Life-style survey of patients with oral lichenoid reactions

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The occurrence of different life-style patterns, including marital status, educational level, nutrition, tobacco and alcohol use, and frequency of physical activity, in patients with oral lichenoid reactions (OLR) in total or partial contact with amalgam fillings was examined. When compared with an age- and sex-matched control group, the daily intake of carbohydrates, fibers, and iron was statistically significantly higher in the OLR patients. Regarding marital status, there was a statistically significant difference between the OLR patients and the control subjects, the former group containing more people who were divorced or whose spouse had died. The frequency of physical activity was also statistically significantly higher in the OLR patients than in the control group. Hypothetical mechanisms that may lie behind the results obtained are discussed. □*Amalgam fillings; life-style factors; mouth diseases; oral lichenoid reactions*

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One of the essential properties of the oral epithelium is its rapid turnover time and ability to replace itself continuously (1). Both erogenous and systemic effects on growth and differentiation of the epithelial cells may, therefore, early reflect disturbances in individuals, such as their nutritional condition (2). The protective function of the oral mucosa includes barrier mechanisms acting against pathogens and toxic and allergic substances (3, 4). As many oral diseases have a hyperkeratotic or inflammatory component, the question arises of how the barrier function may be affected in these conditions. Measurements of permeability in hyperplastic and hyperkeratotic oral epithelium suggest that the increased thickness does not contribute to an improved barrier function but, on the contrary, reduces it (5). The oral mucosa is influenced by several factors, such as immunologic status (6), nutrition (2), stress (7), and tobacco (8–10) use. Nutrients related to, for example, energy support, enzyme activity, or gene expression, such as iron, zinc and vitamin A, respectively, are documented as affecting the state of the epithelial cells and/or the covering mucosal layer (2). Trauma and infections increase the demands for nutrient supply to the oral mucosa, but infections and pain may reduce dietary intake (3). Thus, nutrition and oral health are intimately intertwined.

It is well known that tobacco use affects the oral mucosa and the periodontal tissue in a harmful manner. For example, oral squamous cell carcinoma (11) and periodontal diseases (12) have been associated with tobacco use.

Oral lichen planus (OLP) is a disease of unknown etiology. Being one of the most prevalent diseases affecting the oral mucosa, it has been the subject of intensive research in recent years (13). OLP may be found in any location of the mouth but most frequently in the buccal mucosa, the tongue, and the gingiva, whereas palatal lesions are uncommon (14, 15). OLP has been connected with some generalized medical disorders such as diabetes mellitus (16) and liver diseases (17).

Recently, attention has been focused on OLP-like lesions in contact with amalgam fillings (18, 19), called oral lichenoid reactions (OLR) by some authors (18, 20, 21). Contact allergy to mercury or other dental materials may be a possible etiologic factor, especially in cases in which the lesions are restricted to the contact area opposing the dental restoration (18, 22).

Using four psychologic inventories, Bergdahl et al. (7) studied psychologic aspects of OLR patients. Their results indicated that OLR patients differed significantly from the control subjects, with an implied tendency to be more depressive.

Except for hypersensitivity to mercury and other dental materials and the psychologic impact, little is known about other etiologic factors with regard to OLR lesions, such as the importance of life-style factors on OLR lesions. The aim of the present investigation was, therefore, to study whether patients with OLR differ from the general population in the pattern of their life style.

Materials and methods

Subjects

During 1987–88, 51 patients were referred to the Department of Oral and Maxillofacial Surgery, School of Dentistry, Umeå University, for reticular/papular

Table 1. The distribution of gender and age in the oral lichenoid reactions (OLR) patients and the control subjects

Age group (years)	Men				Women				Total			
	OLR		Control		OLR		Control		OLR		Control	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
25–34	0	(0)	0	(0)	3	(8)	63	(14)	3	(6)	63	(10)
35–44	6	(60)	94	(56)	19	(50)	185	(41)	25	(52)	279	(45)
45–54	2	(20)	33	(20)	9	(24)	123	(29)	11	(23)	156	(25)
≥55	2	(20)	40	(24)	7	(18)	81	(18)	9	(19)	121	(20)
Total no.	10	(100)	167	(100)	38	(100)	452	(100)	48	(100)	619	(100)

lesions in total or partial contact with amalgam fillings (OLR) and with white, slightly elevated patterns and Wickham's striae somewhere in the lesions, with a duration of 3 months or more. The patients were first subjected to a clinical, histologic, and immunohistochemical study (19). A criterion for inclusion in the present study was that the patients had completed the WHO-MONICA questionnaire (23, 24). All but three patients complied. Thus, in total, 48 patients were included. The age of the patients varied from 31 to 74 years (mean age, 47 years). Ten patients (21%) were men aged 39–69 years (mean age, 47 years), and 38 (79%) were women aged 31–74 years (mean age, 47 years) (Table 1).

Controls

The MONICA study (Multinational Monitoring of Trends and Determinants in Cardiovascular Diseases) was initiated by WHO, and its aim is to screen mortality, morbidity, and risk factors for cardiovascular diseases. As a part of the WHO-MONICA study in northern Sweden, life-style factors have been investigated, using different frequency questionnaires, including such variables as diet and alcohol intake (23, 24), smoking habits, exercise, marital status, and educational level (24).

Of a total of 1625 participants in the WHO-MONICA screening in 1986, all 619 subjects within the same age and gender strata as the 48 OLR patients were selected as a control group for the present study (Table 1). The same frequency questionnaires were used for the OLR patients and the control subjects.

Life-style inventories

A food frequency questionnaire concerning consumption of 80 food items, including alcohol intake, was used. The frequency scale had the following levels: never consumed, maximum once a month, 1–3 times per month, once a week, 2–3 times a week, 4–6 times a week, once a day, 2–3 times a day, or 4 or more times a day. The questionnaire included 7 questions about the frequency of consumption of various types of fats, 10 questions on milk and other dairy products, 6 questions on bread and cereals, 9 questions on fruits, greens, and root vegetables, and 8 questions on soft drinks and sugar-containing snacks. Five questions on spirits, wine, and beer consumption were also included. Twenty-nine of the remaining 35 questions recorded the intake of potatoes, rice, pasta, meat and fish, and six varied items, such as salty snacks, ketchup, coffee, tea, juice, and both plain and mineral water. Food items belonging to the same food group were listed together. No information on portion sizes was included.

The energy and nutrient contents were calculated for average portions of the food items using the software MAT's *Rudans Lättdata*, Västerås, Sweden. The data

Table 2. Marital status in 48 oral lichenoid reactions (OLR) patients compared with the control subjects*

Marital status	Men				Women				Total			
	OLR		Control		OLR		Control		OLR		Control	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Married	0	(0)	125	(76)	5	(13)	376	(83)	5	(10)	501	(81)
Divorcee/widow(er)	10	(100)	18	(11)	29	(29)	50	(11)	39	(81)	68	(11)
Single	0	(0)	22	(13)	4	(4)	25	(6)	4	(9)	47	(8)
Missing inform.	0	(0)	2	–	0	(0)	1	–	0	(0)	3	
Total no.	10	(100)	167	(100)	38	(100)	452	(100)	48	(100)	619	(100)

* Difference for men and women separately or merged in the OLR group versus the control group with regard to civil status was statistically significant ($p < 0.0001$).

Table 3. Educational level in 48 oral lichenoid reactions (OLR) patients compared with the control subjects*

Educational level	Men				Women				Total			
	OLR		Control		OLR		Control		OLR		Control	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
≤9 years	8	(80)	109	(67)	25	(65)	292	(68)	33	(69)	401	(67)
>9 years	2	(20)	52	(33)	12	(31)	139	(32)	14	(29)	191	(33)
Missing inform.	0	(0)	6	–	1	(4)	21	–	1	(2)	27	–
Total no.	10	(100)	167	(100)	38	(100)	452	(100)	48	(100)	619	(100)

* Difference for men and women separately or merged in the OLR group versus the control group with regard to educational status was statistically significant.

base from the National Food Administration in Sweden was used (25). Average portion sizes for middle-aged Swedish men and women were used (26). The reported frequencies of consumption were converted to number of intakes per day, and the total daily intake of energy and nutrients was calculated.

The following factors were also analyzed and compared between the OLR patients and the control group: marital status, educational level, frequency of tobacco use, and exercise. Marital status was classified into three categories: 1) married (including people living together); 2) single, and 3) divorced/widow(er). Two educational levels were defined: 1) those with more than 9 years of education, corresponding to high school and a university degree; and 2) those with 9 years or less of education, corresponding to elementary school. The frequency of physical activity was defined as: 1) exercise once a week or less; and 2) exercise more than once a week. Tobacco habits were defined as: 1) those who reported smoking cigarettes, cigars, cheroots, or pipe daily; 2) those who used snuff; 3) those who both used snuff and smoked; and 4) those who did not use any tobacco. 'Occasional' smokers were defined as non-smokers.

Statistics

Several of the independent variables studied are strongly related to gender and age. Therefore, univariate analyses for men and women were initially performed separately and then merged. Variables that had a univariate explanatory power were then entered into a multivariate model including gender and age as covariates.

The control group was, as described earlier, formed by selecting from the MONICA screening those subjects who were age- and gender-matched with the OLR patients. We have, however, standardized the gender-specific means and measures of variation for age by analysis of covariance using the GLM procedure in SAS. Differences between means were tested by a multiple means test (Bonferroni). Proportions, after stratification for marital status, educational level, tobacco use, and physical activity, for example, were

Table 4. Estimated daily mean energy and nutrient intake in 48 oral lichenoid reactions (OLR) patients (OLR_{mean}) and in the control subjects ($Control_{mean}$)

	Men		Women		Total		
	OLR_{mean} (n = 10)	$Control_{mean}$ (n = 167)	OLR_{mean} (n = 38)	$Control_{mean}$ (n = 452)	OLR_{mean} (n = 48)	$Control_{mean}$ (n = 619)	P value*
Energy, kcal	2277 ± 258	2398 ± 69	1944 ± 81	1758 ± 25	2181 ± 87	2063 ± 27	NS
Protein, g	79 ± 8	82 ± 2	79.2 ± 7.8	81.7 ± 2.1	75 ± 2.9	72 ± 0.9	NS
Total fat, g	99 ± 16	110 ± 4	82 ± 4.3	79.5 ± 1.3	94 ± 5.0	95 ± 1.5	NS
Carbohydrates, g	260 ± 29	262 ± 8	230 ± 10	194 ± 3	252 ± 10	224 ± 3	0.01
Sucrose, g	41.6 ± 8.4	46.3 ± 2.2	37.7 ± 3.7	35.7 ± 1.1	40.8 ± 3.5	40.4 ± 1.1	NS
Fiber, g	23.8 ± 2.8	22.0 ± 0.7	21.3 ± 0.9	17.4 ± 0.3	22.6 ± 1.0	19.2 ± 0.3	0.001
β-Carotene, mg	3.0 ± 0.6	2.9 ± 0.2	4.4 ± 0.4	3.9 ± 0.1	3.7 ± 0.35	3.2 ± 0.1	NS
Vitamin C, mg	81.7 ± 12.6	73.4 ± 3.4	73.0 ± 6.3	71.2 ± 19	73.5 ± 5.6	70.5 ± 1.7	NS
Vitamin E, mg	8.0 ± 1.1	8.3 ± 0.3	7.3 ± 0.4	6.6 ± 0.1	7.9 ± 0.4	7.3 ± 0.1	NS
Vitamin A, mg	1.6 ± 0.2	1.4 ± 0.05	1.2 ± 0.1	1.1 ± 0.09	1.4 ± 0.1	1.3 ± 0.03	NS
Selenium, mg	30.3 ± 3.0	32.2 ± 0.8	282 ± 1.4	26.5 ± 0.4	30.3 ± 1.2	29.3 ± 0.4	NS
Iron, mg	17.9 ± 1.9	16.8 ± 0.5	14.9 ± 0.7	12.7 ± 0.2	14.5 ± 0.7	16.4 ± 0.2	0.01
Calcium, mg	1022 ± 137	1163 ± 37	910 ± 51	921 ± 16	1.007 ± 51	1042 ± 16	NS
Alcohol	3.9 ± 1.6	4.8 ± 0.4	1.8 ± 0.3	1.6 ± 0.1	3.2 ± 0.5	3.3 ± 0.1	NS

* Tested with the Bonferroni test.

Table 5. Frequency of physical activity in 48 oral lichenoid reactions (OLR) patients compared with the control subjects

	Men				Women				Total			
	OLR		Control		OLR		Control		OLR		Control	
Physical activity	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Once a week or less	4	(40)	101	(62)	16	(42)	272	61)	20	(42)	373	(62)
More than once a week	6	(60)	60	(38)	22	(58)	172	(39)	28	(58)	232	(38)
Missing inform.	0	(0)	6	–	0	(0)	8	–	0	(0)	14	–
Total no.	10	(100)	167	(100)	38	(100)	452	(100)	48	(100)	619	(100)

* Difference for men and women merged in the OLR group versus the control group with regard to physical activity was statistically significant ($p < 0.005$).

Table 6. Frequency of tobacco use in 48 oral lichenoid reactions (OLR) patients compared with the control subjects*

	Men				Women				Total			
	OLR		Control		OLR		Control		OLR		Control	
Tobacco use	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Smoking	1	(10)	33	(19)	10	(42)	128	(28)	11	(23)	161	(26)
Non-smoking	7	(70)	103	(60)	28	(58)	323	(72)	35	(73)	426	(69)
Snuff	2	(20)	24	(17)	0	(0)	1	(0)	2	(4)	25	(4)
Mixed (snuff/smoking)	0	(0)	6	(4)	0	(0)	0	(0)	0	(0)	6	(1)
Missing inform.	0	(0)	1	–	0	(0)	0	–	0	(0)	1	–
Total no.	10	(100)	167	(100)	38	(100)	452	(100)	48	(100)	619	(100)

* Difference for men and women separately or merged in the OLR group versus the control group with regard to tobacco use was statistically significant.

standardized for age by using the direct method and tested by means of the chi-square test.

The variables that were associated with the presence of OLR in both men and women in the univariate analyses were entered into a multiple logistic regression, using the software from EGRET (27). All variables were entered as dummy variables.

Results

The marital status differed strongly between the OLR patients and the control group (Table 2). Thus, for both men and women there was a significantly higher proportion of OLR patients who were divorcees/widow(er)s ($p < 0.0001$) than in the control group. The proportions with higher and lower educational levels, however, were similar in the OLR patients and the control subjects (Table 3).

The estimated daily energy and nutrient intake for the OLR patients and the control subjects is presented in Table 4. When the whole material was considered, the overall daily nutrient intake was similar in the OLR patients and the control subjects. A statistically significantly higher intake of carbohydrates ($p < 0.05$), fibers ($p < 0.001$), and iron ($p < 0.05$), however, was found in the former group. Both the OLR patients and the control subjects, nevertheless, fulfilled the requirements for nutrient intake as recommended by the National Food Administration in Sweden (28).

The frequency of physical activity in the OLR patients is compared with that in the control subjects in Table 5. The frequency of exercise in the OLR group was statistically significantly ($p < 0.05$) higher than in the control group.

In Table 6 the frequency of tobacco use in the OLR patients and control subjects is tabulated. No statistically significant difference between the groups was found.

In Table 7 the odds ratios and their 95% confidence intervals for having OLR are estimated. The odds ratio for having OLR for divorcees/widow(er)s was 37.6. The corresponding figure for physical activity was 2.5.

No significant difference was noted between various clinical, histologic, and enzyme histochemical subgroups presented in a previous study (19).

Table 7. Odds ratios (OR) and their 95% confidence interval (CI) for having oral lichenoid reactions. Gender and age are included as covariants

	β	SD	*P* value	OR	95% CI
Civil status	3.62	0.40	<0.001	37.6	17.0–82.9
Physical activity	0.91	0.36	<0.05	2.5	1.2–5.1

Discussion

Maintaining an intact oral mucosa is essential. In most cases the natural healing process after a physical trauma or a pathologic process is adequate. The maintaining of

an intact oral mucosa or the healing of a trauma is regulated by a series of complicated interacting processes. One of the prerequisites for the optimal regulation of these processes is an adequate supply of nutrition to the tissue components involved. This is of special importance in the oral mucosal tissues, where the turnover rate is high. An inadequate nutrient supply has been shown to lower the protective function of the oral mucosa, thus facilitating the entry of microorganisms and toxic products (2). Many oral diseases are related to the protection and binding of such products—for example, smoker's melanosis (29).

With regard to the etiology of OLR lesions, there have been speculations that a contact hypersensitive reaction to mercury released during the corrosion of silver amalgam might be a causative factor (18). It has also been suggested that psychologic factors play an etiologic role (7). The exact mechanism behind the establishment of an OLR reaction, however, is so far unknown. The etiologic background of OLR lesions is probably multicausal. The role of different life-style factors has not hitherto been properly taken into consideration. The result of the present study indicated that the OLR patients had an adequate daily intake of energy and nutrients. No compensatory change in the dietary pattern to maintain morphologic and biochemical equilibrium could be observed. The aim of the analysis of the daily nutrient intake in the present study was to obtain an indication of the general nutrient supply by letting the participants fill in a questionnaire. A bias could have been induced by the fact that the OLR patients were more conscientious about completing the forms than the control subjects, who had less interest of the outcome of the study. Also, it should be taken into consideration that the control group consisted of a sample of the general population, whereas the OLR group comprised a highly selected group of patients referred to a specialist clinic for an OLR lesion. The Swedish dental insurance system offers in these cases removal of amalgam fillings, followed by gold therapy free of charge, after specialist examination. This is well known among the referring dentists, who performed the prosthetic treatment. Another source of error is the possible absence of any relationship between the daily nutrient intake, on the one hand, and the nutritional status of the oral mucosal tissue cells, on the other. Absorption of single nutrients may be inhibited or enhanced during the nutrient turnover and/or cell uptake may differ among individuals due to genetic and exposure influence. The carbohydrate, fiber, and iron intakes of the OLR group in the present study were significantly higher than those of the control subjects. One explanation of the high carbohydrate and fiber consumption might be that most of the OLR patients had a higher frequency of exercise than the control group. Therefore, they needed more easily burned calories such as in bread, which might also explain the increased iron and fiber intake, as bread contains these components. Another explanation might be that the OLR patients also ate more sandwiches, instead of cooking proper meals.

The increased frequency of divorcees, widow(er)s, and single people in the OLR group is interesting in the light of the result reported by our group (7) in a psychologic study of the same OLR patients as in the present study. In that study the patients were found to have a personality that made them depression-prone. Bearing this in mind, one can assume that these patients might react with depression when exposed to such traumatic life events as divorce and/or death or loss of spouse or relatives. The findings in the present study in combination with the findings reported in our previous study (7) speak in favor of the hypothesis that OLR patients have a depression-prone personality. When exposed to stressful life events, a depression might develop but is masked and somatized as an OLR lesion. To date, the pathophysiologic mechanisms behind this somatization remain unknown.

Conclusion

The OLR patients seem to have a different life-style pattern. They exercise more and are more frequently divorcees or widow(er)s. The reason why an oral lesion does or does not become established is not at all clearly understood from a biologic point of view. The etiology of many of the commonest lesions in the mouth is not yet clarified, and so far, many of these oral diseases have been considered to have a multicausal etiology. Among these etiologic factors both local, on a cellular level, and systemic and psychologic factors are of importance. There is usually a balance between the factors attacking tissue and the host defense mechanisms. But for some unexplained reasons the defense barrier system in some cases can no longer withstand the attack, and 'the cup runs over', and an oral mucosal lesion is established. It is therefore important to have a holistic etiologic approach to these problems, not to seek for one solution but to realize that many interacting etiologic factors can be involved to a greater or lesser extent in different life situations for the patient.

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