DOI:10.21276/sjodr.2016.1.2.8

Saudi Journal of Oral and Dental Research
Scholars Middle East Publishers
Dubai, United Arab Emirates
Website: http://scholarsmepub.com/

ISSN 2518-1300 (Print)
ISSN 2518-1297 (Online)

Case Report

Management of Periodontally Involved Anterior Teeth by Glass Fiber-Reinforced Composite Splinting: A Clinical Report with 5-Year Recall

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Abstract: Periodontal disease results in attachment loss and damage to the supporting alveolar bone leading to tooth mobility. In majority of cases, the mandibular incisors are the teeth showing the first signs of mobility. The clinical management of periodontally involved teeth remains a challenge to the clinician. Splinting may be indicated for individual mobile tooth as well as for the entire dentition. The main objectives of splinting include decreasing patient discomfort, increasing occlusal and masticatory function, enhancing esthetics and improving the periodontal prognosis of mobile teeth. Fiber-reinforced composites provide one of the better alternatives for splinting of teeth. This clinical report describes a technique of splinting of periodontally involved mandibular anterior teeth using glass fiber-reinforced composite resin with a follow-up period of five years.

Keywords: periodontal splinting, tooth mobility, fiber-reinforced composite, splint, periodontally involved teeth

INTRODUCTION

Periodontal disease is characterized by gingival inflammation, loss of connective tissue attachment and destruction of alveolar bone. Progressive attachment loss around the involved teeth eventually results in increased mobility [1].

According to Tarnow & Fletcher, the primary reasons to control tooth mobility with periodontal splinting are primary occlusal trauma, secondary occlusal trauma, and progressive mobility, migration and pain on function [2, 3]. Primary occlusal trauma is defined as injury resulting from excessive occlusal forces applied to a tooth or teeth with normal periodontal support. Secondary occlusal trauma is injury resulting from normal occlusal forces applied to a tooth or teeth with inadequate periodontal support [4]. Tooth mobility has been shown to contribute to decreased masticatory and occlusal function, as well as patient discomfort when eating. Clinical prognosis of periodontally compromised teeth many times hinges on the presence of tooth mobility [5, 6].

Splinting is a common practice to stabilize mobile periodontally involved teeth. The Glossary of Prosthodontic Terms defines splinting as the joining of two or more teeth into a rigid unit by means of fixed or removable restorations or devices [7]. Splinting teeth to each other allows distribution of forces from mobile teeth to their immobile neighbours, thereby gaining support from stronger teeth. This prolongs the life expectancy of the loose teeth, gives stability for the periodontium to reattach, and improves comfort, function and aesthetics [8].

Over the years, different methods have been employed for splinting teeth. The most conservative of these involve use of adhesives and composite resins. In the past, direct stabilization and splinting of teeth using an adhesive technique required the use of wires, pins, or mesh grids. These materials could only mechanically lock around the resin restorative. Because of this there was the potential of creating shear planes and stress concentrations that would lead to fracture of the composite and premature failure. When the splint failed, the clinical problems that occurred included traumatic occlusion, progression of periodontal disease and recurrent caries. With the introduction of fiber-reinforced technology, many of the problems with older types of reinforcement were solved [9, 10]. A variety of reinforcement fibers such as glass fibers, polyethylene fibers, carbon fibers etc. are available in different widths and sizes for the purpose of tooth splinting [8, 11-14].

This clinical report describes a technique of splinting of periodontally involved mobile mandibular anterior teeth using glass fiber-reinforced composite resin and the follow-up for a period of five years.

CLINICAL REPORT

A female patient aged 45 years presented with the chief complaint of mobile lower central incisors and discomfort while eating. On clinical examination, periodontal pocket depths ranged from 4 to 6 mm involving the proximal aspects of mandibular right lateral incisor and extending to the left first premolar. Grade II mobility in relation to 31 and grade I mobility of 41 were recorded according to the Miller's index. Gingival recession of 2 to 4 mm was noted in relation to the involved teeth (Figure 1). Further examination also revealed positive tension test indicating presence on an aberrant labial frenal attachment in relation to the mandibular incisor region. Difficulty in maintaining plaque control was evident with the presence of plaque and calculus in this area. Radiographic examination revealed over 50% bone loss in relation to the mandibular central incisors (Figure 2). No relevant medical history was revealed by the patient.

A treatment plan was formulated to include scaling and root planing, periodontal splinting to allow stabilization for the mobile teeth followed by periodontal surgery of the involved teeth. At the initial consultation, the plan of extending the splint from canine to canine in the mandibular region was carefully explained to the patient but the patient consented to the compromised treatment plan of getting only the central incisors splinted.

Periodontal therapy started with an initial preparation phase which consisted of scaling and root planing and minor occlusal adjustment. The patient was educated on the importance of maintaining a strict plaque control. Three weeks later, as the condition improved with a favorable plaque control, it was decided to perform periodontal splinting using glass fiber-reinforced composite involving the mobile central incisors as described in the following procedure.

The teeth were cleaned on the facial and lingual surfaces using a prophylaxis cup with a non-fluoridated pumice paste. The teeth were then thoroughly rinsed and dried. The proximal tooth surfaces were prepared using medium-grit finishing strips. As per the manufacturer's instructions, a channel of about 0.5 mm deep and 2 mm wide was prepared on the lingual aspect of each tooth (Figure 3). A piece of dental floss was laid onto the lingual surface at the level of the proximal contacts and cut to required length. With the cut floss, section of fiber splint (Interlig®, Angelus, Brazil) was taken and cut to an equal length as the floss using a sterile scissor.

The fiber splint section was lightly wetted with unfilled resin (Filtek Flow, 3M ESPE, USA). Then the section was kept away from light until it could be embedded into the composite resin on the teeth. Both the proximal and lingual aspects of the teeth were acid etched with 37% phosphoric acid (Scotchbond Etchant, 3M ESPE, USA) for a period of 30 seconds (Figure 4). Care was taken so that the etchant flows in the interdental areas of the teeth to be splinted. The teeth were then copiously irrigated to remove all acid residues, gently dried and isolated. A resin adhesive (Single Bond, 3M ESPE, USA) was applied to the etched enamel surfaces and light-cured for 10 seconds.

A thin layer of microhybrid composite resin (Filtek Z250, 3M ESPE, USA) was placed on the lingual surfaces of the teeth and extended slightly to the proximal surfaces of each tooth. The wetted fiber splint section was gently pressed into the composite resin and any excess resin was adapted for achieving a smooth surface. It was then light-cured for 40 seconds for each tooth from the lingual and proximal directions (Figure 5). A smoothening layer of composite resin was applied over the surface especially covering loose ends of the fiber splint to prevent fraying and then light-cured for 20 seconds for each tooth. The occlusion was checked for any interference and adjusted. Esthetic contouring was done with the help of finishing burs and diamonds. Finishing and polishing were performed using aluminium oxide sandpaper discs (Sof Lex, 3M ESPE, USA) and composite resin polishing paste (Figure 6).

Once the teeth were stabilized, open flap debridement was performed for the involved teeth. In addition to this, the management of aberrant labial frenum was accomplished by performing a frenectomy procedure, which involved complete removal of the frenum including its attachment to the underlying bone (Figure 7). A week later, the patient was recalled, suture removal performed and the healing was noted to be uneventful (Figure 8). The patient was given strict instructions on maintaining meticulous oral hygiene by using an interdental brush on a daily basis, in addition to routine oral hygiene practices.

Fig 1: Pre-treatment facial view

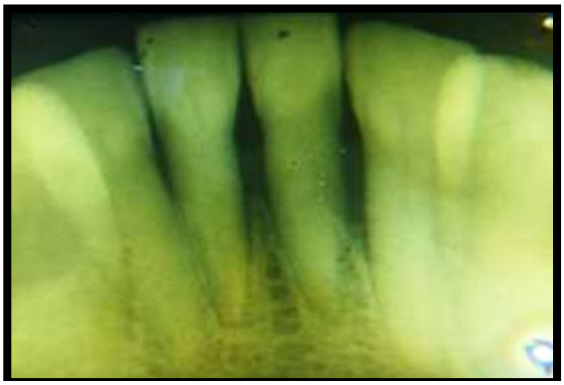

Fig 2: Radiographic view of mandibular incisors

Fig 3: Channel preparation for splinting

Fig 4: Acid etching

Fig 5: Placement of glass fiber and light curing with composite

Fig 6: Facial view after splinting

Fig 7: Lingual view of completed fiber-reinforced composite resin splint

Fig 8: Post-surgical frontal view of healing after 1 month

Fig 9: Splint at one-year recall

Fig 10: Splint at two-year recall

Fig 11: Splint at three-year recall

Fig 12: Splint at four-year recall

Fig 13: Splint at five-year recall

DISCUSSION

The mobility of teeth resulting from loss of supporting bone is common in patients with periodontal disease. In the majority of cases, the mandibular incisors are the teeth showing the first signs of mobility [4]. Tooth splinting may be indicated for individual mobile teeth as well as for an entire dentition. According to Quirynen *et al.;* it is an accepted practice to splint mobile teeth, particularly lower incisors, to maintain the patient's natural dentition as long as possible [15]. Nyman and Lang demonstrated that severely periodontally compromised splinted dentitions with greater than 50% attachment loss of each abutment tooth, in absence of inflammation, could be maintained for extended period of time, in some cases more than 20 years [16]. Pollack stated that severely mobile teeth, if in health, can be retained almost indefinitely [17].

Fiber-reinforced composites provide one of the better alternatives for splinting of teeth [10, 18]. The splint used in the present case is a braided, intertwined glass fiber impregnated with dental resin (Interlig®, Angelus, Brazil). Glass fibers are esthetic having translucency similar to castable glass-ceramics. Fibers can enhance the efficacy of a composite splint by acting as a stress-bearing component, which increases the load enhancing effect of the otherwise brittle matrix composite material and also with the crack stopping or a crack deflecting mechanism, which in turn increases the toughness of the material. The open weave pattern of glass fibers has been shown to have an inherent ability to dissipate stresses and prevent crack propagation [8, 11, 19].

Kolbeck *et al.;* stated that the reinforcing effect of glass fibers was more effective than that of polyethylene fibers. This was attributed to the difficulty in obtaining good adhesion between ultra-high modulus polyethylene fibers and the resin matrix, thus requiring surface treatment of polyethylene fibers to solve the problem [20, 21].

The advantages of glass fiber reinforced composite splinting include: easy and single-visit procedure, fibers provide high flexural strength, fibers are easy to cut as special scissors are not required, minimal tooth reduction making the technique reversible and conservative, fibers are malleable and easy to adapt to the tooth contours, no laboratory work is needed, can be easily repaired or repeated in case of fractured splint and moreover, high esthetic value due to which patient's esthetic expectations are met [3,8,11].

Clinical evaluations of glass fiber-reinforced composite resin restorations for periodontal splinting, fixed partial prostheses or orthodontic retention have been clinically successful [8, 10-12, 22]. Strassler *et al.;* have reported a clinical evaluation of polyethylene fibers used for splinting over 12 to 40 months. They observed that all the periodontal splints were successful and none exhibited debonding or recurrent caries [23]. In another case, Strassler reported a 12-year recall for a periodontally compromised dentition in which the teeth were occlusally adjusted and splinted with polyethylene

fibers as a part of periodontal therapy and observed an improved prognosis of splinted teeth [24].

While the splint is in place performing oral hygiene procedures may be difficult and this may lead to more plaque accumulation. Therefore, special attention must be given to the patient instructing about enhanced measures for oral hygiene (including the use of interproximal brushes and dental floss) after splint placement. Effective personal plaque control, professional caries risk assessment, and periodontal maintenance has been considered crucial to the longevity of the splint and health of the splinted teeth [8, 25].

In the follow-up period, the patient was recalled at a regular 3 month- interval for the periodontal maintenance visits which included examination of the mandibular anterior region with respect to the labial frenum, splint, periodontal status of the splinted teeth and oral hygiene status. It is worthy to note that, satisfactory patient compliance was observed during the follow-up period. No recurrence of periodontal pocket was observed. Labial frenal attachment was observed to be normal. Radiological examination of the splinted teeth was carried out annually for a period of five years and the osseous levels in relation to the splinted teeth were observed to stable at the end of five years. Furthermore, none of the splinted teeth exhibited debonding or recurrent caries. This level of outcome has meant good clinical longevity and success for the splint.

It has been stated by Mosedale that periodontal splinting, when used correctly, can greatly improve the comfort, prognosis and outcome for a patient with advanced periodontal disease [13]. The aesthetically pleasing technique of splinting performed in this case, provided increased chewing comfort to the patient, improved the prognosis of splinted teeth and fulfilled esthetic needs thereby restoring the psychological and physical well-being of the patient.

CONCLUSION

Splinting can be considered as an essential part of periodontal therapy to increase the longevity of periodontally involved teeth with mobility. A wide variety of fiber-reinforced composites are available for periodontal splinting. The chairside technique described in this clinical report proved to be an easy, non-invasive, reliable, comfortable, durable and esthetic choice for periodontal splinting.

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