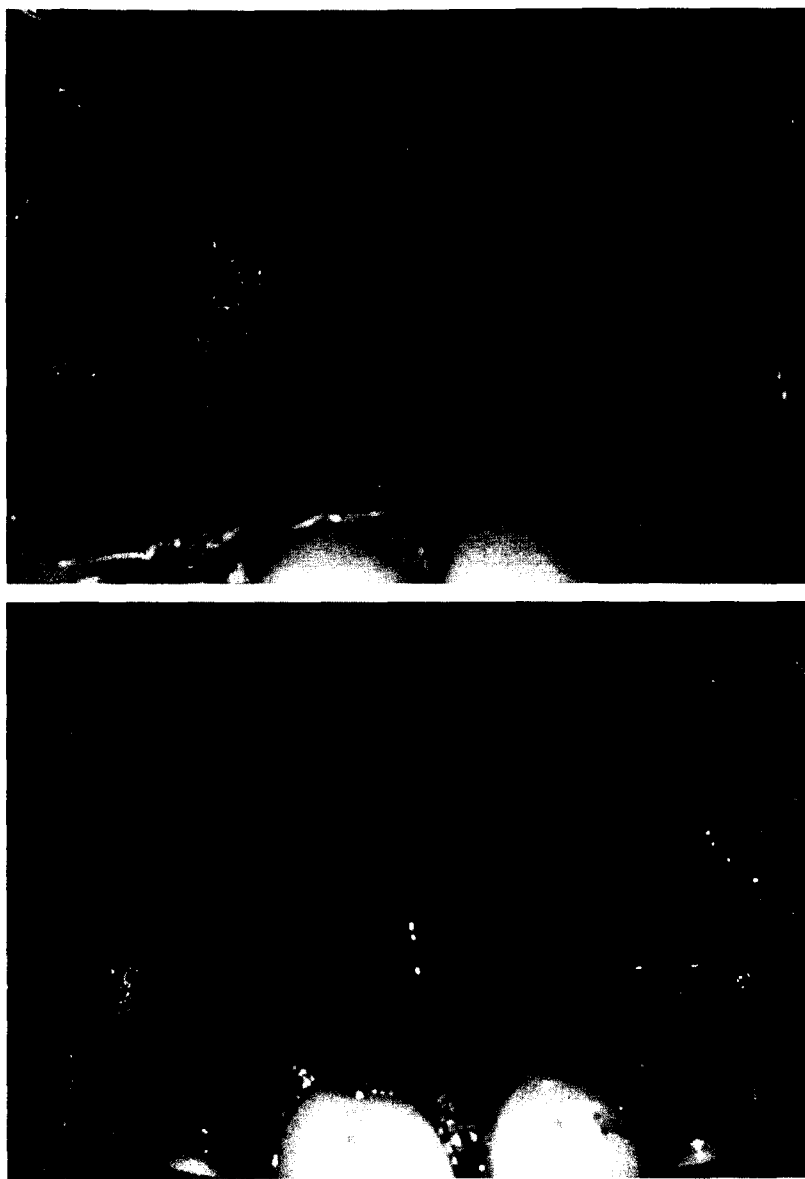
of portion-bag snuff ( $P < 0.05$ ). Table 6 shows the relative risk factors for the development of gingival recessions. The factor with the highest relative risk (8.71) was the package form.

## Discussion

The material for this study was collected from three recruitment categories. Data available on one of the groups, the construction workers, permit some assessment of representativity. Table 1 shows the material for this evaluation. There are minor differences between included and excluded subjects. Data of years with habit and daily grams of snuff used are somewhat higher within the finally included group, but very similar to those of the

Table 6. Relative risk of the influence of some factors on clinical grading of snuff dipper's lesions and on gingival recessions calculated by stepwise logistic regression.

Factor	Snuff dipper's lesion		Gingival recession	
	Relative risk	P-value	Relative risk	P-value
Package form (Loose snuff vs portion-bag snuff)	3.39	0.010	8.71	0.009
Exposure data				
Placing the quid (one vs more sites)	2.91	0.002	1.46	0.284
Hours of daily snuff use (1 h differences)	1.13	0.018	1.04	0.471
Grams of snuff daily (1 g difference)	1.05	0.018	1.01	0.652
Years with regular snuff habit (1 yr difference)	1.04	0.149	1.01	0.677
Age (1 yr difference)	1.01	0.774	1.03	0.141



Figs. 3-4. Fig. 3. Man, 34 yr, showing snuff dipper's lesion clinical Degree 3. Tobacco exposure data: loose snuff of brand *Ettan* used daily for 10 yr, 15 g daily over 10 h. Until 5 yr ago he smoked 10-15 cigarettes daily. Fig. 4. Man, 43 yr, showing snuff dipper's lesion clinical Degree 1. Tobacco exposure data: portion-bag snuff of brand *Tre Ankare* used daily for 10 yr, 16 g daily over 10 h. Until 10 yr ago he smoked 30 cigarettes daily.

total material (Table 2). As could be expected, daily consumption of snuff was lower in the group with mixed habits, supporting the validity of collected information on tobacco habits.

The characteristics of snuff dipper's lesions used in this study were compatible with criteria of the four-grade clinical scale used in previous studies (6, 7). The clinically more severe lesions, Degree 3 and 4, were significantly more prevalent among users of loose snuff

than among users of portion-bags. One explanation for this could be that the pattern of placing the snuff quid differed. However, placing the quid on one site was rather more frequent among users of portion-bag snuff.

There were some differences in snuff exposure data between the groups. While daily hours of snuff use were very similar, users of loose snuff consumed a greater daily amount of snuff and had used snuff for a considerably

longer period. These differences are not surprising as a portion-bag of snuff contains 0.5 or 1 g, while a pinch of loose snuff probably contains 1-2 g, and the sales figures of portion-bag snuff did not increase substantially until the last 4 or 5 yr. However, as seen from data in Table 6 the most important consumption factor for the development of clinically more severe lesions was "daily hours of snuff use" while "grams of snuff used daily" and "years with regular snuff habit" had comparatively less impact. For instance, a consumption increase from 1 to 10 g a day corresponds to an increase of the relative risk from 1.06 to 1.70 and the use of snuff for 1 yr compared with 10 yr corresponds to relative risks of 1.04 and 1.53, respectively. As for number of years with regular snuff habit this calculation should be evaluated with some caution since the *P*-value is comparatively high. The use of stepwise logistic regression to evaluate the relative importance of various exposure data gives somewhat contradictory information compared with previous studies. It should be stressed that this calculation is based on the clinical visible lesion and has no implications for deeper tissue changes. However, by far the most promotive factor for the development of clinically more severe lesions was the package form, with a relative risk for loose versus portion-bag snuff of 3.3. (Table 6). This was elucidated by carefully matching two subjects according to tobacco exposure data (Figs. 3-4).

Alternatively, differences between the severity of the lesions could be explained by the different composition of tobacco used in loose and portion-bag snuff. However, as shown in Table 5, for all three pairs of products compared, the clinical lesions associated with the portion-bag snuff were less severe.

An attempt has also been made to assess the importance of previous smoking and alcohol habits on the observed differences in clinical gradings between users of loose and portion-bag snuff. There is no evidence that either of these factors considerably influenced these differences.

In previous studies, gingival recessions related to the use of smokeless tobacco have been observed. The present study has established clinical criteria making it possible to compare recessions associated with use of snuff in the two different package forms. The present finding of 23.5% gingival reces-

sions registered in users of loose snuff is a somewhat lower figure than previously reported (13-15), but this might be due to criteria differences. However, such differences can probably not explain the remarkably low percentage (2.9%) of gingival recessions among users of portion-bag snuff.

The findings of this study indicate that the use of portion-bag snuff is associated with less severe clinical oral mucosal lesions and a lower frequency of gingival recessions compared with such lesions among users of loose snuff.

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