ROLE OF ORAL HYGIENE IN THE IMMUNO-GENETIC COMPONENT OF THE PATHOGENESIS OF ORAL LICHEN PLANUS

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Abstract

Introduction. In recent years, a special scientific interest has been manifested on the role of the state of oral hygiene in the development of Oral Lichen Planus (OLP). The microbiotope of the oral cavity with an unsatisfactory state of hygiene can be considered as a “perturbing” agent capable of inducing the development of distorted reactions, both specific and nonspecific defense factors, with further occurrence of an autoimmune component in the pathogenesis of OLP. The expressed antigenic load caused by an unsatisfactory oral hygiene probably disrupts the recognition of “one’s own” - “alien”, makes it impossible or difficult to eliminate the antigen + antibody + complement complex, circulating immune complexes (CIC), and thus maintains a steady imbalance. Frequent failures in the treatment of OLP or a short period of remission may be due to a simplified understanding of the role of oral hygiene in the treatment of OLP. The aim of the study was to determine the role of oral hygiene in the pathogenesis of CRPD in individuals with a pattern of genetic determinism to OLP.

Materials and methods. The study used clinical and immunological methods of investigation. Under dynamic observation there were 273 patients with OLP, with ages between 21 and 45 years, among them 73 patients with a typical form of CPL and 200 with an erosive form of OLP. All examined patients of the main group belonged to the group risking the development of OLP in their genotype-phenotypic characteristic O (I), P1, MN, Je(ab+a). To assess the hygienic state of the oral cavity, standard indices - Fedorova-Volodkina and the simplified Green-Vermillion index - were used. For DH determination, inhibition of the migration of leukocytes (RILM) to strepto- and staphylococcus antigens was used.

Results and discussion. The study evidenced that a delayed-type hypersensitivity to streptococcus according to RILM was observed in 87.1 ± 3.31% cases, with an erosive form of OLP with red lip rupture, and hygiene Fedorov-Volodkina and the Green Vermillion index - 2.1 ± 0.1 and 1.8 ± 0.2, respectively. In patients with an erosive form of OLP without lesion of the red border, DH to streptococcus occurred in 59.2 ± 5.46% of cases. An unsatisfactory state of oral hygiene was noted in 91.0% of the examined subjects, where the Fedorov-Volodkina and the Green Vermillion indices were of 2.0 ± 0.2 and 1.7 ± 0.1, respectively. A typical form of OLP was associated with DH to streptococcus in 62.0 ± 5.68% of cases. Conclusions. The level of hygiene of the oral cavity is directly correlated with various forms of OLP. The erosive form of OLP, with or without the involvement of the red lip rim in the pathological process, was most often associated with an unsatisfactory state of oral hygiene. A direct correlation was established between the level of CIC and the state of oral hygiene in patients with an erosive form. There is no correlation between the state of oral hygiene and the flat form of OLP and level of CIC.

Keywords: oral lichen planus, delayed type hypersensitivity, inhibition of leukocyte migration, indices of hygiene.
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aminopeptidases, hyaluronidase, proteinases and other metabolic products, as well as lipopolysaccharides of bacterial capsules.

As known, the last group triggers a metabolic explosion in phagocytes and initiates the release of active halogen-containing radicals that support inflammation and cause the death of MOC cells [6,7]. It has been established that disturbances in the structure and function of MOC are usually accompanied by a pronounced vasomotor reaction initiating the permeability of vascular cells, expression of cell adhesion molecules on endothelial cells and leukocytes, potentiating the marginal state of leukocytes and migration into the intercellular space of polymorphonuclear leukocytes and macrophages [8].

These aspects were evidenced for their inclusion in the general treatment of OLP, against the background of a careful correction of oral hygiene for stabilizing cell membranes, reducing the level of tension in the kallikrein-kinin system, changing and normalizing the microbial landscape [9,10]. Of course, this was a significant breakthrough in understanding the role of oral hygiene in the treatment of OLP.

Without diminishing the importance of these actions for understanding the role of oral hygiene in the pathogenesis of OLP, our study left aside a number of important elements - for example, the role of oral hygiene in patients with OLP with an increased risk of disease, as well as the presence of similar and cross-antigens in a number of microorganisms such as streptococcus, staphylococcus, Helicobacter pylori, with a human connective tissue.

This allows us to consider the microbiotope of the oral cavity with an unsatisfactory state of hygiene as a “perturbing” agent, with the ability to induce distorted reactions, both specific and nonspecific protection factors, and subsequent manifestation of an autoimmune component in the pathogenesis of OLP.

Worth mentioning is that the expressed antigenic load caused by an unsatisfactory oral hygiene probably disrupts the recognition of “one’s own” - “alien”, makes it impossible or difficult to eliminate the antigen + antibody + complement complex, circulating immune complexes (CIC), thus maintaining a steady imbalance.

Besides, it is often unjustified to assert that the intensity of the immune response to the introduction of the bacterial antigenic component, which undoubtedly results from unsatisfactory oral hygiene, is programmed by the level of antigenigenesis, blast formation and, possibly, killing effect, under the influence of the immunological response (IR) gene.

We believe that the frequent failures in the treatment of LP and a short period of remission could be due to the current simplistic approach of understanding the role of oral hygiene in the basic treatment of OLP.

In other words, not only the qualitative and quantitative characteristics of the microbiotope with different conditions of oral hygiene shall be exclusively focused in the therapy of OLP. In our opinion, equally important is the role of the microbial pool in individuals with a similar level of oral hygiene in potentiating the formation of the antigen + antibody + complement complex, in initiating the production of circulating immune complexes (CIC), in the development of delayed-type hypersensitivity to microbial antigens in groups of patients with OLP risk.

The purpose of this study was to determine the role of oral hygiene in the pathogenesis of OLP of MOC in patients with a pattern of genetic determinism to OLP.

The following tasks were established, to determine:
1. the state of oral hygiene in persons with genetic determination to LP.
2. the level of delayed type hypersensitivity to strepto- and staphylococcal antigens in patients with LP risk and different levels of oral hygiene.
3. the level of the CICs in patients with LP risk and different levels of oral hygiene.

2. MATERIALS AND METHODS

Both clinical and immunological methods of investigation were applied. 273 patients with OLP and ages between 21 and 45 years were observed, among which 73 patients had a typical OLP form, and 200 - the main group – an erosive form.
The control group consisted of 50 individuals, identical as to gender and age, without clinical signs of MOC and somatic pathology.

All patients of the main group belonged to the category with OLP risk, as due to their genotype-phenotypic characteristics О(І), Р_1, МN, Јe^{(a-b+)}.

For evaluating the hygienic state of the oral cavity, the standard indices - Fedorova-Volodkina and the simplified Green-Vermillion index - were used.

To determine the delayed type hypersensitivity (DH), the inhibition reaction of leukocytemigration (RILM) to strepto- and staphylococcus antigens was used.

The IRML reaction was carried out by the method of Gorge et al. (1962), using streptolysin-O antigen and staphylococcus toxin. The migration index was calculated with formula:

$$IM = \frac{\text{Square of migration area with antigen}}{\text{Square of migration area without antigen}}$$

IM equal to 0.5-0.1 corresponds to a high degree of sensitization.

The circulating immuno-compounds were determined by precipitation in a mouth liquid of a 3.5% solution of polyethylene glycol with a molecular weight of 6,000 units. The density of the solution was calculated with a SF-56 spectrophotometer, at a wavelength of 450 nm and a thickness of 10 mm. The difference between the experimental and control groups was expressed in terms of % units of optical density.

### 3. RESULTS AND DISCUSSION

The general result obtained was that delayed-type hypersensitivity to streptococcus occurred in most of the cases, according to the migration inhibition of leukocytes (RILM). It was observed in individuals with an erosive form of OLP, as a lesion of the red border of lips, representing 87.1 ± 3.31% (Table 1). All patients had a poor hygiene in the oral cavity. The values recorded for hygiene according to Fedorov-Volodkina and Green-Vermillion indexes were 2.1 ± 0.1 and 1.8 ± 0.2, respectively.

<table>
<thead>
<tr>
<th>Group of examined patients</th>
<th>Forms of OLP</th>
<th>Delayed-type hypersensitivity of to streptococcus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number of examined persons</td>
</tr>
<tr>
<td>Basic</td>
<td>Erosive form without lesions of the red border of lips</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Erosive form with red lip lesions</td>
<td>111</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Typical form</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>Without pathology of MOC and internal diseases</td>
<td>50</td>
</tr>
</tbody>
</table>

### Table 1. Delayed-type hypersensitivity to the streptococcus antigen in patients with Oral Lichen Planus in a high-risk group (O(І), Р_1, МN, Јe^{(a-b+)})

RILM - % of positive reactions
p - index of reliability versus the parameters in the control group.

At the same time, in patients with an erosive form of LP without lesions of the red border, HRT to streptococcus was less frequent, namely of 59.2 ± 5.46%. An unsatisfactory state of oral hygiene was noticed in 91.0% of the examined subjects, where the Fedorov-Volodkina and Green Vermillion indices were of 2.0 ± 0.2 and 1.7 ± 0.1, respectively. A typical form of LP was associated with HRT to streptococcus in 62.0 ± 5.68% of cases.

An unsatisfactory condition of oral hygiene was registered in 81.2 ± 0.2% of cases, with values of the Fedorov-Volodkina and Green-Vermillion indices of 1.9 ± 0.2 and 1.6 ± 0.3, respectively.

Also observed was that the erosive form of LP with the involvement of the red border of lips was associated with HRT to staphylococcus in 93.2 ± 2.4% of cases (Table 2), where the hygiene Fedorov-Volodkina and Green Vermillion indices were of 2.2 ± 0.2 and 1.9 ± 0.3, respectively.
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Table 2. Delayed-type hypersensitivity to the staphylococcus antigen in patients with Oral Lichen Planus in a high-risk group (O(I), P₁⁺, MN, Je₁⁻⁻)

<table>
<thead>
<tr>
<th>Group of examined patients</th>
<th>Forms of LP</th>
<th>Delayed type hypersensitivity of to staphylococcus</th>
<th>Number of examined persons</th>
<th>RILM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>Erosive form without lesions of the red border of lips</td>
<td>89</td>
<td>93.2±2.54</td>
<td>t=36.69  p&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Erosive form with red lip lesions</td>
<td>111</td>
<td>76.4±5.07</td>
<td>t=15  p&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Typical form</td>
<td>73</td>
<td>65.1±5.82</td>
<td>t=11.1  p&lt;0.001</td>
</tr>
<tr>
<td>Control</td>
<td>Without pathology of MOC and internal diseases</td>
<td>50</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

RILM - % of positive reactions
p – index of reliability versus the parameters in the control group.

The erosive form of OLP without involvement of the red border of lips was integrated with HDT to staphylococcus in 76.4 ± 5.07% of cases, the average values of the Fedorov-Volodkina and Green Vermillion indices being of 1.7 ± 0.1 and 1.6 ± 0.2, respectively.

A typical form of OLP was characterized by DH to staphylococcus in a lower percentage of cases: 65.1 ± 5.82%. The hygiene Fedorov-Volodkin and Green-Vermillion indices were of 1.6 ± 0.06 and 1.5 ± 0.09, respectively.

In the control group, HDT to staphylococcus was defined in no case.

The average value of the Fedorov-Volodkin and Green-Vermillion indices was 1.5 ± 0.04 and 1.4 ± 0.09, respectively.

Thus, we have established DH to the streptococcus antigen in the overwhelming majority of patients with OLP with an erosive form involving the red border of lips in the pathological process. At the same time, a typical form of LP and erosive form without involvement in the pathological process of the red border occurred in an approximately equal number of cases. Note that all patients with DH to streptococcus had an unsatisfactory state of oral hygiene, fluctuating between 2.1 ± 0.1-1.9 ± 0.2, according to the Fedorov-Volodkina index, and a corresponding value of 1.8 ± 0.2- 1.6 ± 0.3 - in terms of the Green-Vermillion one.

In the general study of CIC, a significant reduction of the indices, up to 25.69 ± 1.19 conventional units was established for groups with increased risk for OLP (Fig. 1). It should be noted that the highest decrease in CIC was observed with an erosive form involving red lip rims and an unsatisfactory state of oral hygiene.

![Fig.1.Indices of circulating immune complexes in patients with increased risk of OLP](image)

Thus, with an average CIC value of 19.92 ± 1.9 cu, an unsatisfactory state of oral hygiene was noted in 82.2% of patients, where the average Fedorov-Volodkin and Green-Vermillion index was 2.3 ± 0.1 and 1.9 ± 0.1, respectively.

The same dependence was observed in patients with an erosive form not affecting the red border of lips. Thus, with an average CIC of 25.69 ± 4.7 cu, an unsatisfactory state of hygiene was noticed in 76% of cases, the average Fedorov-Volodkina and Green Vermillion indices being of 2.2 ± 0.2 and 1.8 ± 0.3, respectively.
The flat form of OLP was characterized by less pronounced decreases in the CICs, up to 31.18 ± 3.09 cu. An unsatisfactory condition of oral hygiene was registered in 65% of patients, the average Fedorov-Volodkina and Green-Vermillion indices being of 1.9 ± 0.1 and 1.7 ± 0.3, respectively.

In the control group, the CIC index was significantly higher, reaching 48.25 ± 4.8 cu.

A satisfactory state of oral hygiene was noticed in 70% of the examined patients, the average hygiene index according to Fedorov-Volodkina being of 1.6 ± 0.1 and 1.5 ± 0.2, respectively.

4. CONCLUSIONS

The level of hygiene in the oral cavity is directly correlated with various forms of OLP.

Also, the erosive form of OLP, with or without the involvement of the red lip rim in the pathological process, was often and mostly associated with an unsatisfactory state of oral hygiene.

A high frequency of DH to antigens of streptococcus and staphylococcus was identified, associated with an unsatisfactory state of oral hygiene in patients with an erosive form of OLP.

A direct correlation was established between the CIC level and the state of oral hygiene in patients with an erosive form.

There is no correlation between the state of oral hygiene and the flat form of OLP and the CIC level.

We assume that the inclusion of drugs that reduce DH to strepto- and staphylococcus antigens, as well as substances eliminating the complex antibody + antigen + complement in the general therapy scheme, will optimize the treatment of OLP in the high-risk group of patients.

References