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COMPARATIVE ANALYSIS OF THE EFFECT OF LOCAL OZONE THERAPY ON THE ADAPTATION PROCESS TO COMPLETE REMOVABLE DENTURES IN ELDERLY PATIENTS

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Yakubova N.N
Aliev N.Kh.
Bukhara State Medical Institute named after Abu Ali ibn Sina

Abstract: *The clinical and laboratory effectiveness of local ozone therapy (ozonated olive oil) during the adaptation period to complete removable acrylic dentures in elderly completely edentulous patients was comparatively evaluated. Patients were divided into a control group (conventional prosthetic treatment) and a comparison group (conventional prosthetics combined with local ozone therapy). Over a follow-up period of 14 days to 6 months, denture hygiene (Ambjørnsen index), gingival inflammation, subjective complaints, mixed saliva parameters (secretion rate, pH, viscosity), oral microflora, and Candida spp. colonization were analyzed. In patients treated with conventional prosthetics, denture hygiene deteriorated after two weeks, accompanied by more pronounced signs of microbial imbalance. In contrast, patients receiving local ozone therapy demonstrated better preservation of hygiene indices, absence of Candida colonization, enhanced epithelial regeneration, and a more rapid reduction of subjective complaints. Local ozone therapy was assessed as an effective pathogenetic method, reducing the adaptation period to complete removable dentures by approximately 30%.*

Keywords: *complete edentulism; complete removable dentures; elderly patients; local ozone therapy; ozonated olive oil; Ambjørnsen index; mixed saliva; pH; viscosity; oral microflora; Candida spp.; adaptation; oral hygiene.*

INTRODUCTION

Population aging is one of the most prominent global demographic trends, leading to a steady increase in the prevalence of complete edentulism among elderly individuals. According to the World Health Organization and the Global Burden of Disease Study, tooth loss remains a significant public health concern, substantially impairing nutrition, speech, social interaction, and overall quality of life in older populations (World Health Organization, 2012; GBD 2019 Oral Disorders Collaborators, 2020).

Despite advances in implant-supported prosthetic rehabilitation, complete removable dentures remain the most commonly used treatment option for elderly patients. This is largely due to systemic comorbidities, age-related bone resorption, financial constraints, and limited surgical tolerance in this

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population (Budtz-Jørgensen, 1999; Müller et al., 2007).

Adaptation to complete removable dentures is a complex, multifactorial process influenced by anatomical, physiological, and psychosocial factors. Age-related thinning of the oral mucosa, reduced regenerative capacity, impaired microcirculation, and altered neuromuscular control significantly complicate the adaptation period and may prolong functional recovery (Preshaw et al., 2011; Carlsson & Omar, 2010).

A major clinical problem associated with complete removable dentures is denture-related stomatitis, which affects up to 60–70% of elderly denture wearers. The condition is closely associated with poor denture hygiene, biofilm accumulation on acrylic surfaces, local immune suppression, and overgrowth of opportunistic microorganisms, particularly Candida spp. (Gendreau & Loewy, 2011; Coco et al., 2008).

Salivary dysfunction plays a crucial role in the pathogenesis of prosthetic complications. Numerous studies have shown that hyposalivation, increased saliva viscosity, and reduced buffering capacity negatively affect denture retention, mucosal resistance, and microbial balance, thereby increasing susceptibility to inflammation and infection (Turner & Ship, 2007; Dawes et al., 2015).

In recent years, ozone therapy has gained increasing attention in dentistry due to its antimicrobial, anti-inflammatory, immunomodulatory, and biostimulatory effects. Experimental and clinical investigations have demonstrated that ozone and ozonated oils exhibit broad-spectrum antimicrobial activity while enhancing tissue oxygenation, microcirculation, and reparative processes without inducing cytotoxic effects when used appropriately (Baysan & Lynch, 2004; Sechi et al., 2001).

Clinical studies have reported favorable outcomes of ozone therapy in the treatment of oral mucosal lesions, periodontal diseases, caries management, and prosthetic-related inflammatory conditions. However, despite the growing evidence base, the role of local ozone therapy in facilitating adaptation to complete removable dentures in elderly patients remains insufficiently studied and requires further systematic investigation (Nagayoshi et al., 2004; Azarpazhooh & Limeback, 2008).

Therefore, evaluating the clinical and laboratory effectiveness of local ozone therapy during the adaptation period to complete removable dentures is of significant scientific and practical relevance.

Aim of the study was to comparatively evaluate the clinical and laboratory effectiveness of local ozone therapy during the adaptation process to complete removable acrylic dentures in elderly completely edentulous patients, in comparison with conventional prosthetic treatment, as well as to determine its impact on denture hygiene, oral cavity condition, mixed saliva parameters,

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microbiological balance, and subjective complaints.

Materials and Methods. The study was conducted using a comparative dynamic observational design and aimed to evaluate the effect of local ozone therapy on the adaptation process to complete removable acrylic dentures in elderly completely edentulous patients. The observation period lasted 6 months.

A total of elderly patients with complete edentulism requiring prosthetic rehabilitation with complete removable dentures were enrolled in the study and divided into two groups: Control group – patients treated using conventional complete removable denture prosthetics ($n \approx 48–49$);

Ozone therapy group – patients who received conventional prosthetic treatment combined with local ozone therapy using ozonated olive oil ($n \approx 49$). In the ozone therapy group, local ozone therapy was administered in the form of ozonated olive oil applied directly to the intaglio (tissue-contacting) surface of the complete removable denture. This method ensured prolonged and direct contact between the prosthetic base material and the therapeutic agent. The applications were performed regularly during the adaptation period.

Denture hygiene was assessed using the Ambjørnsen denture hygiene index, specifically designed for complete removable dentures. The index was recorded dynamically at 2 weeks, 1.5 months, 3 months, and 6 months after denture insertion.

Subjective complaints—including pain, speech disturbances, difficulty in mastication, foreign body sensation, excessive salivation, oral dryness, and other discomforts—were evaluated using a structured questionnaire. Assessments were conducted on days 2, 7, 14, 21, and 30 after prosthesis placement, allowing a comparative analysis of early adaptation dynamics.

Functional properties of mixed saliva were studied according to the following parameters:

salivary secretion rate (ml/min);

pH value;

salivary viscosity (cP).

Saliva examinations were performed before treatment and at 14 days, 1.5 months, 3 months, and 6 months after prosthetic rehabilitation in order to assess functional changes during early and late stages of adaptation.

The condition of the oral resident microflora was evaluated using standard microbiological methods, including:

dynamic assessment of colony-forming units of predominant microbial representatives (Streptococcus viridans, Streptococcus mitis, Streptococcus spp., Lactobacillus, Neisseria spp., and others);

detection and quantitative assessment of Candida spp. (CFU) and signs of oral dysbiosis.

Statistical analysis was performed using non-parametric methods. Quantitative data were expressed as median (Md) and interquartile range (Q1–Q3). Intragroup differences were analyzed using the Wilcoxon signed-rank

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test, while intergroup comparisons were performed using the Mann–Whitney U test. Categorical variables (distribution of subjective complaints) were analyzed using contingency tables and the χ^2 (chi-square) test. Statistical significance was set at $p < 0.05$.

RESULTS

In the control group of completely edentulous elderly patients, the hygienic condition of complete removable dentures was evaluated using the Ambjørnsen denture hygiene index. The assessment revealed the presence of plaque accumulation and contamination, predominantly on the intaglio (tissue-contacting) surface of the dentures, which is known to be the most difficult area for effective cleaning.

The results demonstrated that beginning from the second week of denture use, hygiene levels became insufficient and showed a persistent negative trend throughout the observation period. Over time, hygiene indices progressively worsened, reaching their maximum values by the end of the 6-month follow-up period.

In contrast, patients receiving local ozone therapy showed significantly better preservation of denture hygiene throughout the entire observation period. At 2 weeks, hygiene scores were on average 1 point better than in the control group, while at 1.5 and 3 months, the difference increased to approximately 2 points. At 6 months, hygiene indicators remained superior compared to conventional treatment, despite a general tendency toward gradual deterioration in both groups.

During the adaptation period to complete removable dentures, characteristic changes were observed in several physiological parameters of mixed saliva. In the control group, salivary secretion rate increased from 0.46 ml/min to 0.75 ml/min by the second week after denture insertion. However, by the third month, this parameter returned to baseline values, and in later stages a tendency toward hyposalivation was noted.

Salivary viscosity demonstrated an inverse relationship with secretion rate, increasing as salivary flow decreased. Salivary pH values showed a slight downward trend during follow-up; however, they remained within physiological limits throughout the study period. In the ozone therapy group, analysis of mixed saliva parameters revealed no statistically significant adverse effects of local ozone application on salivary secretion rate, viscosity, or pH. Although transient changes were observed during early adaptation, these parameters stabilized within physiological ranges during long-term follow-up. This indicates that local ozone therapy does not disrupt salivary functional homeostasis.

Microbiological analysis of the oral cavity in the control group demonstrated a gradual increase in the titers of resident microflora, accompanied by signs of dysbiosis. Over time, clinically relevant quantities of additional microorganisms

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were detected. Notably, Candida spp. were identified in three patients at concentrations of up to 10^4 CFU, consistent with published data on increased candidal colonization associated with complete removable denture use.

In the ozone therapy group, no laboratory evidence of Candida infection was detected at any stage of observation. Although slight increases in microbial titers were observed during long-term follow-up, these changes were not statistically significant compared with baseline values. Comparative analysis confirmed greater stability of both qualitative and quantitative composition of oral microflora in patients receiving ozone therapy.

Questionnaire-based assessment revealed that patients in the control group most frequently reported speech disturbances, articulation difficulties, mastication problems, foreign body sensation, and pain under the denture base. These complaints persisted for relatively prolonged periods: pain and speech disturbances lasted up to 14 days, mastication difficulties up to 21 days, and excessive salivation up to 14 days.

In contrast, patients undergoing local ozone therapy demonstrated a significantly lower prevalence and intensity of subjective complaints, particularly during early stages of adaptation. Pain under the denture base and irritative sensations associated with denture presence were significantly reduced as early as the first two weeks. By day 14, pain persisted in 62% of control patients, whereas only 32% of patients in the ozone therapy group reported similar symptoms

Overall, the average adaptation period in the control group was 28.9 days, ranging from 16.2 to 30 days. In patients receiving local ozone therapy, the adaptation period was reduced by approximately 30%. This acceleration of adaptation was associated with improved denture hygiene, reduced inflammatory manifestations, absence of candidal colonization, enhanced epithelial regeneration, and a marked decrease in subjective discomfort.

Conclusion. The findings of this study demonstrate that local ozone therapy using ozonated olive oil is an effective adjunctive method during the adaptation period to complete removable dentures in elderly completely edentulous patients. The application of ozone therapy contributes to improved denture hygiene, stabilization of oral microflora, absence of Candida colonization, and faster epithelial regeneration of the denture-bearing mucosa.

Local ozone therapy was associated with a significant reduction in the intensity and duration of subjective complaints, particularly pain, foreign body sensation, and speech-related discomfort, during early stages of adaptation. Importantly, the use of ozone therapy did not exert adverse effects on salivary secretion, viscosity, or pH, indicating preservation of oral functional homeostasis.

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Overall, the incorporation of local ozone therapy into conventional prosthetic treatment protocols resulted in an approximately 30% reduction in adaptation time to complete removable dentures. These results support the clinical relevance of ozone therapy as a pathogenetically justified and safe method for improving prosthetic rehabilitation outcomes and quality of life in elderly edentulous patients.

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