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ORIGINAL ARTICLE

# Patients' awareness of the potential benefit of smoking cessation. A study evaluating self-reported and clinical data from patients referred to an oral medicine unit

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**Abstract** The present study analyzed history of smoking and willingness to quit smoking in patients referred for diagnosis and treatment of different oral mucosal lesions. Prior to the initial clinical examination, patients filled in a standardized questionnaire regarding their current and former smoking habits and willingness to quit. Definitive diagnoses were classified into three groups (benign/reactive lesions, premalignant lesions and conditions, and malignant diseases) and correlated with the self-reported data in the questionnaires. Of the 980 patients included, 514 (52%) described themselves as never smokers, 202 (21%) as former smokers, and 264 (27%) as current smokers. In the group of current smokers, 23% thought their premalignant lesions/conditions were related to their smoking habit, but only 15% of the patients with malignant mucosal diseases saw that correlation. Only 14% of the smokers wanted to commence smoking cessation within the next 30 days. Patients with malignant diseases (31%) showed greater willingness to quit than patients diagnosed with benign/reactive lesions (11%). Future clinical studies should attempt (1) to enhance patients' awareness of the negative

impact of smoking on the oral mucosa and (2) to increase willingness to quit in smokers referred to a dental/oral medicine setting.

**Keywords** Smoking · Oral diseases · Willingness to quit · Smoking cessation

## Introduction

Smoking harms nearly every organ of the body, leading to a range of morbidities and premature mortality. There are some 4,000 known chemicals in tobacco smoke; more than 50 of them are known to cause cancer in humans. The lung is the site considered at highest relative risk of cancer due to smoking [1]. Following lung cancer, the highest relative risks are observed for the larynx and oral cavity [2]. A recent meta-analysis reported 12 studies that estimated oral cancer risk in the USA, Uruguay, Italy, Sweden, India, China, Taiwan, and Korea [3]. The reported pooled cancer risk estimate was 3.43 times higher in smokers compared with nonsmokers. Besides oral cancer, other oral diseases that have been considered related to cigarette smoking include oral precancer, periodontal disease, caries and tooth loss, gingival recession, and other benign mucosal disorders such as smoker's melanosis and smoker's palate [4, 5].

Primary prevention focuses on eliminating risk factors in order to reduce the number of cases of certain diseases. Since the risk factors for oral cancer and precancer are well known (tobacco, heavy drinking, poor diet), the oral health team should act both on the community level as well as in its clinical environment [6]. In most countries, the simple scheme of the five As is applied in smoking cessation efforts: Ask patients about their tobacco habits, Advise them to quit smoking, Assess patient's willingness to quit,

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Assist them in achieving this, and Arrange follow-up [7]. The integration and success of tobacco cessation counseling in a dental practice setting involves changes in the knowledge, attitudes, and behavior of both dental team members and their patients. Johnson [8] has identified many possible barriers to the required changes including lack of time to spend counseling, lack of training and skills, legal limitations on prescribing nicotine replacement therapy (NRT), added costs of the counseling, and client/patient resistance to quitting smoking.

The aim of the present study was to analyze the willingness to quit smoking in patients referred to an oral medicine unit for diagnosis and treatment of different mucosal lesions. Primary outcome parameters evaluated were a potential relationship between the type of lesion (benign, premalignant, and malignant) and a subjective appraisal of patients' perception of the benefits following smoking cessation, obtained with a standardized questionnaire.

## Material and methods

### Study sample and clinical examination

The present study included all patients referred to the oral medicine unit at the Department of Oral Surgery and Stomatology, University of Bern, for diagnosis and treatment of oral mucosal lesions in the period from January 2007 to June 2009. The study protocol was approved by the standing ethical committee for clinical studies of the Medical Faculty, University of Bern. All patients were examined following the same protocol by residents of the department, including thorough medical history, recent dental/stomatological history, extraoral and intraoral examination, and oral biopsy and radiographic imaging where necessary. Based on the findings of the clinical and eventual histopathological examinations, a definitive diagnosis was formulated and classified in one of three groups: benign/reactive lesions, premalignant lesions and conditions, or malignant diseases of the oral mucosa. All smokers underwent brief counseling for smoking cessation (behavioral intervention) including the prescription of NRT (pharmacological intervention) where indicated, as recommended in the consensus report of the First European Workshop on Tobacco Use Prevention and Cessation for Oral Health Professionals [9].

### Assessment of smoking status and questionnaire data

- Before commencement of the initial examination at the department, all patients had to fill in a standardized questionnaire regarding their current and former smoking habits and their willingness to quit [10].

This questionnaire included the following parameters: History of smoking: All patients were asked whether they were never smokers, former smokers or current smokers. The current and former smokers had to indicate the number of cigarettes smoked per day (including the time period since they started smoking) to allow for calculation of a pack year value.

- Current smokers were asked if they thought that their mucosal problems were related to their smoking habit. The answers were classified according to the following index:

0 = No correlation between smoking and mucosal lesion

1 = Not clear/maybe some relationship between smoking and mucosal lesion

2 = Clear relationship between smoking and mucosal lesion

- Additionally, current smokers were asked whether they thought their oral lesions would benefit from smoking cessation. The answers were grouped according to the following index:

0 = No benefit from smoking cessation

1 = Not clear/maybe some benefit from smoking cessation

2 = Clear benefit from smoking cessation

- All smokers were asked if they were willing to quit smoking, and if so, when they would like to commence their cessation. The answers were classified according to the following index:

0 = Not interested in smoking cessation at all

1 = Not interested in smoking cessation at the moment, maybe in half a year

2 = Interested in smoking cessation during the next 30 days

- Finally, a history of smoking cessation efforts was recorded for all smokers, including the use of NRT (yes/no answer). The following index was used:

0 = No previous smoking cessation effort

1 = One previous smoking cessation effort

2 = Two to four previous smoking cessation efforts

3 = More than four previous smoking cessation efforts

### Statistical analysis

First, all data were analyzed using descriptive methods. To detect significant differences or potential influencing factors associated with a history of smoking as derived from the patient questionnaire, we complemented all relevant point estimates with 95% confidence intervals. Among smokers,

we estimated the odds ratios for (i) the patient's willingness to quit, (ii) the patient's perception of the benefits of smoking cessation, and (iii) the patient's view about any association between smoking and oral lesions for the three different types of lesions. In addition, we estimated the 95% confidence interval of the respective odds ratios. All statistical analyses were performed using S-Plus Professional (Insightful Corp., Seattle, WA, USA).

## Results

### Study population

During the study period from January 2007 to June 2009, 1,044 patients were referred to the oral medicine unit at the Department of Oral Surgery and Stomatology. A number of 39 patients had to be excluded from further analysis due to missing data in the smoking status evaluation section of the questionnaire. Additionally, 25 patients were not included due to an unclear final diagnosis. Therefore, a total of 980 patients were included in the present study. This group comprised 453 male and 527 female participants with a mean age of 55.5 years (minimum 10 years, maximum 96 years).

The definitive diagnoses of the 980 patients included 741 benign/reactive mucosal lesions, 202 premalignant lesions and conditions, and 37 malignant soft tissue pathologies. In the group of benign/reactive mucosal lesions, fibrous hyperplasias were the most frequent finding ( $n=138$ ). Also, quite frequent findings were anatomic variations, with a total of 61 lesions (e.g., geographic tongue, Fordyce's spots, etc.). Diagnoses that were encountered fewer than ten times during the study period included lesions such as peripheral giant cell granulomas ( $n=8$ ), benign mucosal pemphigoid ( $n=6$ ), and pseudomembranous oral candidosis ( $n=4$ ). Only five diagnosed malignant tumors were not squamous cell carcinomas: a distant metastasis of colon carcinoma and adenocarcinoma of the lung, a Ewing's sarcoma, an atypical Burkitt lymphoma, and an adenoid cystic carcinoma.

### Questionnaire analysis

The study population comprised a total of 466 current or former smokers (48% of 980 patients included). The percentage of current smokers for the different diagnoses varied between 0% and 96% of the patients (Table 1). Regarding the three disease groups (benign/reactive lesions, premalignant lesions and conditions, and malignant diseases of the oral mucosa), 55% of never smokers had benign lesions, whereas only 30% had malignant diseases including oral squamous cell carcinoma (Table 2). The

mean pack year values were 22 for the benign/reactive lesions group, 30 for premalignant lesions, and 56 for malignant diseases. The 95% confidence intervals of the mean indicate that there is a statistically significant increase in pack years among patients with a malignant lesion.

Current smokers (33%) indicated that they thought their premalignant lesions/conditions were related to their smoking habit, yielding an odds ratio of 2.43 (95% CI 1.12–5.27;  $p<0.01$ ) compared to smokers with a benign lesion. Only 15% of current smokers with malignant diseases acknowledged a correlation (Table 3); the odds ratio as compared to current smokers with benign lesions was 1.45 (95% CI 0.29–7.09). Asked whether they thought their oral lesions would benefit from smoking cessation, 75% of current smokers in the group with benign/reactive lesions said yes, compared to 57% of current smokers in the malignant disease group (Table 4). The odds ratio for patients with malignant versus benign lesions was therefore 0.45 (95% CI 0.14–1.39). For patients with a premalignant versus a malignant lesion, the odds ratio was 1.51 (95% CI 0.71–3.21).

About half of the current smokers (49%) did not want to quit smoking within the next 6 months. Overall, only 14% of the smokers wanted to commence smoking cessation within the next 30 days. There was greater willingness to quit among smokers with malignant diseases (11% for benign/reactive versus 31% for malignant lesions; Table 5), yielding an odds ratio of 3.76 (95% CI 1.03–13.72;  $p<0.01$ ). For smokers with a premalignant versus a benign lesion, the corresponding odds ratio for willingness to quit was 1.94 (95% CI 0.83–4.52). Accordingly, 38% of the smokers with malignant mucosal diseases indicated no interest in quitting smoking, whereas 53% of the smokers with benign/reactive lesions were not interested.

Regarding history of smoking cessation efforts, 32.5% of the current smokers reported no previous attempts to stop smoking. The percentage of smokers who had never before tried to quit ranged from 25% of current smokers with premalignant lesions and conditions to 33% of smokers with benign/reactive lesions to 58% of smokers with malignant oral lesions (Table 6). Most of the current smokers that had tried smoking cessation before reported more than one effort. Out of the 264 registered current smokers in the study, only 64 had tried NRT for a former smoking cessation effort.

## Discussion

On a global scale, the use of tobacco products is increasing, although there is a clear trend toward a decrease in high-income countries. Overall in Europe, the prevalence of cigarette smoking has stabilized at around 28.6% in the

**Table 1** Distribution of never, former, and current smokers according to the different mucosal findings ( $n > 10$ ; percentages given, if group total  $\geq 100$ )

Diagnosis	Total	Never smoker (%)	Former smoker (%)	Current smoker (%)
Fibrous hyperplasia	138	79 (57%)	27 (20%)	32 (23%)
Oral lichenoid lesions	112	60 (54%)	38 (34%)	14 (12%)
Oral leukoplakia	100	29 (29%)	14 (14%)	57 (57%)
Oral lichen planus	100	61 (61%)	24 (24%)	15 (15%)
Anatomic variations	61	35	10	16
Frictional hyperkeratosis	53	26	7	20
Oral squamous cell carcinoma	32	9	8	15
Mucocele	31	21	4	6
Papilloma	31	11	6	14
Tobacco-related lesions <sup>a</sup>	27	–	1	26
Vascular malformation (e.g., hemangioma)	22	8	11	3
Recurrent aphthous stomatitis	19	11	6	2
Tongue-tie/frenulum	19	19	–	–
Sialadenitis/sialolithiasis	18	13	2	3
Burning mouth syndrome (BMS)	18	12	2	4
Pyogenic granuloma	16	10	5	1
Bisphosphonate-related osteonecrosis of the jaws (BRONJ)	15	10	3	2
Amalgam tattoo	12	8	3	1
Lipoma	10	3	3	4
Other lesions ( $n < 10$ )	146	89 (61%)	28 (19%)	29 (20%)
Total	980	514 (52%)	202 (21%)	264 (27%)

<sup>a</sup> Smokers' melanosis and smokers' palate

adult population (40% males versus 18.2% females), and there is no visible decline for countries in southern and eastern Europe such as Greece, with a total of over 50% smokers (male 63.6%, female 39.8%; [11, 12]). In the present study, the patients analyzed were rather representative of an average European population, with 27% being smokers. Although the patients referred to an oral medicine unit represent a selective population, and a higher percentage of smokers could have been suspected initially, this was not substantiated by the present findings. Nevertheless, there was a pronounced difference of percentages of current smokers present in the three different groups of oral lesions, with 24% of current smokers having benign/reactive lesions

and 43% of current smokers presenting with malignant mucosal diseases.

The most important etiological factors for the development of oral cancer are tobacco [5], excess consumption of alcohol [13], and betel quid usage in South and Southeast Asia [14, 15]. These factors act separately or synergistically. Heavy drinkers and smokers have 38 times greater risk than abstainers from both products [16]. In a study from northern Italy, the single factor with the highest attributable risk for oral cancer development was smoking [17], and this risk was related to both intensity and duration of tobacco smoking [18]. The dose effect of tobacco was also demonstrated in the present study, where the mean pack

**Table 2** Distribution of never, former and current smokers according to three different groups of mucosal findings

Group	Total	Never smoker (%)	Former smoker (%)	Current smoker (%)	Current smokers male (%)	Current smokers mean py (95% CI)
Benign/reactive lesion	741	411 (55%)	154 (24%)	176 (24%)	99 (56%)	22 (19–25)
Premalignant lesions and conditions	202	92 (45.5%)	38 (19%)	72 (35.5%)	43 (60%)	30 (25–35)
Malignant diseases	37	11 (30%)	10 (27%)	16 (43%)	11 (69%)	56 (36–76)
Total	980	514 (52%)	202 (21%)	264 (27%)	153 (58%)	–

py Cumulative pack years, defined as 20 manufactured cigarettes/one pack smoked per day for 1 year, CI confidence interval

**Table 3** Correlation between the smoking habit and the mucosal findings as assessed by the current smokers in the three groups of diseases analyzed

Group	Correlation smoking and mucosal lesion			Row total
	0 (% and 95% CI)	1 (% and 95% CI)	2 (% and 95% CI)	
Benign/reactive lesion	108 (67% and ±7.2%)	36 (22% and ±6.4%)	18 (11% and ±4.8%)	162 <sup>b</sup>
Premalignant lesions and conditions	24 (40% and ±12.4%)	22 (37% and ±12.9%)	14 (23% and ±10.7%)	60 <sup>c</sup>
Malignant diseases <sup>a</sup>	8 (62% and ±26.4%)	3 (23% and ±22.9%)	2 (15% and ±19.6%)	13 <sup>d</sup>
Column total	140 (60%)	61 (26%)	34 (14%)	235

0 No correlation between smoking and mucosal lesion, 1 not clear/maybe some relationship between smoking and mucosal lesion, 2 clear relationship between smoking and mucosal lesion, 95% CI 95% confidence interval

<sup>a</sup> Group comprises 12 squamous cell carcinomas and one distant metastasis of an adenocarcinoma of the lung

<sup>b</sup> Answers missing: 14

<sup>c</sup> Answers missing: 12

<sup>d</sup> Answers missing: 3

year value for current smokers with malignant mucosal diseases was 56, and the 95% confidence intervals of the mean indicate that there is a statistically significant increase in pack years over the three groups of diseases.

Although some studies suggest that smokers know the potentially harmful effects of smoking such as lung cancer [19, 20]), there is also literature demonstrating that more education is needed to inform patients of the other, lesser-known health risks of cigarette smoking, such as reproduction-related problems and cancers other than lung cancer [21–23]. There are few studies assessing patient awareness of negative effects of cigarette smoking on oral health. A questionnaire study from 12 dental centers in Kuwait [24] reported that a majority of included patients were aware of smoking effects on tooth staining (89.5% of all subjects). Awareness levels decreased with variables such as periodontal health (76.2%), oral cancer (62.2%), and wound healing (27.7%). Fewer smokers than nonsmokers thought that oral health and smoking are related (92.2% vs.

95.8%) and that smoking affected oral cancer (52.4% vs. 66.8%). Logistic regression analysis showed smokers to be significantly less aware of the oral health effects of smoking than nonsmoking patients. Similar results were reported for a study from the UK questioning 1,000 subjects [25]. In that survey, 78% of the patients were aware that smoking had a negative impact on health. However, 52% of patients who were aware of the negative impact could not state what the negative effects were on oral health. Similar findings were also reported for another study asking 152 patients after treatment for oral cancer about their smoking habits, alcohol consumption, and their understanding of the part these factors play in the development of malignancy [26]. At least 6 months after the diagnosis of their malignancy, 72 (47%) still smoked and 55 (36%) drank alcohol to excess. Only one third were aware that their addiction had an impact on the development of oral cancer.

In the present study, only 14% of the smokers questioned indicated that they thought there was a clear relationship

**Table 4** Potential benefit of smoking cessation as estimated by the current smokers in the three groups of diseases analyzed

Group	Benefit of smoking cessation on mucosal lesion			Row total
	0 (% and 95% CI)	1 (% and 95% CI)	2 (% and 95% CI)	
Benign/reactive lesion	18 (12% and ±5.3%)	19 (13% and ±5.5%)	109 (75% and ±7.6%)	146 <sup>b</sup>
Premalignant lesions and conditions	8 (13% and ±8.6%)	3 (5% and ±5.5%)	49 (82% and ±9.8%)	60 <sup>c</sup>
Malignant diseases <sup>a</sup>	1 (7% and ±13.5%)	5 (36% and ±25.1%)	8 (57% and ±25.9%)	14 <sup>d</sup>
Column total	27 (12%)	27 (12%)	166 (76%)	220

0 No benefit from smoking cessation, 1 not clear/maybe some benefit from smoking cessation, 2 clear benefit from smoking cessation, 95% CI 95% confidence interval

<sup>a</sup> Group comprises 13 squamous cell carcinomas and one distant metastasis of an adenocarcinoma of the lung

<sup>b</sup> Answers missing: 30

<sup>c</sup> Answers missing: 12

<sup>d</sup> Answers missing: 2

**Table 5** Willingness to quit smoking reported by the current smokers in the three groups of mucosal lesions analyzed

Group	Willingness to quit smoking			Row total
	0 (% and 95% CI)	1 (% and 95% CI)	2 (% and 95% CI)	
Benign/reactive lesion	75 (53 and $\pm 8.2\%$ )	52 (36.5 and $\pm 7.9\%$ )	15 (10.5 and $\pm 5.0\%$ )	142 <sup>b</sup>
Premalignant lesions and conditions	24 (40.5 and $\pm 12.5\%$ )	24 (40.5 and $\pm 12.5\%$ )	11 (19 and $\pm 9.9\%$ )	59 <sup>c</sup>
Malignant diseases <sup>a</sup>	5 (38 and $\pm 26.4\%$ )	4 (31 and $\pm 25.1\%$ )	4 (31 and $\pm 25.1\%$ )	13 <sup>d</sup>
Column total	104 (49%)	80 (37%)	30 (14%)	214

0 Not interested in smoking cessation at all, 1 not interested in smoking cessation at the moment, maybe in half a year, 2 interested in smoking cessation during the next 30 days, 95% CI 95% confidence interval

<sup>a</sup> Group comprises 12 squamous cell carcinomas and one distant metastasis of an adenocarcinoma of the lung

<sup>b</sup> Answers missing: 34

<sup>c</sup> Answers missing: 13

<sup>d</sup> Answers missing: 3

between smoking and their mucosal lesion. But in contrast to the studies mentioned above, the patients were not knowledgeable about the definite diagnosis when answering the questionnaire before the initial clinical examination. All they knew about their respective mucosal findings was what the referring dentist had told them. Interestingly, patients with premalignant conditions/lesions were more aware of a correlation between smoking and their mucosal lesion, exhibiting a statistically significant odds ratio of 2.43 (95% CI 1.12–5.27,  $p < 0.01$ ) as compared to patients with a benign lesion.

The significance of dentists' role in supporting their patients' attempts to discontinue tobacco use was first mentioned by Christen [27]. Since this initial report, tobacco use interventions in the dental setting have consistently shown to increase the odds of quitting [7, 28, 29]. Additionally, although patients expect their oral health care providers to ask about their tobacco use history [30–32], many dental professionals express discomfort about implementing tobacco use prevention and cessation

(TUPAC) strategies in their routine care. These barriers include the possibility of dental patients being offended by discussions of smoking cessation and therefore account for the reason that only 33–50% of dentists routinely ask their patients about their tobacco dependence [7]. Other barriers to the implementation of TUPAC have been identified such as (i) lack of financial incentives or resources, (ii) assumptions that patients will not cooperate, (iii) tobacco use by oral health professionals, (iv) frustration over low success rates, (v) lack of visible effects of tobacco use in the oral cavity, (vi) low cost–benefit ratio, and (vii) discomfort in discussing tobacco use cessation [7, 8].

In order to potentially reduce these barriers and to facilitate the adoption of TUPAC strategies by dental practitioners, a level of care model involving a step-by-step strategy was recently proposed in the consensus report of the 2nd European Workshop on Tobacco Use Prevention and Cessation for Oral Health Professionals, to give dental clinicians the freedom to offer a varied approach, according to their patients' needs [33, 34]. Following this approach, in

**Table 6** Previous smoking cessation efforts of the current smokers in the population evaluated

Group	Smoking cessation efforts				Row total
	0	1	2	3	
Benign/reactive lesion	50 (33%)	38 (25%)	49 (32%)	14 (10%)	151 <sup>b</sup>
Premalignant lesions and conditions	15 (25%)	14 (24%)	24 (41%)	6 (10%)	59 <sup>c</sup>
Malignant diseases <sup>a</sup>	7 (58%)	2 (17%)	2 (17%)	1 (8%)	12 <sup>d</sup>
Column total	72 (32.5%)	54 (24.5%)	75 (33.5%)	21 (9.5%)	222

0 No previous smoking cessation effort, 1 one previous smoking cessation effort, 2 two to four previous smoking cessation efforts, 3 more than four previous smoking cessation efforts

<sup>a</sup> Group comprises 11 squamous cell carcinomas and one distant metastasis of an adenocarcinoma of the lung

<sup>b</sup> Answers missing: 25

<sup>c</sup> Answers missing: 13

<sup>d</sup> Answers missing: 4

the oral medicine unit at the School of Dental Medicine, University of Bern, every patient is offered basic TUPAC care consisting of brief interventions to identify tobacco users, assess readiness to quit, request permission to readdress at a subsequent visit, and if preferred, refer for further TUPAC counseling.

In the present study population, there was greater willingness to quit smoking in patients with malignant diseases (11% for benign/reactive versus 31% for malignant lesions), yielding a statistically significant odds ratio of 3.76 (95% CI 1.03–13.72,  $p < 0.01$ ). An inverse trend can be seen regarding the history of previous smoking cessation efforts, where the percentage of smokers who had never tried to stop smoking ranged from 25% of the current smokers with premalignant lesions and conditions to 33% of the smokers with benign/reactive lesions to 58% of the questioned smokers with malignant oral lesions.

To the best of our knowledge, the present study represents the first approach in the literature to assess patients' awareness of a possible relationship between their smoking habit and the mucosal disorders present, and their willingness to quit smoking. Nevertheless, the data presented has to be interpreted with some caution, as patients may have been already informed about the nature of their mucosal lesion (benign/reactive, premalignant, malignant), and its possible correlation with the harmful effects of smoking by their referring dentist. Furthermore, the study did not include smokeless tobacco in the questionnaire, thus, potentially underestimating the actual use of tobacco products by the patients evaluated. Future studies should take these possible confounders into account and should also try to validate subjective questionnaire data concerning tobacco use with objective methods, e.g., carbon monoxide or cotinine blood level testing. Whether current results for TUPAC [35–37] can be improved through more targeted identification of patients ready to quit smoking and the provision of alternate cessation strategies—including pharmacotherapy such as bupropion or varenicline—remains to be demonstrated in prospective clinical studies.

## Conclusions

The present study demonstrates that patients referred to an oral medicine unit for treatment of a variety of oral mucosal diseases represent a percentage of current smokers (27%) similar to that of the general Swiss population. Only a minority of the smokers questioned (14%) saw a clear relationship between their smoking habit and the mucosal lesion present, whereas a majority (76%) indicated that there could be a benefit from smoking cessation on the oral mucosa. Only 14% of the smokers were interested in undertaking a smoking cessation effort during the next

30 days, but there was significantly greater willingness to quit among patients with malignant diseases (odds ratio of 3.76) in comparison to patients with benign/reactive lesions. Future clinical studies should attempt (1) to enhance patients' awareness of the negative impact of smoking on the oral mucosa and (2) to increase willingness to quit in smokers referred to a dental/oral medicine setting.

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**Conflicts of interest** None

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