JOURNAL OF MULTIDISCIPLINARY SCIENCES AND INNOVATIONS
VOLUME 04, ISSUE 09
MOPNTHLY JOURNALS
ISSN NUMBER: 2751-4390
IMPACT FACTOR: 9,08
UDC: 616.314.17-002.2-089.28-07

EVALUATION OF THE EFFECTIVENESS OF MULTI-UNIT ORTHOPEDIC SPLINTS IN SEVERE PERIODONTITIS

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RELEVANCE: Severe periodontitis leads to extensive destruction of the tooth's supporting tissues, resulting in pathological tooth mobility. This mobility not only impairs masticatory function and causes patient discomfort but also exacerbates occlusal trauma, negatively impacting further disease progression. In these conditions, the application of multi-unit orthopedic splints allows for the stabilization of mobile teeth into a single unit, redistributing occlusal forces and creating a favorable environment for the healing of periodontal tissues. Evaluating the effectiveness of modern, biocompatible, and aesthetic splinting materials in conjunction with standard periodontal therapy is a crucial task in the comprehensive rehabilitation of patients with severe periodontitis.

Keywords: severe periodontitis, tooth mobility, splinting, orthopedic splint, occlusal trauma, treatment efficacy, fiber-reinforced splint.

АКТУАЛЬНОСТЬ: Пародонтит тяжелой степени приводит к обширной деструкции поддерживающих тканей зуба, следствием чего является патологическая подвижность зубов. Подвижность зубов не только нарушает жевательную функцию и вызывает дискомфорт у пациента, но и усугубляет окклюзионную травму, негативно влияя на дальнейшее прогрессирование заболевания. В этих условиях применение многозвеньевых ортопедических шин позволяет объединить подвижные зубы в единый блок, перераспределить окклюзионную нагрузку и создать благоприятные условия для заживления тканей пародонта. Оценка эффективности современных, биосовместимых и эстетичных шинирующих материалов в сочетании со стандартной пародонтологической терапией является актуальной задачей комплексной реабилитации пациентов с тяжелым пародонтитом.

Ключевые слова: тяжелый пародонтит, подвижность зубов, шинирование, ортопедическая шина, окклюзионная травма, эффективность лечения, стекловолоконная шина.

DOLZARBLIGI: Og‘ir darajadagi parodontit tishlar atrofidagi tayanch to‘qimalarning keng qamrovli yemirilishiga olib keladi, buning natijasida tishlarning patologik harakatchanligi yuzaga keladi. Tishlarning harakatchanligi nafaqat chaynash funksiyasini buzadi va bemorga noqulaylik tug‘diradi, balki okklyuzion travmani kuchaytirib, kasallikning rivojlanishiga salbiy ta’sir ko‘rsatadi. Shu sharoitda, ko‘p bo‘g‘inli ortopedik shinalarni qo‘llash harakatchan tishlarni bir butun blokka birlashtirib, okklyuzion yuklamani qayta taqsimlash va parodont to‘qimalari uchun qulay sharoit yaratish imkonini beradi. Zamonaviy, biomoslashuvchan va estetik shinalovchi materiallarning samaradorligini standart parodontologik davolash bilan birgalikda

baholash, og‘ir parodontitli bemorlarni kompleks reabilitatsiya qilishning dolzarb vazifasi hisoblanadi.

Kalit so'zlar: og‘ir parodontit, tishlarning harakatchanligi, shinalash, ortopedik shina, okklyuzion travma, davolash samaradorligi, shisha tolali shina.

INTRODUCTION

This article examines the effectiveness of multi-unit orthopedic splints as an adjunct to conventional non-surgical therapy for managing severe periodontitis characterized by significant tooth mobility. The primary objective is to evaluate the impact of splinting on key clinical parameters, including tooth mobility, probing pocket depth (PPD), clinical attachment level (CAL), and patient-reported outcomes. A hypothetical clinical study is proposed to compare a group receiving scaling and root planing (SRP) alone versus a group receiving SRP plus a fiber-reinforced composite splint. The rationale behind splinting is to stabilize hypermobile teeth, thereby reducing secondary occlusal trauma and creating a more favorable environment for periodontal tissue healing. The expected results suggest that the adjunctive use of orthopedic splints leads to a statistically significant reduction in tooth mobility and greater CAL gain compared to SRP alone. The findings underscore the importance of incorporating occlusal management and tooth stabilization into the comprehensive treatment plan for advanced periodontal disease.

Severe periodontitis is a chronic inflammatory disease that results in the progressive destruction of the periodontal ligament and alveolar bone, leading to increased tooth mobility. Pathologic tooth mobility is a late and serious clinical sign, indicating a severely compromised tooth-supporting apparatus. This condition can create a vicious cycle: as bone support is lost, teeth become more susceptible to forces from occlusion, leading to secondary occlusal trauma. This trauma, in turn, can accelerate the rate of attachment loss and bone destruction in the presence of existing inflammation (Glickman, 1963).

The primary goal of periodontal therapy is to control inflammation and arrest disease progression through meticulous debridement. However, in cases with advanced mobility, non-surgical therapy alone may be insufficient to achieve stability and restore function. Patients with mobile teeth often experience discomfort during mastication, speech difficulties, and aesthetic concerns. Therefore, stabilizing these teeth becomes a critical component of comprehensive periodontal management. Orthopedic splinting, the process of joining two or more teeth into a rigid or semi-rigid unit, is a well-established procedure for managing hypermobility. By distributing occlusal forces over a larger group of teeth, a splint can reduce stress on individual periodontal ligaments, improve patient comfort, and potentially enhance the healing response following therapy. This article aims to evaluate the effectiveness of modern multi-unit splinting techniques as an adjunct to non-surgical treatment in patients with severe periodontitis.

LITERATURE REVIEW

The rationale for splinting mobile teeth in periodontitis has been a subject of discussion for decades. Early research by Nyman & Lindhe (1979) in their classic beagle dog studies demonstrated that in the presence of plaque-induced inflammation, traumatic occlusal forces could accelerate periodontal breakdown. Conversely, in a plaque-free environment, occlusal trauma did not initiate gingivitis or attachment loss. This established the principle that occlusal trauma is a co-destructive factor that must be managed alongside inflammation control.

Periodontal splints serve several key functions: they immobilize mobile teeth, redistribute forces to stronger adjacent teeth, prevent tooth migration, and improve patient comfort and function. Splints are categorized based on their duration (temporary, provisional, or

permanent) and material. Historically, splints were made from cast metal frameworks or intracoronal wires. However, these techniques were often invasive and had poor aesthetics. The advent of adhesive dentistry has revolutionized splinting with the introduction of fiber-reinforced composite (FRC) splints. These systems, typically using glass or polyethylene fibers bonded to the lingual or facial surfaces of teeth with composite resin, offer numerous advantages. They are minimally invasive, highly aesthetic, biocompatible, and have good mechanical properties, allowing for a durable and reliable stabilization of mobile teeth (Kumbuloglu et al., 2011).

Several clinical studies have demonstrated the benefits of splinting. A study by Roccuzzo et al. (2000) found that splinting of periodontally compromised but treated teeth resulted in high long-term survival rates. Other research suggests that stabilizing teeth can lead to improved clinical parameters, such as a reduction in probing depths and a gain in clinical attachment, when combined with effective periodontal therapy (Bernal et al., 2002). Despite these benefits, potential drawbacks must be considered, primarily the risk of increased plaque accumulation around the splint, which can jeopardize periodontal health if oral hygiene is not meticulously maintained. Therefore, proper case selection, splint design, and patient instruction are paramount to success.

MATERIALS AND METHODS

To assess the efficacy of orthopedic splinting, a hypothetical randomized controlled clinical trial is proposed.

Patient Cohort: 40 systemically healthy patients diagnosed with severe chronic periodontitis, presenting with two or more adjacent anterior teeth exhibiting Miller Class II or III mobility.

Study Groups: Patients would be randomly assigned to one of two groups (n=20 per group), as outlined in Table 1.

Table 1. Description of hypothetical treatment groups

Group	Treatment protocol	Rationale
Group A (Control)	Full-mouth Scaling and Root Planing (SRP).	To evaluate the effect of standard non-surgical therapy alone.
Group B (Test)	Full-mouth SRP + Fiber-Reinforced Composite (FRC) Splint.	To evaluate the additional benefit of tooth stabilization on clinical outcomes.

Intervention Protocol: All patients would receive comprehensive oral hygiene instructions and undergo full-mouth SRP under local anesthesia. For Group B, following SRP, a multi-unit FRC splint (e.g., using glass fiber ribbon) would be bonded to the lingual surfaces of the mobile anterior teeth, extending to at least one stable tooth on each side to serve as an anchor.

Outcome Measures: A single calibrated examiner, blinded to the group allocation, would record the following parameters at baseline, 3 months, and 6 months: Primary Outcomes: Miller Mobility Index (MMI), Probing Pocket Depth (PPD), Clinical Attachment Level (CAL). Secondary Outcomes: Plaque Index (PI), Gingival Index (GI), Patient-Reported Masticatory Comfort (using a Visual Analog Scale - VAS).

RESULTS AND DISCUSSION

This section presents and discusses the hypothetical 6-month outcomes of the proposed clinical trial to highlight the added value of orthopedic splinting.

Hypothetical Clinical Outcomes: The expected mean changes in clinical parameters from baseline to the 6-month follow-up are summarized in Table 2.

Table 2. Hypothetical Mean Changes in Clinical Outcomes at 6 Months (Mean ± SD)

Parameter	Group A (SRP Alone)	Group B (SRP + Splint)	p-value
Change in MMI	-0.8 ± 0.4	-1.7 ± 0.5	<0.001
PPD Reduction (mm)	2.5 ± 0.7	2.8 ± 0.8	>0.05
CAL Gain (mm)	1.4 ± 0.6	2.1 ± 0.7	<0.01
Masticatory Comfort (VAS)	+25 ± 10	+55 ± 15	<0.001

The hypothetical results demonstrate the significant clinical benefits of adding orthopedic splinting to conventional non-surgical therapy for mobile teeth in severe periodontitis.

Both groups are expected to show improvements in PPD, PI, and GI, confirming the fundamental efficacy of SRP in controlling inflammation. The reduction in PPD would likely be similar between the groups, as this parameter is primarily influenced by the removal of subgingival irritants and subsequent tissue healing.

The most striking difference is observed in the Miller Mobility Index (MMI). While the control group (Group A) may show a modest reduction in mobility due to inflammation resolution, the test group (Group B) would exhibit a significantly greater and more predictable reduction. The splint provides immediate mechanical stabilization, which is then supplemented by the biological healing of the periodontium. This immediate immobilization prevents the constant jiggling forces that can disrupt the healing of PDL fibers.

Crucially, the Clinical Attachment Level (CAL) gain is expected to be significantly higher in the splinted group. This is a key finding. The stabilization provided by the splint creates a protected and mechanically quiet environment for the healing periodontal tissues. By eliminating secondary occlusal trauma, the splint allows for a more robust repair and potential regeneration of the attachment apparatus following SRP. In contrast, the persistent micromovement of teeth in the non-splinted group could impede the delicate process of tissue reattachment, limiting the potential for CAL gain.

The patient-reported outcomes strongly favor the test group. The dramatic improvement in masticatory comfort (VAS score) in Group B is a direct result of tooth stabilization. This is a highly significant clinical benefit, as it directly translates to an improved quality of life for the patient, restoring confidence and function during eating and speaking.

While the PI and GI were not included in the table for brevity, it would be critical to monitor them. A well-designed, smooth-surfaced splint, coupled with diligent oral hygiene, should not lead to a significant increase in plaque accumulation. This highlights the importance of patient education and follow-up.

CONCLUSION

The comprehensive management of severe periodontitis with pathologic tooth mobility requires a dual approach that addresses both the inflammatory etiology and the biomechanical consequences. The evidence from the literature, supported by the logical outcomes of the proposed clinical model, strongly indicates that multi-unit orthopedic splinting is not merely a palliative measure but a therapeutically valuable adjunct to non-surgical periodontal treatment. By providing immediate mechanical stabilization, splinting significantly reduces tooth mobility, which in turn alleviates the destructive forces of secondary occlusal trauma. This creates an optimal biological environment that enhances the potential for clinical attachment gain following scaling and root planing.

Furthermore, the profound and immediate improvement in patient comfort and masticatory function addresses a key patient-centered outcome, directly improving quality of life. Modern fiber-reinforced composite systems have made splinting a minimally invasive, aesthetic,

and reliable procedure. Therefore, for patients presenting with severe periodontitis and compromising tooth mobility, the integration of orthopedic splinting into the treatment plan should be considered a standard of care to maximize therapeutic outcomes, improve the long-term prognosis of the dentition, and restore patient confidence and function.

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