

Advanced Treatment Strategies for Removable Denture-Induced Oral

Rasulova Mokhigul Matyokub kizi

Assistant, Department of Anatomy, Clinical Anatomy (OSTA), Bukhara State Medical Institute named after Abu Ali Ibn Sino, Bukhara, Uzbekistan

Abstract Removable denture prostheses are one of the major etiological factors contributing to oral mucosal lesions, including prosthetic stomatitis. Mechanical trauma, microflora imbalance, and impaired local immunity play a key role in the development and persistence of inflammatory changes. In denture wearers, mucosal pathology tends to progress gradually, often presenting with subtle clinical signs that complicate early diagnosis and timely therapeutic intervention. Recent research has focused on optimizing treatment strategies aimed at accelerating epithelial regeneration, normalizing local pH, reducing hyperemia and discomfort, as well as improving patient compliance. Comparative studies indicate that modern therapeutic approaches may demonstrate better clinical efficacy than conventional methods. The identification of reliable, non-invasive clinical markers of inflammation can contribute to earlier detection and improve treatment outcomes in patients with removable denture-induced oral mucosal lesions.

Keywords Removable dentures, Oral mucosa, Prosthetic stomatitis, Epithelial regeneration, Hyperemia, pH, Modern therapy

1. Introduction

The oral mucosa is a complex biological structure that exhibits several unique physiological characteristics. Its protective potential is largely attributed to its capacity to withstand numerous types of harmful influences, including mechanical trauma, chemical irritants, fluctuations in temperature, and the continuous action of microbial and toxic metabolic products. One of the most distinctive features of the oral mucosa is its remarkable regenerative ability, which ensures rapid cell turnover and restoration of tissue integrity following injury [2]. Nevertheless, despite its robust defensive capacity and specialized biological functions, diseases affecting the oral mucosa remain highly prevalent and constitute one of the most challenging and clinically significant problems in dentistry.

Epidemiological data from the World Health Organization indicate that more than 90% of the middle-aged and elderly population suffer from disorders of the oral mucosa and periodontal tissues [1]. The high incidence of such conditions can be attributed to a combination of local and systemic factors including aging, chronic somatic diseases, metabolic syndrome, long-term medication use, immune dysregulation, and the widespread application of removable prosthetic

appliances. These elements collectively impair mucosal homeostasis, weaken protective mechanisms, and promote the progression of inflammatory and degenerative lesions.

According to A. E. Zarkumova, the insufficient therapeutic effectiveness of current treatment modalities and the broad impact of adverse environmental factors on the dentoalveolar system as well as on the human body necessitate a more detailed classification of inflammatory mucosal disorders [4]. This reflects a major scientific and practical challenge for contemporary dentistry and underscores the need for innovative approaches aimed at improving diagnostic accuracy, preventive strategies, and treatment outcomes.

A growing number of studies support the view that pathological processes observed in the oral cavity are closely associated with systemic diseases, including endocrine disorders, gastrointestinal dysfunction, metabolic abnormalities, and deviations in immune status. The variety of dental problems, their multifactorial etiology, and the similarity of clinical manifestations across different nosological forms further complicate the task of diagnosis and require evidence-based therapeutic guidelines [3]. From a clinical standpoint, the interconnection between oral and systemic health has stimulated considerable interest in the development of non-invasive diagnostic markers and new disease models aimed at early detection and more precise risk stratification.

Saliva, in particular, has emerged as a promising biomarker source and a valuable tool for the diagnosis and monitoring of oral mucosal diseases. It is an easily obtainable biological fluid that contains a wide range of protective molecules,

* Corresponding author:

mohigul.rasulova@bsmi.uz (Rasulova Mokhigul Matyokub kizi)

Received: Jan. 7, 2026; Accepted: Jan. 27, 2026; Published: Feb. 3, 2026

Published online at <http://journal.sapub.org/ajmms>

including antimicrobial peptides, immunoglobulins, enzymes, antioxidants, growth factors, and cytokines. These components play an essential role in maintaining oral homeostasis and providing first-line defense against pathogens. Comprehensive investigation of salivary biomarkers offers new possibilities for enhancing early diagnosis, differentiating similar pathological conditions, and monitoring treatment responses in clinical practice [5].

Removable denture prostheses represent one of the most significant etiological factors contributing to injuries and inflammatory conditions of the oral mucosa in elderly individuals. Denture-related changes are often multifactorial in origin, involving mechanical irritation, microbial dysbiosis, local immune suppression, and biochemical alterations in the denture-bearing tissues. Several authors have demonstrated that prosthetic appliances can alter the acid–base balance and mineral composition of mixed saliva, potentially influencing oral microbial ecology and favoring the development of pathological processes [6].

2. Materials and Methods

The study was carried out at the Department of Orthopedic Dentistry and the Stomatology Center of the Bukhara State Medical Institute named after Abu Ali ibn Sina. A total of 149 patients (Table 1) requiring removable denture prosthetic treatment were examined during the study period (2024–2025). Depending on the clinical condition of the oral mucosa and the applied therapeutic approach, the patients were divided into three groups: a control group, a conventional therapy group and a modern therapy group.

Patients were evaluated prior to prosthetic rehabilitation, as well as at 1 week, 1 month, and 3 months following treatment. Clinical assessment included the evaluation of hyperemia intensity, epithelial regeneration rate, subjective discomfort, and the presence of prosthetic stomatitis or other mucosal lesions.

Table 1. Distribution of Patients with Edentulism by Study Groups (%)

Study Groups	Partial Edentulism	Complete Edentulism
Women	55 (36.9%)	32 (21.5%)
Men	47 (31.5%)	15 (10.1%)

Additionally, pH levels of mixed saliva were measured to assess local biochemical changes associated with denture wear. Morphological and functional characteristics of the oral mucosa were recorded using standard clinical indices and laboratory indicators. Objective evaluation was complemented by photographic documentation to monitor the dynamics of clinical changes. Inclusion criteria were: partial or complete edentulism, indication for removable denture prosthesis, and absence of acute somatic or infectious diseases. Exclusion criteria included malignant neoplasms of the oral cavity, severe systemic immunological disorders, and failure to comply with follow-up examinations. All patients provided informed consent prior to participation, and the study protocol complied with biomedical ethical

standards.

Prosthetic stomatitis, a common inflammatory condition of the oral mucosa associated with removable dentures, is often exacerbated by mechanical irritation and microbial imbalance at the denture-bearing surfaces. In the present study, treatment with qizilmiya extract demonstrated a significant positive effect on the clinical and laboratory parameters of patients with prosthetic stomatitis. Clinical evaluation revealed that patients receiving Calendula officinalis extract-based therapy showed a marked reduction in hyperemia and mucosal inflammation compared to the conventional therapy group. Epithelial regeneration, assessed through visual inspection and standardized scoring, was accelerated in the Calendula officinalis extract-treated group, with the majority of patients achieving nearly complete restoration of mucosal integrity within 1 month. Salivary pH measurements indicated a tendency toward normalization in the Calendula officinalis extract group, suggesting stabilization of the oral microenvironment and partial restoration of acid-base balance disrupted by denture use.

The bioactive components of Calendula officinalis extract, including glycyrrhizin and flavonoids, are known for their anti-inflammatory, antioxidant, and immunomodulatory properties, which likely contributed to the observed clinical improvements. These compounds may enhance mucosal repair by promoting epithelial proliferation, reducing oxidative stress, and modulating local immune responses, thereby supporting the restoration of oral mucosal homeostasis. Compared to the conventional therapy group, which exhibited slower mucosal healing and persistent mild hyperemia in some patients, the Calendula officinalis extract-treated cohort demonstrated faster recovery, reduced discomfort, and improved tolerance to denture wear. These findings highlight the therapeutic potential of Calendula officinalis extract as an adjunct or alternative treatment for removable denture-induced stomatitis.

3. Results

Prior to treatment, the majority of patients exhibited pronounced inflammatory signs in the oral mucosa. Among subjective complaints, pain, itching, and burning sensations were predominant, with an average intensity of 6.8 ± 1.2 points on the Visual Analog Scale (VAS). Clinical examination revealed diffuse erythema, edema, and, in some cases, areas of erosion on the mucosal surface, with the overall frequency of inflammatory signs reaching 100%.

The study results indicated that patients rehabilitated with partial removable dentures demonstrated significant positive changes in the condition of the oral mucosa following treatment with Calendula officinalis (Calendula officinalis extract) extract (Table 2). Prior to therapy, mucosal hyperemia was observed in 100% of patients, swelling in 100%, and erosion or ulceration in 38%. The average sub-denture reactivity score was 2.8 ± 0.4 , the Oral Hygiene Index–Simplified (OHI-S) was 4.5 ± 0.6 , pain intensity on the VAS scale was 6.7 ± 1.1 , and denture adaptation was 0%.

Table 2. Partial Removable Denture Rehabilitation with *Calendula officinalis* Extract

Parameter	before treatment	1 week	1 month	3 months
Hyperemia (%)	100	70	42	16
Swelling (%)	100	65	40	14
Erosion/Ulcer (%)	38	24	10	4
Sub-denture Reactivity (0–3)	2.8 ± 0.4	2.1 ± 0.5	1.4 ± 0.3	0.6 ± 0.2
Oral Hygiene Index–Simplified (OHI-S)	4.5 ± 0.6	3.1 ± 0.5	2.0 ± 0.4	1.1 ± 0.3
Pain (VAS, 0–10)	6.7 ± 1.1	4.0 ± 0.9	2.1 ± 0.7	0.9 ± 0.4
<i>Candida</i> spp. (×10 ³ CFU/ml)	120 ± 18	65 ± 12	30 ± 9	14 ± 5
Denture Adaptation (%)	0	40	70	90
Traumatic Impact (%)	100	65	38	15

The initial traumatic impact on the oral mucosa in patients undergoing denture treatment was assessed at 100%, 65%, 38%, and 15%, indicating varying degrees of mechanical irritation depending on individual patient conditions and the extent of prosthetic influence.

At the end of the first week of treatment, a significant improvement in the condition of the oral mucosa was observed. Hyperemia of the mucous membrane decreased by 70%, indicating a notable reduction in inflammation. Swelling, another common manifestation of mucosal trauma, decreased by 65%, reflecting a positive response to the treatment regimen. Erosions and ulcerative lesions showed a reduction of 24%, demonstrating the beginning of tissue recovery. Subprosthetic reactivity, which reflects the oral mucosa's inflammatory response under the denture, decreased on average to 2.1 ± 0.5 score, suggesting that the mucosal tissue was gradually adapting to the prosthesis. The Oral Hygiene Index-Simplified (OHI-S), an indicator of overall oral hygiene status, improved to 3.1 ± 0.5 score, demonstrating enhanced oral hygiene practices during this period. Pain intensity, as reported by patients, decreased to 4.0 ± 0.9 score, which further confirmed the alleviation of discomfort associated with prosthetic wear. Additionally, denture adaptation improved by 40%, indicating that patients were increasingly comfortable with their dentures and showing better functional use.

By the end of the first month of treatment, further positive changes in the oral mucosa were recorded. Hyperemia decreased to 42%, and swelling reduced to 40%, showing continued resolution of inflammatory processes. Erosions and ulcerative lesions decreased to 10%, indicating substantial healing of damaged mucosal areas. Subprosthetic reactivity further decreased to 1.4 ± 0.3 score, suggesting that the oral tissues were now significantly less reactive to the presence of the denture. The OHI-S index improved to 2.0 ± 0.4 score, reflecting more effective oral hygiene maintenance, while the reported pain intensity declined to 2.1 ± 0.7 score, indicating that discomfort was becoming minimal. At this stage, denture adaptation reached 70%, showing that most patients were able to tolerate and function with their prostheses comfortably.

At the end of the third month of treatment, the improvements became even more pronounced. Hyperemia was reduced to 16%, and swelling was minimal at 14%, demonstrating near-complete resolution of inflammatory changes. Erosions and ulcerative lesions were present in only 4% of patients, indicating almost full mucosal healing. Subprosthetic reactivity reached a low level of 0.6 ± 0.2 score, reflecting that the oral tissues had largely adapted to the dentures without significant inflammatory response. The OHI-S index was further reduced to 1.1 ± 0.3 score, confirming excellent oral hygiene maintenance. Pain intensity was minimal at 0.9 ± 0.4 score, indicating that patients experienced very little discomfort while using their prostheses. Denture adaptation reached 90%, suggesting that the majority of patients had fully adjusted to their dentures and could use them effectively in daily life.

4. Conclusions

Overall, these results demonstrate a clear trend of progressive improvement in oral mucosal health during denture treatment. The reduction in hyperemia, swelling, and erosive lesions, along with decreased subprosthetic reactivity and pain scores, highlights the effectiveness of the applied treatment protocol. Furthermore, the improvement in denture adaptation underscores the importance of both proper prosthetic design and patient education in achieving optimal functional and clinical outcomes. This progressive recovery process also emphasizes the critical role of continuous oral hygiene monitoring and management in patients receiving removable prostheses.

Treatment with *Calendula officinalis* extract significantly reduced pain and mucosal inflammation in patients with prosthetic stomatitis. Clinical observations showed that in 78% of patients, pain levels decreased to 0–3 points on the Visual Analog Scale (VAS), confirming the extract's effectiveness in alleviating dental discomfort. Patients treated with *Calendula officinalis* extract demonstrated a marked reduction in mucosal hyperemia and erosive changes within 14 days. Clinical follow-up confirmed that 85% of patients achieved complete mucosal regeneration with the absence of

inflammatory signs. Microbiological analysis revealed that treatment with *Calendula officinalis* extract significantly reduced pathogenic oral microflora. The levels of *Streptococcus mutans* and *Candida albicans* decreased on average by 2.5–3 times, indicating the extract's antimicrobial efficacy in both the prevention and management of prosthetic stomatitis. with *Calendula officinalis* extract extract also enhanced patient tolerance to removable dentures. During the study, 90% of patients reported a substantial reduction in discomfort and pain while wearing dentures, supporting the use of the extract as an effective adjunct in prosthetic rehabilitation.

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