Reaction of Oral Mucosa Depends on Surface Physicochemical Characteristics of Acrylic Resins of Plate Dentures

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The reactions of oral mucosa (denture bed) contacting with removable plate dentures made of acrylic resins were studied. The reaction depended on physicochemical characteristics of denture surface. Glow discharge treatment of denture improved their hygienic characteristics and biocompatibility. Microscopic study of oral mucosa scrapings from patients with modified dentures showed normalization of cytogram and increased keratinization index.

Key Words: *oral disease; oral mucosa; basic acrylic resins; cytological analysis*

Surface epithelium is the main structural and functional component of the mucosa, which is the first to react to various environmental factors [1,2]. Studies of the morphology and function of surface epithelial layers help to understand the reaction of the oral mucosa to various orthodontic structures, implants, and other foreign bodies [7,10,12].

Effects of removable dentures on the oral mucosa have been evaluated many times, with special emphasis on the surface epithelial reaction [4-6,11]. The function of the oral mucosa in patients wearing removable dentures is largely evaluated by subjective patient's sensations, which do not always help to choose proper treatment method and strategy. That is why qualitative and quantitative cytological studies acquire special importance in such cases, particularly for evaluating the regeneratory processes.

We evaluated the status of the oral mucosa in patients wearing removable plate dentures of acrylic resins with modified surface by a complex cytological analysis.

MATERIALS AND METHODS

A total of 127 patients (79 women and 48 men) aged 30-72 years in need of removable maxillary plate dentures were examined. Group 1 (n=66) were patients fitted with dentures for the first time without apparent changes in the oral mucosa or diseases affecting its status [1]. This group was divided into 2 subgroups in the course of orthodontic treatment. For group 1a (n=12) removable dentures were made in accordance with standard technology for Etacryl resins, while for subgroup 1b (n=11) denture surface was modified.

Group 2 (n=103) consisted of patients wearing dentures for 1-15 years. They were divided into 3 subgroups by clinical parameters. Subgroup 2a (n=51) had no clinical abnormalities caused by removable dentures. Subgroup 2b (n=36) consisted of patients with inflammatory changes of different severity in the oral mucosa. Subgroup 2c (n=16) included patients who complained of unpleasant sensations because of removable plate dentures but had no apparent pathological changes in the oral mucosa. Patients from group 1 (n=42) were included in the appropriate subgroups of group 2 one year after they were fitted with dentures.

All patients were examined before orthodontic treatment and at various terms after it. Subjective sensations of patients were taken into account, the status of oral mucosa and denture bed were visually assessed, hyperemia and other pathological changes were evaluated. Special attention was paid to hygienic status of the internal denture surface [3].

All dentures were made of basic Etacryl resins (AKR-15). Some new and previously made dentures which were considered satisfactory after inspection

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were subjected to physicochemical modification (glow discharge treatment). Such treatment essentially modified surface hydrophilicity. The wetting angle decreased from the initial 63 to 35°, free specific critical surface energy decreased from 38.5 to 60 erg/cm^2, and the free interphase energy decreased after treatment from 5.5 to 0.6 erg/cm^2, approximating the ideal value (0) [8,9].

The effect of basic material with different free interphase energy on the denture bed mucosa was evaluated in all patients by a complex cytological analysis (microscopic examination of impressions, scrapings and washings off the oral cavity).

Material for analysis was collected by surface scraping which provides information from a local focus. Palatal mucosa of the alveolar process 1 cm centrally to the first molars was carefully (without scarification) scraped with a histological spatula with 5-mm working surface. The material was homogenized in a drop of sterile normal saline on a slide, dried on air, fixed in 96° ethanol, and stained routinely.

Epitheliocytes were evaluated and classified by the degree of keratinization. The intensity of keratinization of multilayer squamous epithelial cells was evaluated using the keratinization index (I_k) used in

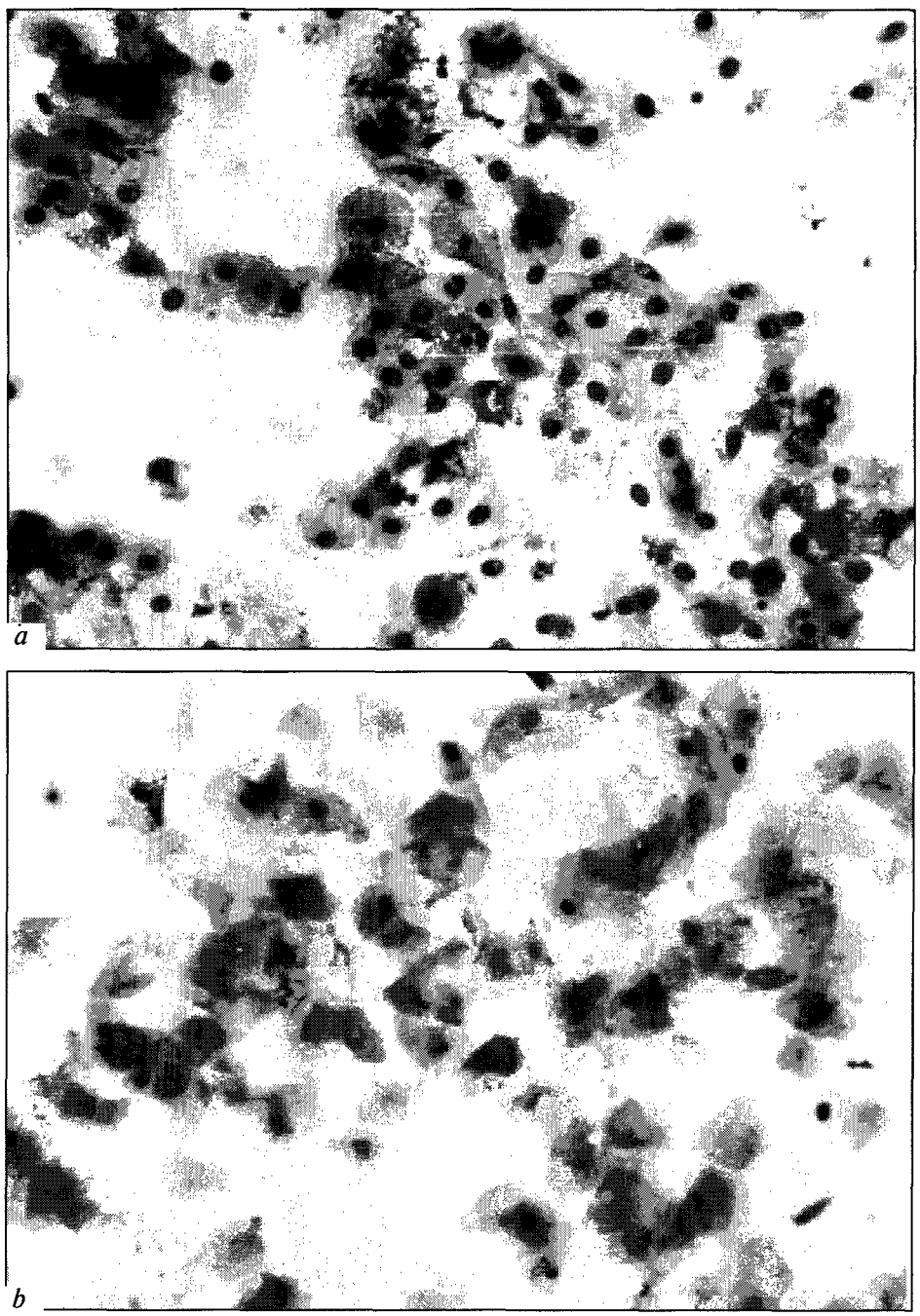

Fig. 1. Hard palatal mucosa scraping from patients wearing dentures with unmodified (*a*) and modified (*b*) surface. Predominance of nucleated (*a*) and anucleated (*b*) epitheliocytes. Romanowsky—Giemsa staining, ×200.

periodontology [7,11], calculated as the percentage of anucleated cells.

Cytograms were made for each patient.

RESULTS

No apparent pathological changes in the palatal mucosa of the denture bed were found in subgroup 1a patients on days 3 and 14 after they were fitted with dentures. Hyperemia on the vestibular part of the alveolar process was seen in some patients. In such cases the dentures were corrected and no inflammatory reaction was observed during later check-ups. Five patients complained of burning sensation, bitterness, and dryness of the oral cavity during 5 months after orthodontic treatment. No apparent pathological changes in the oral mucosa were detected.

Microscopic analysis of scrapings taken on day 3 after orthodontic treatment showed a 1.5-3-fold increase in the number of nucleated epitheliocytes (Fig. 1, *a*) without signs of degeneration and decreased keratinization index (39.7-85.4% *vs.* the initial 68.5-89.3%). Leukocytic infiltration slightly increased. On day 14 of adaptation to dentures various reactions were observed (increased or decreased I_K in comparison with the initial value). The leukocyte count increased in some patients and notably decreased in others.

After 2 months the cytograms were hardly comparable in different patients; however in many cases there was a clear-cut tendency to an increased keratinization rate, which manifested by an increased count of anucleated keratinocytes and I_K. It is noteworthy that some patients developed an opposite reaction.

Examinations of subgroup 1b patients fitted with dentures with modified surface for the first time showed no apparent pathological changes in the palatal mucosa of the denture bed on days 3 and 14 after treatment. Slight focal hyperemia on the vestibular surface of the alveolar process observed in some cases disappeared spontaneously after correction of the denture. We also observed more rapid adaptation to dentures: by day 14 in the majority of cases, compared to 1 month in subgroup 1a. Hygienic status of dentures was better in subgroup 1b. None of the patients complained of unpleasant sensations associated with dentures.

Microscopic analysis of scrapings showed that the cytograms of the majority of patients of this group virtually did not differ from the initial values at all terms of examination (Fig. 1, *b*). Minor reaction usually consisted in appearance of individual leukocytes in the patients who had no leukocytes in the cytogram before or in an increased number of nucleated epitheliocytes. After 2-month wearing of dentures with modified surface the cytograms indicated that the state of denture bed mucosa in the majority of patients was virtually the same as before orthodontic treatment. Anucleated epitheliocytes predominated in scrapings and the mean I_K was 98.3±1.3%.

Denture surface was modified for subgroup 2a patients fitted with removable dentures and complaining of dryness, bitter taste, or burning sensations in the oral cavity. After denture modification no complaints were recorded and the patients noted «lightness and freshness» in the oral cavity and lesser sticking of food to dentures during eating. Microscopic analysis showed essential and similar shifts in all cytograms. The number of nucleated epitheliocytes decreased in all patients, the number of degenerated cells increased in some cases. The number of anucleated keratinocytes sharply increased and I_K increased 2 months after denture modification in all examines; in many cases this value approximated that in subgroup 2b (more than 90%).

Hence, I_K increased in patients fitted with plate dentures with modified surface for the first time and repeatedly. This fact and clinical data indicate better biocompatibility of removable plate dentures of acrylic resins with a modified surface and denture bed mucosa, which manifests by a better local adaptive reaction.

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