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Original Research Article

Esthetic Rehabilitation with Porcelain Laminates in Periodontally Compromised Teeth

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This case report presents a female patient who had undergone orthodontic treatment followed by removable splint. Because of her non-motivation to wear her appliance, she had an aggravation of the periodontal disease with diastemas reopening, recessions, mobility and open gingival embrasures. She requested to improve her smile impaired by diastemas, and black triangles. The patient was treated with porcelain laminate veneers in the anterior maxillary teeth associated with a facial approach of fixed splinting using Ribbond.

Key words: Periodontal disease, fixed splint, Ribbond, porcelain, veneers

INTRODUCTION

The patient's desire to improve its dento-facial appearance has been found to be the primary motivating factor for seeking treatment in adults. However, special attention must be given to the periodontal status of adults because they are more likely to be susceptible to or have already suffered from periodontal disease.¹ In fact, periodontitis may lead to the loss of dental support, movement, flaring an extrusion of the teeth associated with diastema, gingival margins discrepancy and papilla loss. This induces an esthetic and functional problem, especially in the anterior segment.¹⁻⁴ The etiology of diastemas can be multifactorial. Potential cause include dento-alveolar discrepancies, tooth loss, migration, orthodontic mechanisms (rapid maxillary extension, distal movements).⁵ Over the past 40 years, periodontal and orthodontic literature has been littered with thousands of articles concluding that, taking into account the cost/benefits/safety ratio, the periodontal effects of orthodontic treatment are minimal when the periodontium is healthy or treated.⁶

However, a recent systematic review concerning the effects of orthodontic treatment of periodontal health strongly questions these certainties showing at best 0.03mm of gingival recession 0.13mm of alveolar bone loss and 0.23mm of pocketing in comparison with a control group without treatment.⁷ On the other hand, without a post-orthodontic retention there is a tendency for the teeth to return towards their initial positions. The etiology of relapse is not fully understood, but relates to a number of factors, including periodontal and occlusal factors, soft tissue pressures and

growth. In fact, the retention can be achieved by placing fixed or removable retainers. The latter needs a strong collaboration and motivation from the patient to maintain the orthodontic outcome.⁸ The restorative closure of diastema can be achieved by using any of the techniques mentioned: metal or all ceramic crowns, direct or indirect composite veneers, and porcelain laminate veneers.⁹

Diastema closure and minor orthodontic problems were the main indication for veneers.¹⁰ Composite resin veneers are easy to use, economic, require less appointments, but offer less wear resistance and surface staining, which make it inferior to dental porcelain.⁹ These are an excellent restorative option when well indicated because they require the minimum wear of tooth structure and restore tooth morphology, shape, texture, color and harmony. When bonded to tooth enamel, they show excellent clinical longevity.¹¹ Porcelain laminate veneers were introduced into dentistry around 1938. With the introduction of acid etch technique by Buonocore (1955) and silica resin direct filling material by Bowen (1958), interest was generated in porcelain veneers.⁹ A range of dental ceramic materials is presently available on the market for these treatments, though with very different characteristics in terms of the composition, optic properties and manufacturing processes involved. In fact, A.A Font *et al* created a classification based on the objectives of treatment: esthetic and/or functional problems.¹² This article describes the esthetic rehabilitation of a patient who restrained herself from smile due to self-consciousness.

Case presentation

A 24-years-old female patient reported to the prosthetic department in the dental clinic of Monastir with the chief complaint of unsightly smile due to the open gingival embrasures, and spacing of the maxillary anterior teeth. The interrogation revealed the long-term abuse and neglect in using the removable splinting orthodontic retainer (Hawley appliance) after accomplishing orthodontic treatment. Thorough clinical examination revealed that the smile was impaired by upper lateral incisors extrusion, black triangles between centrals and right lateral, and diastemas between the left central, lateral and canine, and between right lateral and canine. When smiling, the patient exposed slightly the lower teeth. (fig.1, and 2) Periodontal examination revealed chronic periodontitis with supra-gingival plaque and dental calculus in the lower arch indicating inadequate oral hygiene, and gingival margins discrepancy with recession in the right lateral. The panoramic X-ray revealed a diffuse horizontal bone loss, especially in the upper right incisor area where grade 1 mobility was noted. (fig.3) No occlusal trauma was marked, but the patient had a deep bite which contra-indicated a fixed palatal splint. After examination, impressions for diagnostic cast were made in irreversible hydrocolloid. The casts were studied to decide the shape and size of the restoration with help of diagnostic wax up. Preoperative treatment involving multiple scaling and root planning sessions were arranged as well as hygiene instructions. During re-evaluation and as part of the treatment plan, it was decided to stabilize the maxillary teeth.

A periodontal surgery (gingivectomy) aimed to realign the gingival margins was discussed with the patient who reported her non-motivation to any long-lasting treatment. Therapeutic decision was splinting the maxillary incisors with a fixed composite resin-polyethylene ribbon-reinforced splint placed on the facial surface and their restoration with porcelain laminate veneers to achieve an acceptable esthetic. Before proceeding for teeth preparation, gingival retraction was performed, shade was selected using Vitapan classical shade guide, and a preoperative mock-up was fabricated intraorally with the help of a silicone impression made from the wax-up. The preparations were begun with rounded burs and the mock-up in place, which allow maximum conservation of enamel, and strength of the porcelain veneers. (fig.4) the entire surfaces were then reduced using a round end diamond bur at different angles following the convexity of the teeth. The mock-up was cut back until the demarcation lines were removed, indicating that the essential depth was achieved. The length of the extruded maxillary laterals was adjusted corresponding to the incisal plane. Once teeth reduction was completed, a local anesthesia was administrated, and a horizontal facial groove was prepared in the incisal third of the facial surface at the level of the proximal contact area to a depth of 0,3mm, which will contain polyethylene ribbon that would be used to reinforce the bonded composite resin splint to stabilize maxillary incisors.

For that, the necessary length of polyethylene ribbon was cut, the teeth were thoroughly cleaned, the prepared surfaces were rinsed, and dried, and the grooves were etched, then rinsed, and gently dried. Five successive coats of a dentin primer were painted into the grooves, and then air dried. The adhesive was painted and light-cured for 20seconds. The polyethylene ribbon was pre-impregnated with light cured adhesive. Composite resin was placed into tooth groove. The ribbon was then adapted and embedded in the composite

resin. Both were light-cured for 40 seconds. (fig.5) after stabilization of incisors, impression of the maxillary arch was made by single step double mix technique. The cast was scanned, and porcelain veneers were designed and fabricated by CAD/CAM using a high resistance feldspate ceramics. (fig.6) the laminates were tried in for shade, fit, marginal adaptation, shape, size, symmetry, and contacts, until patient's approval were obtained. (fig.7, and 8) The completed restorations were cemented using a self-etching dual-cure luting agent (Totalcem). Laminates, were light cured for 5seconds. Excess cement was removed, and then complete curing was done in 20 seconds.

Discussion

Fixed orthodontic appliances can result in an increased accumulation of plaque which can contribute to caries, and an aggravation of existent periodontal disease with consequent open gingival embrasures, diastemas and gingival margins discrepancies.^{7,13} Another problem associated with orthodontic therapy is the potential of diastemas reopening, especially when the patient is not motivated to the use of removable splints used to ensure the retention and stabilization after orthodontic treatment accomplishment.^{8,13} For that, retention with fixed splints is generally more accepted as an effective technique.¹³ In this case, the non-motivation of the patient to wear removable splints caused an aggravation of the periodontal disease with tooth migration, mobility, diastemas reopening, and recessions. For that, a fixed splint on the maxillary anterior teeth was planned and placed for both retention and periodontal splint. Because of the presence of a deep bite, the palatal splinting of the anterior maxillary teeth would present problems with occlusion and restoration. The facial approach to stabilize the incisors has many advantages: the occlusal stops are maintained on sound tooth structure and the splint has a better functional position, because forces developed during protrusive movements have major facial components and are more easily controlled. If the splint was placed on the lingual surface, the composite resin would be susceptible to wear in function, compromising the strength of the splint. The most conservative splint combine acid etch bonded, ribbon reinforced composite resin technique.¹³ Having virtually no memory, Ribbon adapts to the contours of the teeth and dental arch. It is translucent, and disappears within the composite or porcelain without show-through offering excellent esthetics. Ribbon fibers are the standard in biocompatibility.¹⁴

In case of diastemas, tooth size discrepancy, papilla loss, and smile designing, ceramic laminates are considered as a minimally invasive esthetical restoration due to their high aesthetic appeal, as well as their proven biocompatibility and long-term predictability. However, Teeth with reduced crown structure or in case of severe bruxism, and high carious activity are contra-indicated.¹¹

Survival rate of veneers which has been estimated to 97,5% by Camillo d'Arcangelo et al ¹⁰ depends on material properties and fatigue resistance of ceramic and adhesive/ luting cement systems used. Further factors for clinical success are marginal adaptation of the veneer restoration, tooth preparation design, functional and morphological condition of the abutment tooth.⁹⁻

¹¹ One of the most important advantages of bonded porcelain veneers is that they are extremely conservative in terms of tooth reduction. This minimal reduction rarely, if ever, leads to pulpal involvement which is a major advantage. The highly

glazed surface of the porcelain laminates prevents plaque accumulation, considered important to attain a healthy periodontal response.⁹The preparation, cementation, and finishing procedures adopted are considered key factors for the long-term success and aesthetical result of the veneer restorations. To achieve the esthetic of veneers, and according to the clinical indication, a high intension must be present when selecting the appropriate ceramic material. In this case, the use of high resistant ceramic was indicated, since they show good esthetic qualities combined to adequate resistance to fracture. Thus, it helped for shape and size modifying purposes.

Conclusion

Porcelain laminate veneers may be a suitable solution for diastemas, and open gingival embrasures closure after orthodontic treatment for patients with a reduced periodontium, if well selected. However, non-motivated patients for removable splint need a fixed one, as well as an esthetic restorative treatment. Thanks to the development of fiber reinforced technologies for splinting besides the high range of resistant ceramics, size and morphology modifications associated with translucent splinting procedures are currently allowed within a minimal tooth reduction.

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Figure 1: Front view of patient's smile showing the extruded lateral incisors with open gingival embrasures



Figure 2: Intra-orally photograph showing the diastema between central and lateral incisors, and the marginal gingival discrepancy



Figure 3: Panoramic X-ray showing the horizontal bone defects



Figure 4: Starting teeth preparation within the mock-up



Figure 5: Prepared teeth after splinting procedure with Ribbond



Figure 6: Porcelain laminates designed by CAD/CAM



Figure 7: Front view of patient's smile with bonded veneers



Figure 8: Lateral view of the patient's smile