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Changes in The Oral Mucosa After Orthodontic Constructions

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ABSTRACT

Objective: *The aim of this study is to address the challenges associated with prosthetics, particularly complete removable dentures, which require specific conditions for fixation in the oral cavity. It also aims to explore the design considerations and post-treatment care to improve patient adaptation and the longevity of the prosthetic devices.* ***Methods:*** *The study focuses on the evaluation of various factors considered by orthopedic dentists when designing removable dentures. These factors include the condition of the temporomandibular joint (TMJ), the elasticity of mucous membranes, the presence of scars or cords, the degree of bone tissue atrophy, and the shape of the palate. After the prosthesis is delivered, patients are instructed on its use, as well as on specific speech exercises to aid in adaptation.* ***Results:*** *The findings highlight the importance of assessing the patient's oral condition before prosthetic design. Proper care and adaptation exercises post-prosthetic fitting significantly enhance the patient's ability to adjust to the dentures, thus improving both comfort and effectiveness.* ***Novelty:*** *This study provides insights into the complexities of designing complete removable dentures and emphasizes the critical role of personalized care and speech training to facilitate faster adaptation and extend the lifespan of dentures.*

INTRODUCTION

It is known that the population's need for orthopedic treatment is not decreasing, and even increasing. 70% of the Russian population has partial or complete secondary adentia at the age of 20-50. The percentage of people who need prosthetics with partial and complete removable dentures has increased significantly and has a tendency to rejuvenate. An analysis of numerous studies revealed unfavorable conditions for prosthetics in 30-40% of patients. Inability to use removable dentures was observed in 20% of those examined, which was associated with poor-quality preliminary preparation for orthopedic treatment [1], [2], [3]. Since the oral mucosa has protective forces and high regenerative properties, minor effects of various traumatic factors (mechanical and physical) acting on it during food intake do not lead to significant changes. In order for pathological changes to occur in the mucous membrane, a more intense irritant effect is required. The peculiarity of the oral mucosa is that any traumatic injury to the mucous membrane is inevitably accompanied by infection. The nature of the stimulus, the time and strength of exposure, its localization, individual characteristics, the general condition of the body, age affect the degree of damage and the clinical picture.

Changes in the mucous membrane are most often manifested in the form of catarrhal inflammation (hyperemia, edema), erosive and ulcerative processes, and hyperplasia. There is a certain dependence of the degree of damage to the mucous membrane on the period of use of dentures. When using dentures for 1-3 years, in most

cases, changes in the mucous membrane are detected, which persist as catarrhal inflammation (hyperemia, edema), while maintaining the integrity of the epithelial cover. When examining the mucous membrane, a violation of its integrity is manifested in the form of erosion and ulcers. With long-term use (more than 3 years), hypertrophic processes are observed along with hyperemia.

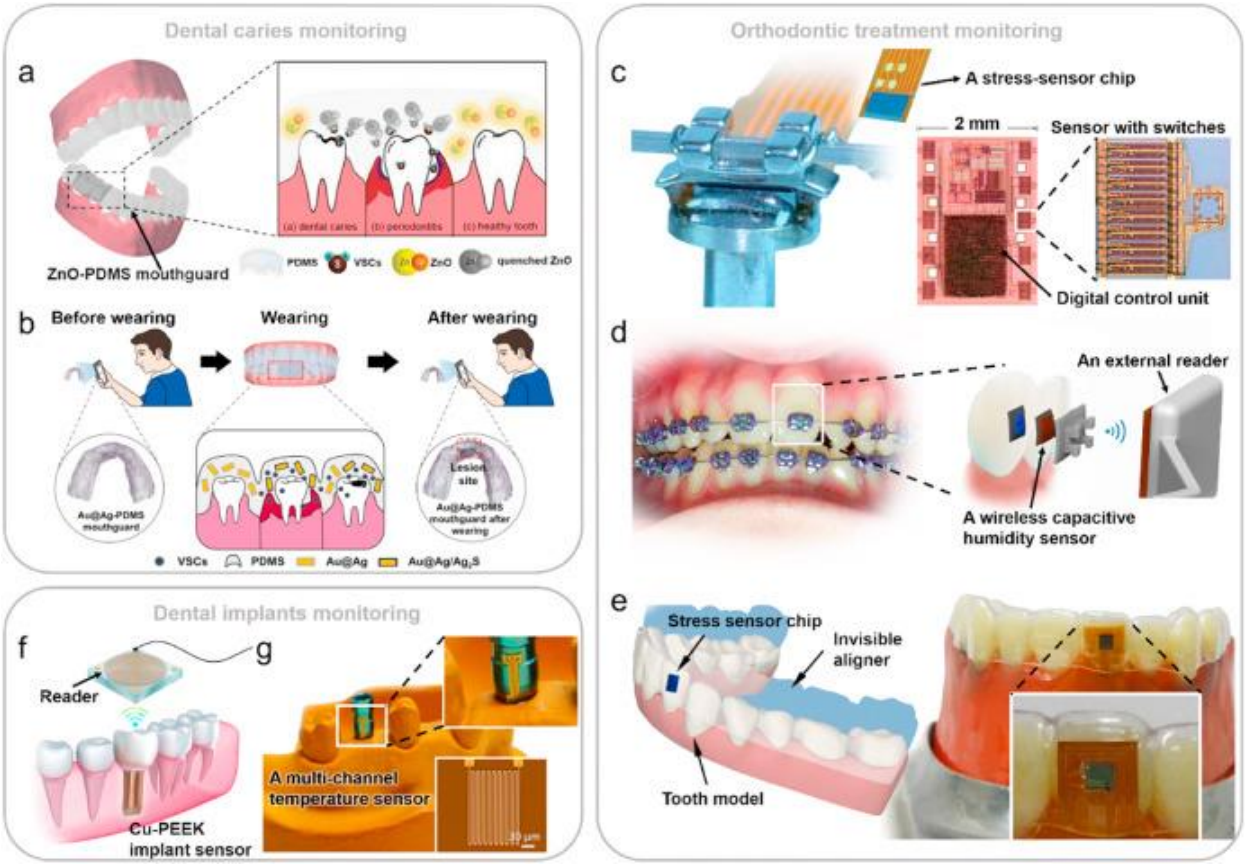

Figure 1. Treatmentmonitoring.

The duration, nature, and intensity of the stimulus, on the one hand, and the body's reactivity, on the other hand, determine the reaction of the prosthetic bed.

The oral mucosa has a high regenerative capacity, as well as a relative resistance to infection. Due to its functional purpose, the oral mucosa (OM) is constantly exposed to various factors (mechanical, chemical and physical) and pathogenic microorganisms and viruses [4].

Removable dentures, which cover a significant part of the surface of the oral mucosa, are one of the main causes of pathological changes in the oral cavity [5].

It is known that a removable denture, which transmits chewing pressure to the oral mucosa, delays the self-cleaning of the oral cavity, leads to a change in the existing balance between various microorganisms, and also changes the sensitivity of nerve receptors in the mucous membrane.

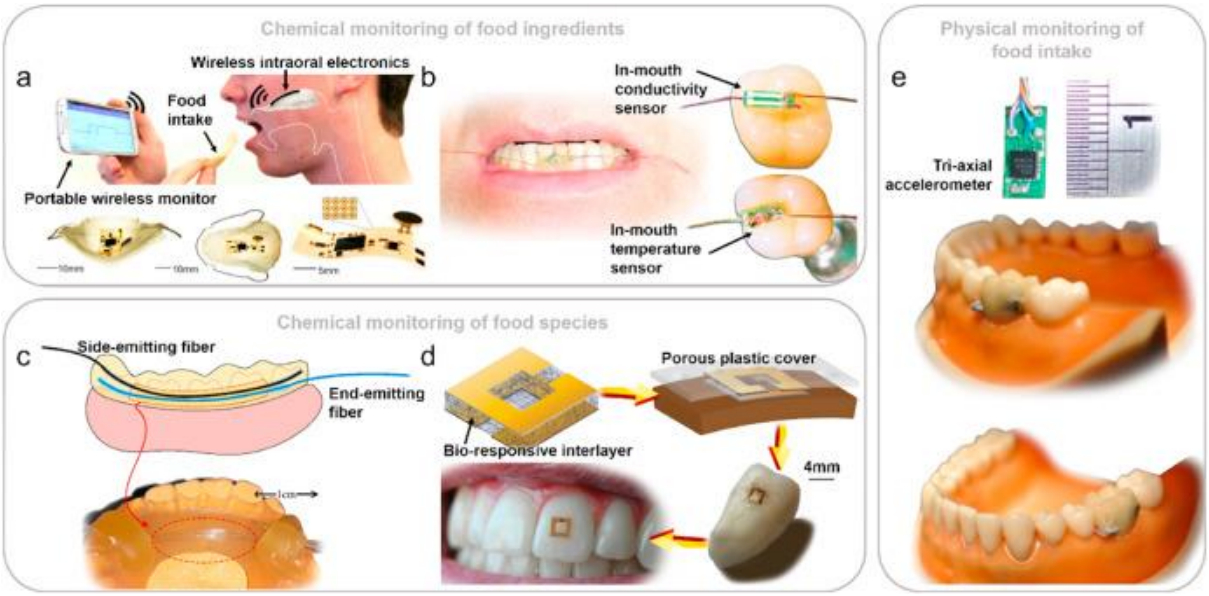

Figure 2. Chemical monitoring.

The causes of complications after the installation of removable dentures are:

a. Poor-quality preparation for prosthetics. Preparation for prosthetics includes the need for oral hygiene, dental treatment and prosthetics, which will help to fix the prosthesis;
b. Inadequate oral hygiene. Improper hygiene can lead to inflammation of the mucous membrane of the denture base, the formation of caries and pulpitis of the teeth supporting the denture;
c. Fracture of the prosthesis. As a result of fracture or displacement of the prosthesis parts, its fixation in the oral cavity is disrupted, causing discomfort and pain when wearing it;
d. Improperly made denture. The design should be easy to install and remove without much effort. There should be no gaps in the oral cavity between the structure and the gums, but the denture should not put pressure or rub the soft tissues. In the first case, food debris will accumulate in the gap, and in the second, ulcers will form on the mucous membrane, and in the future - bedsores;
e. Changes in the bite and position of individual teeth, leading to displacement of the prosthesis.

Pathological changes that occur in the oral cavity when wearing removable laminar dentures are called denture stomatitis (DS).

As a result of the analysis of the causes of PS, it has been proven that changes in the remnants of the prosthetic bed can occur as a result of chronic damage. Damage to the mucous membrane is the result of errors in the clinical stages of the manufacture of prostheses and violations of the technology of their manufacture. The mismatch between the relief and the boundaries of the prosthesis, the uneven load on the mucous membrane of the prosthetic bed, which occurs due to the lack of multiple contacts of artificial teeth,

as well as the period of use of prostheses, which affects the formation of deformations, roughness and micropores, have an irritating effect [6].

Figure 3. An important issue is the tissue reaction to denture materials.

An equally important problem is the reaction of the tissues of the denture base to the materials used for the manufacture of removable prosthetic structures. At the present stage, new materials are being developed for the manufacture of prostheses with minimal negative effects. The materials from which laminar prostheses are made have a significant impact on the occurrence of prosthetic stomatitis. If the technology and, in particular, the polymerization regime of acrylic plastics are violated, an excess of monomer, which is one of the toxicogenic factors, appears. When the plastic ages, free monomer can also appear [7], [8].

When PS occurs, compliance with the rules of individual oral care and the use of dentures is of great importance. It has been proven that a significant proportion of those surveyed have a low level of knowledge about personal hygiene and hygienic care of the oral cavity and removable dentures, which subsequently leads to the creation of favorable conditions for the reproduction of pathogenic microflora. the basis of a removable prosthesis. This process is also facilitated by irregular care of the oral cavity and orthopedic structures [9], [10].

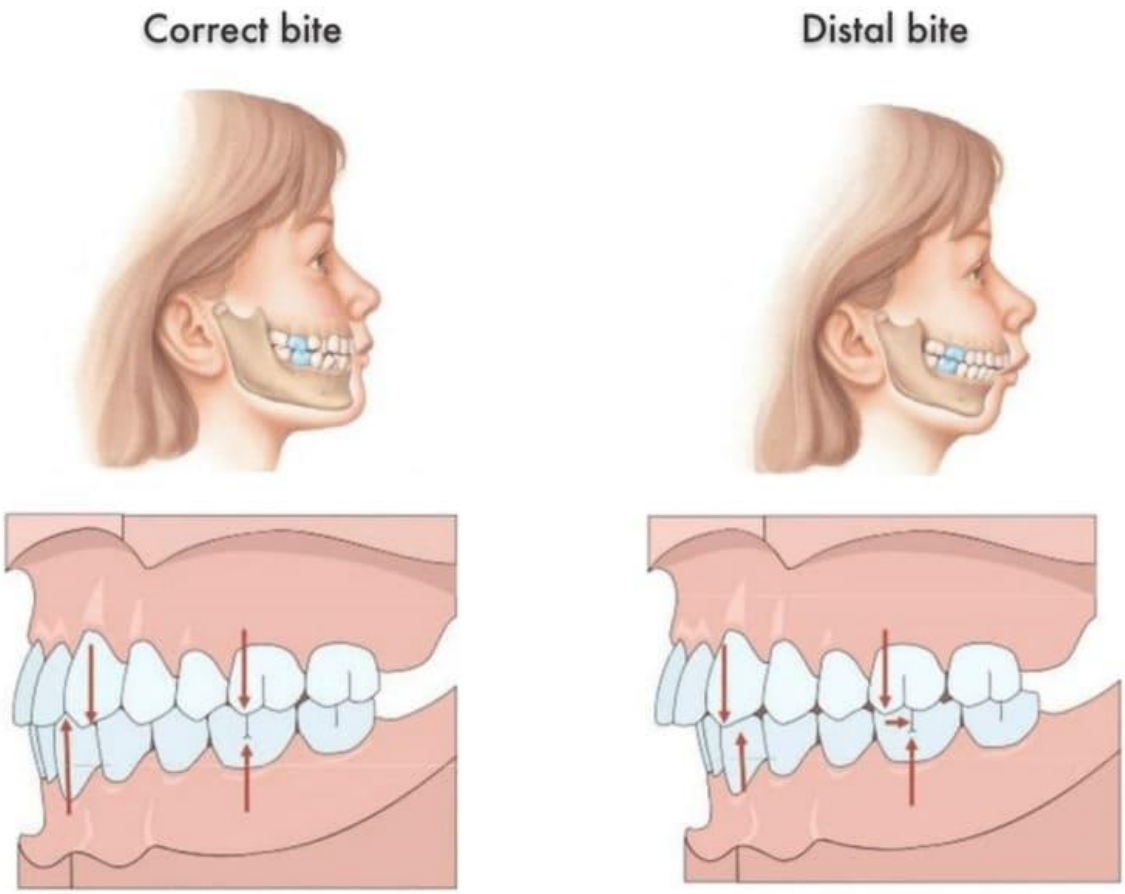

Figure 4. Chronic mechanical injury to the oral mucosa due to dentures.

Chronic mechanical injury (trauma mechanicum cronicum) is a common complication after prosthetics. The severity of clinical manifestations and the nature of the disease are influenced by factors such as the patient's age, the structural features of the oral mucosa (presence or absence of a submucosa) and the severity of the impact on the oral cavity. application of a traumatic factor, the microflora of the oral cavity (risk of secondary infection). Violation of the integrity of the mucous membrane under the influence of chronic irritants is often observed in the elderly. Changes in the position of the teeth, partial adentia, pathological abrasion of the hard tissues of the teeth, leading to a change in the height of the lower third of the face and the turgor of the mucous membrane, are the causes of PS. in the elderly. The reason for the long-term treatment of damaged mucous membranes is the slowdown of regeneration processes in the elderly [11], [12].

Damage to the mucous membrane caused by chronic mechanical damage can occur for a long time without subjective sensations. After some time, patients may complain of unpleasant, mild pain and discomfort in the oral cavity [13], [14]. Objective examination reveals signs of catarrhal inflammation of the mucous membrane, manifested in the form of edema and hyperemia, as well as erosive and ulcerative lesions of the mucous membrane, hyperplastic processes in the form of hypertrophy of periodontal tissues, as well as pronounced hyperkeratosis [15]. All of the above can be detected in one or another

combination. An important aspect is the possibility of a negative effect on the microflora of the oral cavity, which will subsequently lead to infection of the damaged mucous membrane [16], [17], [18].

Thus, denture stomatitis remains a fairly common complication in orthopedic dentistry, which requires the development of adequate treatment methods. The aim of our study was to determine the prevalence of denture stomatitis in patients using partial and complete removable laminar dentures.

RESEARCH METHOD

Assessment of the condition of the mucosa of the denture bed in patients using removable laminar dentures. Analysis of the causes of denture stomatitis in the studied population. Materials and methods of the study, to address these issues, an examination of the oral mucosa of 650 patients aged 55 years and older (345 women and 305 men) using complete and partial removable dentures was conducted [19]. The study was conducted on the basis of dental clinics and offices in Nalchik. The methods of clinical examination of the dental patient (complaint, anamnesis, examination of the oral mucosa) were used for the study [20], [21].

The condition of the oral mucosa is assessed visually. During the examination, the color of the mucosa (pink, pale, hyperemia, cyanosis), edema (the presence of teeth marks on the buccal mucosa along the line of occlusion of the teeth), moisture, primary and secondary elements of the lesion (erosion, ulcers, papillomas, etc.) were determined [22]. When examining the tongue, attention was paid to its size, the presence of plaque, teeth marks on the lateral surfaces, the severity of the lingual papillae (atrophy, hypertrophy). The hygienic condition of removable dentures was visually determined [23].

Figure 5. Examination of oral mucosa, tongue, and hygiene of removable dentures.

RESULTS AND DISCUSSION

The second group consisted of patients with traumatic lesions of the prosthetic bed, which were significantly more numerous than patients in other groups - 455 (70%) ($p < 0.01$). Of these, 345 (75.8%) patients had damage to the prosthetic bed in the form of catarrhal inflammation, manifested by hyperemia, edema and tissue infiltration, which was significantly higher than the detected hyperplastic processes ($p<0.05$). Patients complain of pain and burning in the mouth, dry mouth when eating spicy, salty, sour foods [24], [25]. The localization of the lesion was determined along the boundaries of the prosthesis and mainly on the mucous membrane of the hard palate and on the vestibular surface of the alveolar process [26]. Hyperplastic processes were detected in 110 (24.2%) patients, including 3 lobular fibromas and 107 with papillomatosis. Papillomatosis is identified as a soft, granular, bright red surface on the anterior third of the hard palate and alveolar process. A fold with linear erosion (lobular fibroma) is identified at the site of contact with the edge of the prosthesis [27].

Intolerance to acrylic plastics, manifested by burning, hyperemia and swelling of the mucous membrane, in some cases in the form of erosive lesions of the mucous membrane of the denture base, was detected in 9 (1.4%) patients in the group. In all patients, the listed symptoms appeared immediately after the dentures were applied and disappeared some time after their removal from the oral cavity [28].

Patients with candidiasis and fungal infections of the oral mucosa were included in the fourth group and amounted to 233 people (35.8%). In 98 of the 233 patients, candidiasis was combined with papillomatosis.

The fungal infection manifested itself in the form of bright hyperemia, swelling, dryness of the mucous membrane, smoothness of the papillae of the tongue, and in the corners of the mouth - cracks with thin gray scales. Mycological studies confirmed the diagnosis of candidiasis [29].

There is a direct correlation between changes in the mucous membrane and the period of use of dentures. The survey results showed that 9 patients used partial and full removable dentures for up to 1 year, 205 of the examined were from 1 to 3 years old, 285 from 4 to 7 years old, from 8 to 11 years old – 19 and over 11 years old - 132 people.

No mucosal changes were detected in 186 patients, 138 of whom used removable dentures for 1 to 3 years and 48 for 4-5 years [30].

Denture stomatitis in the form of catarrhal inflammation was diagnosed in 69 patients up to 3 years, in 231 up to 7 years, in 65 examined patients up to 11 years and older. Hyperplastic processes were detected in people who used removable dentures for more than 7-8 years. Intolerance to acrylic plastics appeared immediately after the manufacture of removable dentures [31], [32].

The survey reliably revealed that 372 (57.2%) people use poor-quality dentures ($p<0.05$). The shortcomings identified during the inspection of dentures were incorrect planning of the boundaries, violation of the rules for installing teeth, the absence of several contacts in the central occlusion, roughness of the denture base on the side

adjacent to the mucosa, poor fixation, imbalance, etc. A clinical study showed that one of the causes of inflammation of the mucous membrane is defects in dentures [33].

It is worth noting that during the examination of patients, poor hygiene was detected, as well as violations of the denture use regime. Visually, staining plaque of varying intensity was detected on the denture. Violations of hygiene rules were observed in 457 (70.3 percent) of the examined patients. Only 29.7 percent of patients cleaned their dentures regularly (morning and evening) and rinsed their dentures with water after meals. A survey among patients revealed that they did not have sufficient knowledge about hygiene methods and tools, and the features of caring for removable dentures.

The study results also revealed a significantly higher prevalence of denture stomatitis in women than in men, which was 8.2 and 42.4%, respectively ($p<0.05$).

CONCLUSION

Fundamental Finding : The study revealed that dental stomatitis affected 70% of removable prosthesis users, with a significant correlation between the duration of denture use and changes in the oral mucosa. Catarrhal inflammation was most common, followed by hyperplasia and plastic intolerance. Additionally, candidiasis was observed in 35.8% of patients. Unsatisfactory denture hygiene and the use of inadequate dentures were prevalent, affecting over half of the participants. **Implication :** The findings underscore the need for preventive strategies in managing removable prostheses, emphasizing better hygiene practices and regular monitoring of patients. The long-term use of dentures, particularly beyond 7 years, appears to be associated with more severe complications, suggesting a need for updated guidelines for denture care and replacement. **Limitation :** This study was limited by its observational nature and lack of intervention, which restricts the ability to draw definitive causal relationships. Furthermore, the sample size and patient diversity may not fully represent the broader population of removable prosthesis users. **Future Research :** Future studies should explore intervention-based approaches to improve denture hygiene, investigate alternative materials, and examine the long-term effects of denture use on oral health. Research could also focus on developing effective treatment protocols to manage denture-related complications more efficiently.

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