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CLINICAL EFFECTIVENESS OF INDIVIDUAL ADAPTIVE SPLINTS IN ORAL MUCOSAL REHABILITATION AND DENTURE RETENTION IMPROVEMENT IN COMPLETELY EDENTULOUS PATIENTS

Makhmud Khamidov
Department of Dentistry Zarmed University

Abstract
Complete edentulism remains one of the most challenging conditions in prosthetic dentistry, often associated with impaired denture retention, prolonged adaptation periods, and pathological changes of the oral mucosa. The condition of the mucosal tissues of the denture-bearing area plays a decisive role in the stability and functional efficiency of removable complete dentures. Inadequate adaptation of the oral mucosa to prosthetic loading frequently leads to pain, inflammation, and reduced patient satisfaction.
This article reviews and analyzes clinical and functional aspects of using individual adaptive splints as a preliminary stage of oral mucosal rehabilitation in completely edentulous patients. Special emphasis is placed on the mechanisms of mucosal adaptation, reduction of traumatic effects, and improvement of denture retention. The available evidence suggests that individual adaptive splints promote gradual functional adaptation of the mucosa, reduce pain symptoms, shorten the adaptation period, and enhance the clinical effectiveness of complete removable dentures.

Keywords: Complete edentulism, individual adaptive splints, oral mucosa, removable dentures, denture retention, prosthetic rehabilitation.

Introduction

Complete edentulism represents a significant clinical and social problem in modern dentistry, particularly among elderly patients. The loss of all teeth results not only in severe impairment of mastication and speech but also in pronounced

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anatomical and functional changes of the denture-bearing tissues. Progressive resorption of the alveolar ridges, thinning of the oral mucosa, and disruption of microcirculation create unfavorable conditions for the retention and stability of complete removable dentures [1.3].

Despite advances in denture materials and fabrication techniques, achieving adequate denture retention in completely edentulous patients remains difficult. One of the primary reasons for treatment failure is the insufficient adaptive capacity of the oral mucosa to prosthetic pressure. Direct placement of complete dentures onto unprepared mucosal tissues often leads to localized trauma, inflammation, pain, and repeated adjustments, which negatively affect patient compliance and overall treatment outcomes [2.4].

The concept of staged oral mucosal rehabilitation prior to definitive prosthetic treatment has gained increasing attention in recent years. Individual adaptive splints have been proposed as a means of gradually conditioning the mucosa to functional loading. By evenly distributing mechanical stress and reducing peak pressure zones, these splints facilitate tissue adaptation and create more favorable conditions for subsequent denture placement.

However, the clinical effectiveness and functional justification of individual adaptive splints in improving denture retention and patient comfort require comprehensive evaluation. Therefore, the aim of this article is to analyze current evidence on the role of individual adaptive splints in oral mucosal rehabilitation and their impact on denture retention in completely edentulous patients [2.5].

In completely edentulous patients, the oral mucosa undergoes significant structural and functional alterations as a result of tooth loss and progressive alveolar ridge resorption. The absence of physiological masticatory loading leads to reduced stimulation of the underlying bone and soft tissues, resulting in atrophy and decreased tissue resilience.

Histological studies indicate thinning of the stratified squamous epithelium, reduction of collagen fiber density, and diminished vascularization of the connective tissue layer. These changes compromise tissue elasticity and regenerative capacity, rendering the mucosa more susceptible to mechanical

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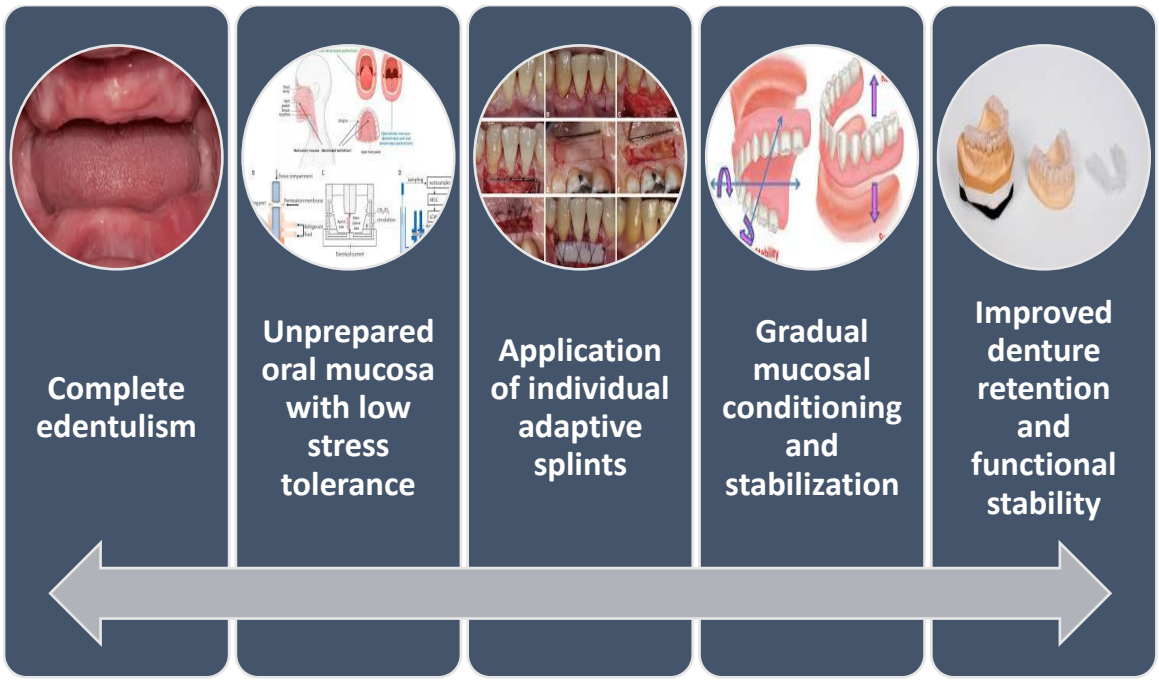
trauma. Consequently, even moderate prosthetic pressure may provoke inflammatory reactions, ulcerations, and pain [3.4].

Functionally, the reduced tolerance of the oral mucosa to mechanical stress interferes with denture stability. Patients frequently experience denture displacement during mastication and speech, which further increases friction and exacerbates mucosal injury. This vicious cycle highlights the importance of preparing the denture-bearing tissues prior to definitive prosthetic rehabilitation.

Role of individual adaptive splints in improving denture retention



Individual adaptive splints are designed to serve as an intermediate therapeutic stage between the initial clinical condition of the denture-bearing tissues and definitive prosthetic rehabilitation. Their primary mechanism of action is based on controlled, gradual functional loading of the oral mucosa, allowing tissues to adapt without excessive mechanical stress.

Unlike definitive complete dentures, adaptive splints are fabricated from materials that provide a degree of resilience and flexibility. This property enables redistribution of occlusal pressure across a wider surface area of the mucosa, thereby reducing localized stress concentrations. As a result, peak pressure

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zones—commonly responsible for mucosal trauma and pain—are significantly minimized.

Another important mechanism involves stimulation of microcirculation within the mucosal tissues. Moderate, evenly distributed mechanical loading enhances blood flow, improves tissue oxygenation, and supports metabolic processes essential for regeneration. Improved microcirculation contributes to increased tissue resistance and a reduction in inflammatory responses associated with prosthetic pressure [5.6].

From a functional perspective, adaptive splints promote neuromuscular accommodation. Patients gradually adapt to the presence of an intraoral appliance, which facilitates improved control of mandibular movements and more stable functional patterns. This neuromuscular adaptation plays an important role in subsequent denture retention and overall prosthetic stability.

Table 1. Biomechanical mechanisms of individual adaptive splints and their effects on oral mucosal tissues

Mechanism	Description	Clinical effect
Load redistribution	Even distribution of pressure on mucosa	Reduced localized trauma
Elastic buffering	Partial absorption of mechanical forces	Decreased pain sensitivity
Microcirculation stimulation	Enhanced blood flow in mucosal tissues	Improved tissue resilience
Neuromuscular adaptation	Gradual functional conditioning	Increased denture stability

Clinical observations indicate that the adaptation process in completely edentulous patients using individual adaptive splints follows a predictable and favorable pattern. During the initial phase, patients report reduced discomfort compared with direct placement of complete dentures. Mild pressure sensations are common but typically do not progress to pain or inflammation.

As adaptation progresses, signs of mucosal stabilization become evident. Hyperemic areas diminish, tissue sensitivity decreases, and tolerance to functional loading improves. This phase is critical, as it reflects successful

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biological accommodation of the mucosa to mechanical stress. The duration of this phase varies depending on patient age, systemic health, and degree of alveolar ridge atrophy, but it is generally shorter than adaptation periods observed with immediate denture placement.

Importantly, the use of adaptive splints reduces the need for frequent clinical adjustments. Because the mucosa is conditioned in advance, definitive dentures can be fabricated with improved predictability and fewer post-insertion complications. This contributes to increased efficiency of prosthetic treatment and enhanced patient satisfaction.

Table 2. Clinical indicators of mucosal adaptation during the use of individual adaptive splints

Indicator	Early adaptation phase	Late adaptation phase
Pain response	Mild or absent	Absent
Mucosal hyperemia	Moderate	Minimal or none
Tissue tolerance	Limited	Significantly improved
Need for adjustments	Occasional	Rare

The ultimate goal of prosthetic rehabilitation in completely edentulous patients is to achieve stable denture retention while maintaining patient comfort and tissue health. Clinical effectiveness of individual adaptive splints can therefore be assessed through their impact on denture stability, functional performance, and patient-reported outcomes after placement of definitive complete dentures.

Clinical evidence indicates that patients who undergo preliminary mucosal conditioning with adaptive splints demonstrate superior primary and secondary denture retention compared with those receiving immediate complete dentures. Improved tissue tolerance allows for closer adaptation of the denture base to the mucosal surface, enhancing the physical and functional factors responsible for retention. Reduced pain and inflammation further contribute to improved neuromuscular control during mastication and speech, limiting denture displacement.

In addition, the use of adaptive splints significantly decreases the frequency of post-insertion corrections. Because mucosal tissues are preconditioned to

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functional loading, areas of excessive pressure are minimized, resulting in fewer sore spots and reduced need for repeated denture adjustments. This not only improves clinical efficiency but also increases patient satisfaction and acceptance of prosthetic treatment.

Table 3. Effect of individual adaptive splints on denture retention and clinical outcomes

Parameter	Without adaptive splints	With adaptive splints
Primary denture retention	Unstable	Stable
Denture displacement during function	Frequent	Rare
Post-insertion adjustments	Multiple	Minimal
Patient comfort	Moderate	High
Overall clinical effectiveness	Satisfactory	High

Discussion

The findings summarized in this review highlight the importance of oral mucosal preparation as a critical determinant of prosthetic success in completely edentulous patients. While conventional prosthetic approaches focus primarily on denture design and materials, insufficient attention to the biological readiness of the denture-bearing tissues often compromises treatment outcomes.

Individual adaptive splints address this limitation by introducing a biologically oriented strategy that aligns prosthetic loading with the adaptive capacity of oral tissues. By reducing mechanical stress, enhancing microcirculation, and promoting neuromuscular adaptation, these splints create favorable conditions for long-term denture stability. Importantly, this approach supports a patient-centered model of care, emphasizing comfort, gradual adaptation, and reduced complication rates.

Conclusion

Individual adaptive splints represent an effective and clinically justified method for preliminary oral mucosal rehabilitation in completely edentulous patients. Their use facilitates gradual functional adaptation of the mucosa, reduces traumatic effects, and significantly improves denture retention and stability.

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Incorporating adaptive splints into the prosthetic treatment protocol enhances clinical outcomes, shortens adaptation periods, and increases patient satisfaction. Based on the available evidence, individual adaptive splints should be considered a valuable adjunct in the comprehensive rehabilitation of completely edentulous patients, particularly in cases involving compromised mucosal conditions and reduced adaptive capacity.

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