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Psychological profile in oral lichen planus

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Abstract

Aim: Oral lichen planus (OLP) is an oral lesion with an enigmatic etiology. To explore the possibility of psycho-somatization, we evaluated the psychological personality profiles of OLP patients.

Methods: Twenty patients with reticular; 20 with erosive form of OLP, and 25 controls were tested with the psychological Minnesota Multiphasic Personality Inventory (MMPI)-202 test. Eight clinical scales (hypochondriasis, depression, hysteria, psychopathic deviate, paranoia, psychasthenia, schizophrenia, and hypomania) as well as cortisol level, CD3, CD4, CD8, and CD16 markers by group were compared. Psychosomatization was evaluated by the use of internalization ratio (IR) Index.

Results: A characteristic MMPI profile was noted in the OLP groups with high IR index value. Significant differences among the groups were detected for cortisol, CD4, CD8, and CD16 counts. Mean values for hypochondriasis, depression, and hysteria were all significantly different with significantly higher mean scores for both reticular and erosive OLP subjects compared with controls.

Conclusions: Prolonged emotive stress in many OLP patients may lead to psychosomatization and may contribute to the initiation and clinical expression of this oral disorder.

Clinical significance: If additional research involving a larger and more diverse sample of patients confirms these findings, clinical trials will be needed to determine whether adjunctive psychological intervention provides a benefit in treating patients with OLP.

Key words: MMPI; oral lichen planus; stress

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Oral lichen planus (OLP) is a relatively common chronic oral lesion with an enigmatic etiology frequently associated with general disorders such as diabetes and arterial hypertension. Although OLP has also been reported to have premalignant potential (Lanfranchi-Tizeira et al. 2003), it usually presents bilaterally as striated, papular, atrophic, or erosive lesions that can vary clinically and microscopically in intensity. Histologically, the lymphocytic infiltrate in OLP is heavily laden with T-cells adjacent to damaged keratinocytes (Matthews et al. 1984). However, in addition to the specific T-cell autoimmune reaction, the etiology of OLP may also be associated with both a specific genetic and psychological constitution. Based on psychological investigations, Preda et al. (1990) reported that the oral mucosa is a primary erogenic zone, and is an extremely complex and vulnerable region that is very reactive to certain psychological influences. These authors also included OLP as one of the psychosomatic diseases. The Cornell Medical Index (CMI) test (Hampf et al. 1987) revealed significant differences when used to compare the psychological constitution of OLP patients to a control group establishing a connection between the psychological stressful occurrences in OLP patients and clinical recurrences of the disease. Soto Araya et al. (2004) recently established a positive relationship between psychological alterations and OLP, considering the stress and anxiety levels in OLP patients as high. According to these findings, it is possible to assume that psychological factors should be taken into account when maintaining oral health as such patients showed increased values on the HAS – Hamilton anxiety scale and HDS– Hamilton depression scale (Colella et al. 1993).

There are reported differences in psychoimmune interactions between patients afflicted with non-erosive OLP lesions compared with those with erosive OLP lesions (Chiappelli et al. 1997). Andreasen (1968) reported that 49% of OLP patients have been sub-

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jected to strong stress in their lives, while others have reported stress-related history in OLP patients with the erosive form, as compared with reticular form (Lowental & Pisanti 1984). Some authors even suggest psychotherapy as additional therapeutic intervention for OLP. Koray et al. (2003) reported that the levels of anxiety and salivary cortisol in OLP patients were high and concluded that this disease is closely related to stress. Thus besides traditional treatment of OLP patients, they suggest that psychological support is also needed. However, Macleod (1992) and Humphris & Field (1992) concluded that no relevant connection between stress and OLP occurrence can be established. To begin to address this uncertainty and to explore the possibility of psychosomatization as a possible pathogenic mechanism of initiation and clinical expression of this oral disorder, we evaluated the psychological personality profiles of patients with OLP and correlated these findings with biological markers.

Material and Methods

Patient selection

Forty patients with histologically confirmed diagnosis of OLP (20 patients with reticular and 20 with erosive form) were tested with psychological Minnesota Multiphasic Personality Inventory (MMPI)-202 test (Biro 1995). The MMPI is a standardized questionnaire developed at the University of Minnesota in 1940. Updated in 1989, as MMPI-2 (Edwards et al. 1993), it remains one of the most popular clinical psychology personality inventories currently in use in clinical psychology, psychiatry, research, and forensic settings. We used the MMPI-202 test which is an abbreviated form of the MMPI-2 test for a specific European population. The control population consisted of 25 healthy individuals. All patients were female, age 30–60, non-smokers, with no anamnestic record of use of alcohol. Patient exclusion criteria included previous anamnestic or clinical history of stress, emotional distress or psychiatric disorder, presence of significant co-morbid conditions (autoimmune diseases, endocrine disorders), and presence of local irritating factors at the site of the lesion (overhanging fillings, amalgam fillings, piercings of tongue or buccal mucosa, tobacco chewing, ill-fitting removable prosthesis, and heavy calculus). Patients were examined and screened for the presence of any psychiatric disorder at the first visit by a clinical psychologist. The study has been conducted in full accordance with ethical principles, including the World Medical Association Declaration of Helsinki (version VI, 2002). The MMPI test was administered by one person (K. I.) and evaluated by a clinical psychologist (A. I.) in a ''blinded'' manner. The MMPI is used for psychological evaluation of personality and psychiatric morbidity (Welsh 1951). The results were recorded as scores on the validity (L-lie, F-infrequency, and K-correction scales) and clinical scales (Hs-hypochondriasis, D-depression, Hy-hysteria, Pd-psychopathic deviate, Pa-paranoia, Pt-psychasthenia, Sc-schizophrenia, and Ma-hypomania) (Meyers et al. 2002). Possible psychosomatization and the emotional status of the patients were evaluated using the internalization ratio (IR) Index (Welsh 1952). The IR Index is calculated using the following formula, based on the scores from the clinical scales of the MMPI-202: IR = (Hs+D+Pt)/(Hy+Pd+Ma), where Hs is the Hypochondriasis; D is the Depression; Pt is the Psychasthenia; Hy is the Hysteria; Pd is the Psychopathic deviate, and Ma is the Hypomania. The IR indicates the level of emotional control and tendency towards ''acting out'' with a theoretical base value of 1. IR values of less than 1 indicate poor level of self-control and open manifestation of emotional disturbances, while IR values higher that 1 indicate tendency of self-internalization of emotional disturbances and somatization. The results were interpreted by a clinical psychologist.

CD markers and radioimmunoassay (RIA)

Blood samples were obtained from patients in all groups in the morning, and indirect immunofluorescence test was performed (Bottazzo et al. 1976) for CD3, CD4, CD8, and CD16 (BD PharMingen, San Diego, CA, USA). The normal range for CD marker levels were as follows: CD3 = 65 ± 10%; CD4 = 40 ± 10%; CD8 = 26 ± 9%; CD16 = 15 ± 7% (Institute for Transfusiology, Skopje, Macedonia). Serum cortisol levels were measured by a solid-phase ^{125}I RIA (Lichtarowicz-Krynska et al. 2004) using the Coat-A-Count kit TKCO1 (Diagnostics Product Corp., Caernarfon, Wales, UK) according to manufacturer's instructions.

Statistical analysis

Summary statistics were computed for cortisol level, CD3, CD4, CD8, and CD16 markers by group (control, reticular OLP, erosive OLP). One-way ANOVA was used to compare cortisol level, CD3, CD4, CD8, and CD16 markers by group, and Student–Newman–Keuls multiple range test was used for multiple comparisons. Similarly, summary statistics were computed for the eight clinical scales (hypochondriasis, depression, hysteria, psychopathic deviate, paranoia, psychasthenia, schizophrenia, and hypomania) by group, and comparisons were made using one-way ANOVA with Student–Newman–Keuls multiple range test used for multiple comparisons. To evaluate the relationship of psychological factors on cortisol level, CD3, CD4, CD8, and CD16, Spearman's correlations were calculated for the entire sample.

Results

To examine the possibility of psychosomatization as a potential contributing pathogenic mechanism in the initiation and clinical expression of this oral disorder, we evaluated the psychological personality profiles of patients with OLP. Summary statistics for cortisol level, CD3, CD4, CD8, and CD16 markers by group (control, reticular OLP, erosive OLP) are presented in Table 1. Significant differences were found using a one-way ANOVA, among the three groups for cortisol, CD4, CD8, and CD16 counts. Based on Student–Newman–Keuls multiple range test, the mean cortisol level and mean CD4 count were significantly greater among subjects with erosive OLP compared with control subjects and subjects with reticular OLP, which were not significantly different from each other. There was a twofold increase in serum cortisol level in the erosive OLP group compared with the control, while the reticular OLP group was similar to the control (Fig. 1). As expected, the average CD8 counts in both subjects with reticular OLP and subjects with erosive OLP were significantly greater than the average CD8 count in control subjects (Fig. 2). The average CD16 count in subjects with erosive OLP was significantly lower than either subjects with reticular OLP or control subjects, which were not significantly different from each other.

Summary statistics for the eight clinical scales of the MMPI for each group

Table 1. Summary statistics for cortisol and CD markers by group

	Mean ± SD	Median	Range	$p^{\dagger}$
Cortisol				
Control	248.7 ± 10.8	250	231–260	<0.001
Reticular OLP	250.3 ± 11.1	250	220–270	
Erosive OLP	536.0 ± 55.6	522	448–661	
CD3				
Control	63.5 ± 4.23	64	56–70	0.806
Reticular OLP	64.2 ± 3.47	65	56–72	
Erosive OLP	64.3 ± 4.96	65	50–70	
CD4				
Control	38.0 ± 3.21	38	30–44	0.002
Reticular OLP	38.1 ± 1.91	38	36–44	
Erosive OLP	41.2 ± 3.90	42	30–45	
CD8				
Control	23.4 ± 3.86	22	18–30	<0.001
Reticular OLP	27.5 ± 2.52	27.5	20–32	
Erosive OLP	29.2 ± 3.77	30	16–32	
CD16				
Control	15.0 ± 1.21	15	10–16	0.009
Reticular OLP	14.7 ± 2.54	15	10–20	
Erosive OLP	13.1 ± 2.34	13	10–18	

$^{\dagger}p$-values are based on one-way ANOVA.
OLP, oral lichen planus.

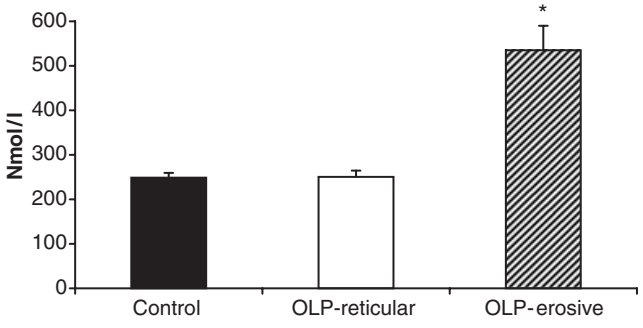

Fig. 1. Serum cortisol levels assessed by ^{125}I radioimmunoassay showing a two fold increase in the erosive oral lichen planus (OLP) group. ($p<0.001$, one-way ANOVA).

are presented in Table 2. No statistical differences among the three groups were detected for the scales of psychopathic deviate, paranoia, psychasthenia, schizophrenia, or hypomania. In contrast, mean values for hypochondriasis, depression, and hysteria were all significantly different with significantly higher mean scores for both reticular OLP subjects and erosive OLP subjects compared with control subjects (Fig. 3).

Spearman's correlations between the clinical scales of the MMPI and cortisol levels, CD3, CD4, CD8, and CD16 markers are presented in Table 3. Significant moderate positive correlations were detected between the clinical scale for hysteria and cortisol, CD3, CD4, and CD8 markers ($p<0.01$ for all Spearman's correlations listed). A significant moderate negative correlation was detected between the clinical scale for hysteria and CD16 counts ($p<0.01$). Significant moderate positive correlations were detected between hypochondriasis and cortisol level and between hypochodriasis and CD8 count ($p<0.01$). Significant moderate positive correlations were detected between depression and cortisol level and between depression and CD8 count while a significant weak negative correlation was detected between depression and CD16 count ($p<0.05$). A significant weak positive correlation was also detected between the clinical scale for schizophrenia and CD3 count ($p<0.05$). Furthermore, results from the validity scales – L, F and K (data not shown) indicated that patients in both OLP groups were honest in their responses to the test and did not exaggerate their problems, and that the control group of patients demonstrated a dissimulative psychological profile. In addition, the IR values were evaluated in the control group and the two OLP groups. The control group had a value of 0.9, while both OLP groups had values of 1.1, which is higher than the theoretical value of 1.0 (Fig. 4), suggesting a potential for somatization.

Discussion

Psychological stress, associated with OLP has been linked with depressive and anxiety disorders (Andreasen 1968, Kovesi & Banoczy 1973, Lowental & Pisanti 1984, Hampf et al. 1987, Colella et al. 1993). McCartan (1995) reported that 12% of OLP patients (erosive form) suffer from borderline or morbid depression, while 50% of these patients have border or morbid anxiety. Although Allen et al. (1986) were not able to confirm a connection between anxiety level and OLP, they concluded that such a connection cannot be definitely denied.

The MMPI-202 test generates validity scale scores that are used to measure the truthfulness and honesty of respondents, and clinical scale scores that are used for diagnosis but interpreted in the light of the validity scale results. The MMPI-202 is a multidimensional personality test and is able to identify other personality characteristics besides anxiety and depression, such as hypochondria, paranoia, mania, psychopathic deviation, etc. The depressive or manic status can be evaluated based on T-score on the D and Ma scales (Gilberstadth 1965), and the anxiety level, assessed through the Pt scale.

The Hs and D scale scores of the reticular OLP group, as well as the Hs, D, and Hy scale scores of the erosive OLP group are significantly higher compared with the control group. A high Hs score suggests a tendency for life conflicts to manifest as physical conditions in these individuals (Biro 1995). A high D scale score indicates low mood or depression, while a high Hy scale score suggests a tendency to develop physical problems under stressful conditions (Biro 1995). These characteristics may have a significant role in the onset and progression of OLP.

Scores for Hs, D, and Hy on the clinical scale of the MMPI-202 were lower than a T score of 70 necessary for significant diagnosis. As such, they

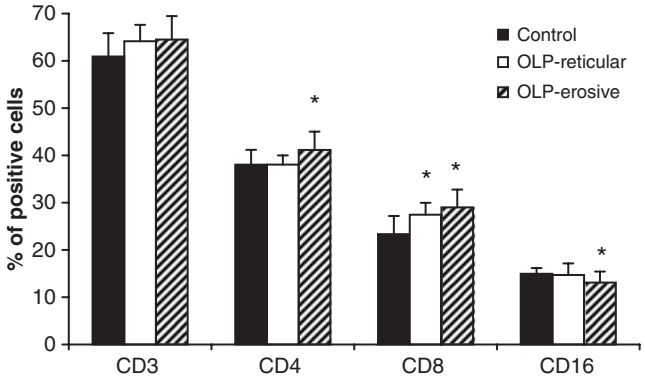

Fig. 2. Indirect immunofluorescence analysis (IIF) of oral lichen planus (OLP)/control group patients for CD markers in peripheral blood. *Statistically significant differences ($p<0.001$, one-way ANOVA).

Table 2. Summary statistics of MMPI clinical scales by group

	Mean ± SD	Median	Range	$p^{\dagger}$
Hypochondriasis				
Control	38.8 ± 4.37	38	30–45	<0.001
Reticular OLP	51.3 ± 7.15	48.5	41–65	
Erosive OLP	55.0 ± 5.21	56	45–65	
Depression				
Control	39.5 ± 6.62	41	29–55	<0.001
Reticular OLP	52.3 ± 6.58	50	45–69	
Erosive OLP	54.0 ± 6.32	55	40–65	
Hysteria				
Control	42.0 ± 3.69	42	35–52	0.012
Reticular OLP	44.7 ± 5.68	45	34–60	
Erosive OLP	45.5 ± 1.91	45.5	41–48	
Psychopathic deviate				
Control	47.0 ± 3.95	48	37–54	0.917
Reticular OLP	46.7 ± 2.62	46.5	41–50	
Erosive OLP	46.7 ± 2.13	46	44–53	
Paranoia				
Control	50.8 ± 3.94	50	45–58	0.231
Reticular OLP	49.0 ± 4.25	50	35–53	
Erosive OLP	49.7 ± 1.69	51	46–51	
Psychasthenia				
Control	44.2 ± 4.34	45	38–50	0.673
Reticular OLP	43.2 ± 4.59	42.5	38–56	
Erosive OLP	43.9 ± 1.92	44	42–48	
Schizophrenia				
Control	44.4 ± 5.52	45	37–55	0.178
Reticular OLP	42.1 ± 3.25	43	32–45	
Erosive OLP	43.3 ± 3.08	44.5	35–47	
Hypomania				
Control	44.0 ± 4.21	45	38–53	0.516
Reticular OLP	42.8 ± 3.83	44	29–49	
Erosive OLP	43.6 ± 1.60	44	40–45	

$^{\dagger}p$-values are based on one-way ANOVA.
OLP, oral lichen planus.

do not represent pathological diagnoses when considered alone. However, important psychological information can be obtained by considering the pattern or trend of the profile. The psychological profiles of both OLP groups were characterized as Hs–D–Hy profile. This profile has a downward neurotic trend, suggesting dominant autonomic nervous system psychosomatic type reactions, usually of abdominal type. These individuals are pre-occupied with disease, often with hypochondriac fixations, have low level of frustration tolerance, and they have psychosomatic reactions to stress. While anxiety is rare, they express good affect control by using inversions as a mechanism of defence. They are introvert and often unsure in their social and sexual contacts. The diagnostic manual of the American Psychiatric Association explains the psychosomatic reactions of these individuals as ''over-expressed visceral expressions of the affects, because of long-term suppression. Prolonged and chronic physiological reactions may lead to pathological effects if they are to be delayed and suppressed'' (Biro 1995). Furthermore, the pattern or trend of the OLP profiles suggests that OLP patients have certain psychological mechanisms of ''emotional defence'' as a way to solve certain emotional problems and stress. According to the MMPI results, such reactions are not to be expected in the control group.

Our results are in accordance with some previous findings (Andreasen 1968, Colella et al. 1993, McCartan 1995). The basic characteristic of the psychological personality profile, type Hs–D–Hy (OLP patients in our study), is a psychosomatic type of reaction. This is supported by the increased IR index seen in both OLP groups, which also points to possible somatization, in contrast to the lower IR index values in the control group, suggesting that this group is not psychosomatic. In addition, the MMPI profile of the control group based on the validity scales, showed a specific-dissimulative profile. This profile is not based on a specific type of personality, but on the approach towards the test material. The ''dissimulative'' V configuration on the validity scale, where the L and K values are very high, and the F scale value is very low, is characteristic of this profile. Such individuals tend to have good control of their self-conscience.

Although the reticular form of OLP is usually chronic, there is a potential for transformation into the erosive form. Psychosocial and emotional stress is one possible factor that may precipitate this occurrence. We reason that the psychological profiles of OLP patients in our study suggest a tendency towards psychosomatic responses to stress. In addition, the similar profiles seen in both reticular and erosive OLP groups, may suggest a stronger impact on exacerbation of disease rather than initial occurrence.

It is well recognized that lichen planus is a T-cell mediated disease, and analysis using CD markers confirmed an increase in T-cell populations in our

Macedonian OLP population. However, evidence is emerging in support of psychoimmune interactions. Studies have demonstrated an increased number of leukocytes in patients suffering from major depression (Kronfol & House 1989). More specifically, recent evidence indicates an altered CD4+ and CD8+ profile and immune activation in severe depression (Maes et al. 1992). Furthermore, our data demonstrates a reduced level of natural killer cells, especially in the erosive OLP group, consistent with previous findings (Irwin et al. 1990). It is accepted that the organization of the autonomic innervations is such that nerve fibres lie in close contact with lymphocytes, and that some noradrenergic terminals lie among the haemopoetic elements within bone marrow, and terminate in the thymic parenchyma and in the T-cells of the lymph node paracortex (Felten & Olschowka 1987). Although our understanding of these neuroimmune interactions is evolving, it is likely that neurotransmitters and hormones responding to stress, mediate such interactions as may occur through the hypothalamic–pituitary–adrenal (HPA) axis.

The HPA axis is considered the main neuroendocrine stress axis activated in parallel with the intensity of the immune response in conjunction with infective, inflammatory, autoimmune, and neoplastic disorders (Maes 1995, Mossner & Lesch 1998, Besedovsky & del Rey 2000). Evidence for a potential interaction between the CNS and the endocrine and immune systems is derived from in vivo and in vitro observations that may bioactive molecules including corticosteroids can influence immune function and that receptors for these molecules are present on mononuclear cells including lymphocytes and macrophages (Reiche et al. 2004) Moreover, the neuroendocrine and immune systems share many common signalling molecules and receptors supporting the notion that the brain has an immunoregulatory role while the immune system functions in a sensory capacity (Blalock 1994, Ader et al. 1995, Haas & Schauenstein 2001). Glucocorticoids can potentially affect immune function and, conversely, activated immune cells can release cytokines capable of affecting the HPA axis suggesting that an immune-HPA axis circuit operates during the immune response. The stimulation of the HPA axis will result in inhibition of the production of certain cytokines via the production of glucocorticoids. In turn, cytokines derived from activated immune cells including interleukin-1, tumour necrosis factor (TNF)-α, interferon-α, and interferon can alter the function of the HPA axis (Reiche et al. 2004).

It has been proposed that HPA axis hyperactivity may provide the neurobiological basis of major depression (Dinan 1994). During stress, serum corticoid concentrations are significantly elevated potentially leading to an immunosuppressive milieu by their negative effects on mononuclear cells and the production

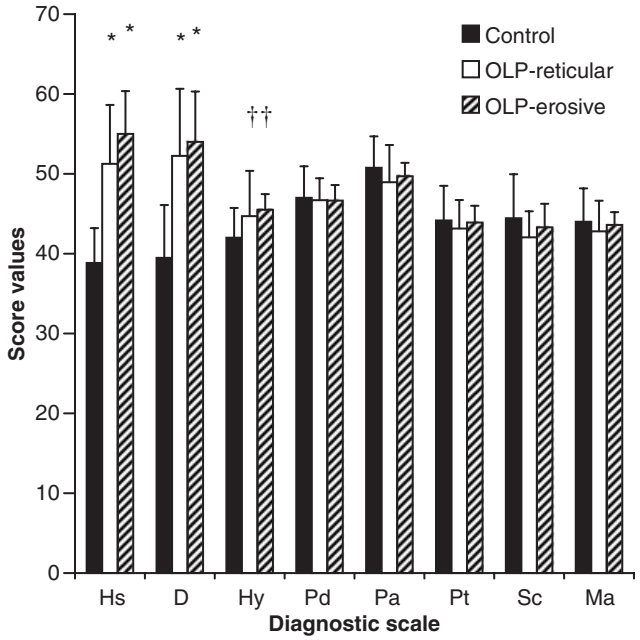

Fig. 3. Minnesota Multiphasic Personality Inventory test score values in patients with reticular form and erosive form of oral lichen planus (OLP), compared with the control group. Hs, Hypochondriasis; D, Depression; Hy, Hysteria; Pd, Psychopathic deviate; Pa, Paranoia; Pt, Psychasthenia; Sc, Schizophrenia; Ma, Hypomania. *Statistically significant differences ($p<0.001$, one-way ANOVA). †Statistically significant differences ($p<0.05$, one-way ANOVA).

Table 3. Spearman's correlation between MMPI clinical scales and cortisol, CD markers

	Hypochondriasis	Depression	Hysteria	Psychopathic deviate	Paranoia	Psychasthenia	Schizophrenia	Hypomania
Cortisol	**0.495** (**$p<0.001$**)*	**0.387** (**$p=0.001$**)*	**0.365** (**$p=0.003$**)*	−0.030 ($p=0.810$)	0.062 ($p=0.626$)	0.083 ($p=0.512$)	0.077 ($p=0.544$)	0.017 ($p=0.892$)
CD3	0.231 ($p=0.064$)	−0.068 ($p=0.588$)	**0.332** (**$p=0.007$**)*	−0.001 ($p=0.993$)	−0.036 ($p=0.777$)	0.014 ($p=0.913$)	***0.253*** (***$p=0.042$***)*	0.199 ($p=0.113$)
CD4	0.173 ($p=0.167$)	0.116 ($p=0.356$)	**0.351** (**$p=0.004$**)*	−0.113 ($p=0.370$)	0.078 ($p=0.538$)	0.074 ($p=0.559$)	0.083 ($p=0.513$)	−0.009 ($p=0.945$)
CD8	**0.474** (**$p<0.001$**)*	**0.388** (**$p=0.001$**)*	**0.476** (**$p<0.001$**)*	−0.004 ($p=0.972$)	−0.042 ($p=0.740$)	0.112 ($p=0.376$)	0.103 ($p=0.416$)	−0.182 ($p=0.146$)
CD16	−0.215 ($p=0.086$)	***−0.252*** (***$p=0.043$***)	**−0.320** (**$p=0.009$**)*	0.082 ($p=0.516$)	−0.043 ($p=0.732$)	0.077 ($p=0.542$)	−0.037 ($p=0.772$)	0.078 ($p=0.538$)

*Significant correlations.

Correlations in bold are statistically significant for $p<0.01$ while correlations in italics are statistically significant at $p<0.05$.

OLP, oral lichen planus; MMPI, Minnesota Multiphasic Personality Inventory.

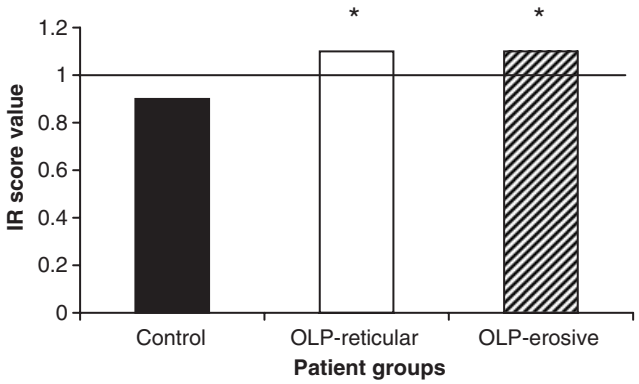

Fig. 4. Internalization ratio (IR) values in oral lichen planus (OLP) patients, where 1 indicates normal IR score values. *Increase over the normal value of 1.

of pro-inflammatory cytokines. In this study, serum cortisol levels were elevated in erosive OLP patients and were significantly correlated with the clinical scales for hypochondriasis, depression, and hysteria (Table 3). This observation may reflect a compensatory up-regulation of the HPA axis to control the immune and inflammatory response in these patients. However the effects of glucocorticoids can be selective and depend on the stage and type of immune response (del Rey & Besedovsky 2000). Glucocorticoids can affect the lymphocyte subsets and induce a shift between Th1/Th2 cytokines while preferentially inhibiting non-activated lymphocytes (Besedovsky et al. 1986) thus favouring IL-2 expression during clonal expansion (Wiegers & Reul 1998). This may result in the suppression of cells with little or no affinity for an antigen and favour the clonal expansion of cells with high affinity for antigen. Moreover, major depression has been associated with activation of the inflammatory response as pro-inflammatory cytokines are potent stimulators of the HPA axis (O'Brien et al. 2004). In particular, IL-6 stimulates production of corticotrophin-releasing hormone (CRH) enhancing HPA activity and hence increased levels of ACTH and cortisol levels (Dentino et al. 1999). Paradoxically despite the hypersecretion of glucocorticoids, there is an increase in pro-inflammatory cytokine levels during chronic stress and depression suggesting a hypofunctional state of glucocorticoid receptors on immune cells that fail to suppress key components of cellular immunity (Leonard 2001). However, Cooney & Dinan (1996) reported that normal function of sub-sensitive glucocorticoid receptors returns after effective treatment. Interestingly, the antidepressants, imipramine, venlafaxine, 1–5 hydroxytrytophan, and fluoxetine increase the production of the anti-inflammatory cytokine, IL-10 and significantly reduce the IFN-γ/IL-10 ratio resulting in negative T-cell immunoregulatory responses (Kubera et al. 2001).

Although the cortisol levels tested in this study represents only one possible mechanism for psychoimmune interactions, these data suggest that cortisol and psychological status may play a role in the pathogenesis of OLP, especially in the erosive forms of the disease. Taken together, these may represent possible avenues by which the psychological status of an individual may impact on immune system homeostasis during onset and progression of lichen planus.

While our results provide statistical evidence for an association between clinical scales and OLP, we recognize the need to replicate our findings in a larger study population that includes males. The patient population used in this study consisted of non-smoking females, aged 30–60. Females were studied because OLP is a disease that is highly prevalent among women (Silverman et al. 1985, Thorn et al. 1988, Brown et al. 1993, Lozada-Nur & Miranda 1997). Moreover, as this study evaluated the role of psychosomatization in OLP, the gingival condition was not evaluated nor attempts made to intervene with oral hygiene or gingival inflammation. Future studies would be improved by consideration of gingival and periodontal status in these patients. In the present study, patients with heavy calculus were excluded during the initial visit as heavy calculus was considered to be a local irritative factor for occurrence of OLP.

Our results emphasize the necessity for additional therapeutic intervention in patients who have stress-induced oral diseases. As an adjunct to conventional therapy for these patients, it may be beneficial to advocate cooperation with psychiatric services to avoid the occurrence of somatization as an aid in possible prevention of disease exacerbations.

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Clinical Relevance

Scientific rationale: To evaluate the role of psycho-somatization in the pathogenesis of OLP, psychological profiles of patients with reticular and erosive form of OLP were correlated with biological markers.

Principal findings: Specific ''psychosomatic profiles'' and increased IR index in both OLP groups compared with the controls were noted. Reduced levels of natural killer cells and increased cortisol levels (especially in the erosive OLP group) were evident.

Practical implications: Patients with OLP may benefit from psychological counselling as an adjunct to conventional therapy.