

The Periodontal-Orthodontic Interface: A Simple Solution to a Difficult Problem

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Abstract. *A technique which combines the use of a sectional fixed and removable appliance in periodontally compromised dentitions is described. The rationale behind treatment in these patients is discussed and the relative advantages over other techniques highlighted.*

Index words: Orthodontics, Periodontal, Removable Appliances, Sectional Fixed Appliances.

Introduction

With an increasing number of adult patients now seeking orthodontic treatment (Gottlieb *et al.*, 1991; Salonen *et al.*, 1992), the problems of a dentition affected by chronic periodontitis are more likely to be encountered. The primary motivating factor in adults seeking orthodontic treatment is a desire to improve their dental appearance (McKiernan *et al.*, 1992). The localized loss of periodontal attachment can result in these patients presenting with varying degrees of over-eruption, tipping, drifting, and rotations predominantly seen in the upper labial segment (Heasman *et al.*, 1994).

Prior to undertaking any orthodontic treatment, the periodontal tissues must be stabilized with the creation of a healthy periodontium, devoid of any active inflammatory disease. There is a need for a professional maintenance programme during orthodontic treatment, aimed specifically at preventing repopulation of pockets with periodontopathic organisms (Lisgarten and Levin, 1981).

When planning orthodontic treatment for any particular malocclusion it becomes necessary to evaluate the type and sequence of tooth movements required to achieve the overall aims. It has been reported that apart from the simple tipping movements of favourably inclined teeth over short distances, removable appliances are unlikely to produce satisfactory results (Reay and Stephens, 1993). However, the use of a removable appliance to either commence treatment or as an adjunct to fixed appliance therapy should not be underestimated. It is with this in mind that the present article describes a simple, but yet very effective approach to the alignment of the maxillary teeth in periodontally compromised dentitions.

Appliance Technique

In all patients, prior to undertaking any orthodontic treatment, the periodontal tissues were stabilized. During orthodontic treatment a professional periodontal maintenance programme was adhered to which included 3-monthly visits to an oral hygienist for instruction on hygiene and subgingival debridement at sites that showed bleeding on probing.

Active orthodontic treatment commenced by placement of 0.022 × 0.028-inch pre-adjusted edgewise brackets (Forestadent Ltd) with Andrew's Prescription on the six maxillary anterior teeth. A round 0.014-inch superelastic nickel-titanium (NiTi) sectional alignment archwire was then engaged. At the same visit, a heat-cured upper removable appliance was fitted in an attempt to reduce the risk of fracture occurring in the baseplate. The design features of which include: Adam's clasps on 64/46 and a buccal arm, soldered to the 44 clasp bridge, incorporating a helix for additional flexibility and a hook for the attachment of elastics (Figs 2a,b and 5a,b). In designing the removable appliance, particular care needs to be observed with regard to the positioning of the buccal arms such that they are sufficiently high to enable light intrusive forces of 100–125g to be applied to the anterior teeth without resulting in soft tissue trauma. The placement of the buccal arm should therefore lie just distal to the long axis of the canine at a height of one-third along the length of its root from the crown. The patient was then instructed on appliance insertion, attachment and placement of the intra-oral elastics coronal to the brackets on the anterior teeth. The patient was instructed to change the elastics every 2 days and reviewed at monthly intervals. The archwire sequence progressed from the round super-elastic NiTi to rectangular NiTi and finally to a rectangular stainless steel sectional arch. Following their correction in position, in all three planes of space, the teeth were stabilized by a bonded retainer placed onto the palatal surfaces of the six anterior teeth (Zachrisson, 1982) in addition to a Hawley retainer.

Two cases are presented, utilizing this technique. Both cases had been diagnosed as suffering from chronic periodontitis with some of the cardinal signs of a periodontally compromised dentition being present in the upper labial segments. An initial course of periodontal therapy had been undertaken to stabilise the periodontal tissues prior to any orthodontic treatment. Strict plaque control measures, with particular emphasis on subgingival cleaning, were introduced along with supra- and subgingival scaling. The periodontal status was then re-evaluated on a regular basis with plaque deposits being monitored. The orthodontic treatment was commenced after a period of 6 months, when it was felt that the periodontal tissues had been

stabilized and where devoid of active inflammation. As stated earlier, during orthodontic treatment a professional periodontal maintenance programme was adhered to.

Figs 2a-c illustrate the appliance system in place (the archwire can be seen in place in Fig. 2c). Active treatment was completed within 6 months and the patient was delighted with the result (Figs 3a-f).

Case 1

This case illustrates a 29-year-old patient who requested only a simple solution to her primary concern, which was the excess show on smiling of her maxillary anterior teeth and their malalignment (Figures 1a-f). The patient presented with a class II division I malocclusion on a mild Skeletal II pattern with bimaxillary protrusion. The lower labial segment showed mild crowding whilst the upper labial segment demonstrated drifting, rotation and over-eruption. Treatment was thus limited to the upper arch and

Case 2

This case illustrates the flexibility of the reported technique. The patient was 19 years old and presented with a severe Skeletal II anomaly, characterized by a retrognathic mandible and a reduced lower anterior face height. The lips were incompetent at rest and there was an obvious lower lip trap and excessive incisor display at rest (Fig. 4a-f). A combined surgical-orthodontic solution was opted for by the patient. In order to facilitate presurgical

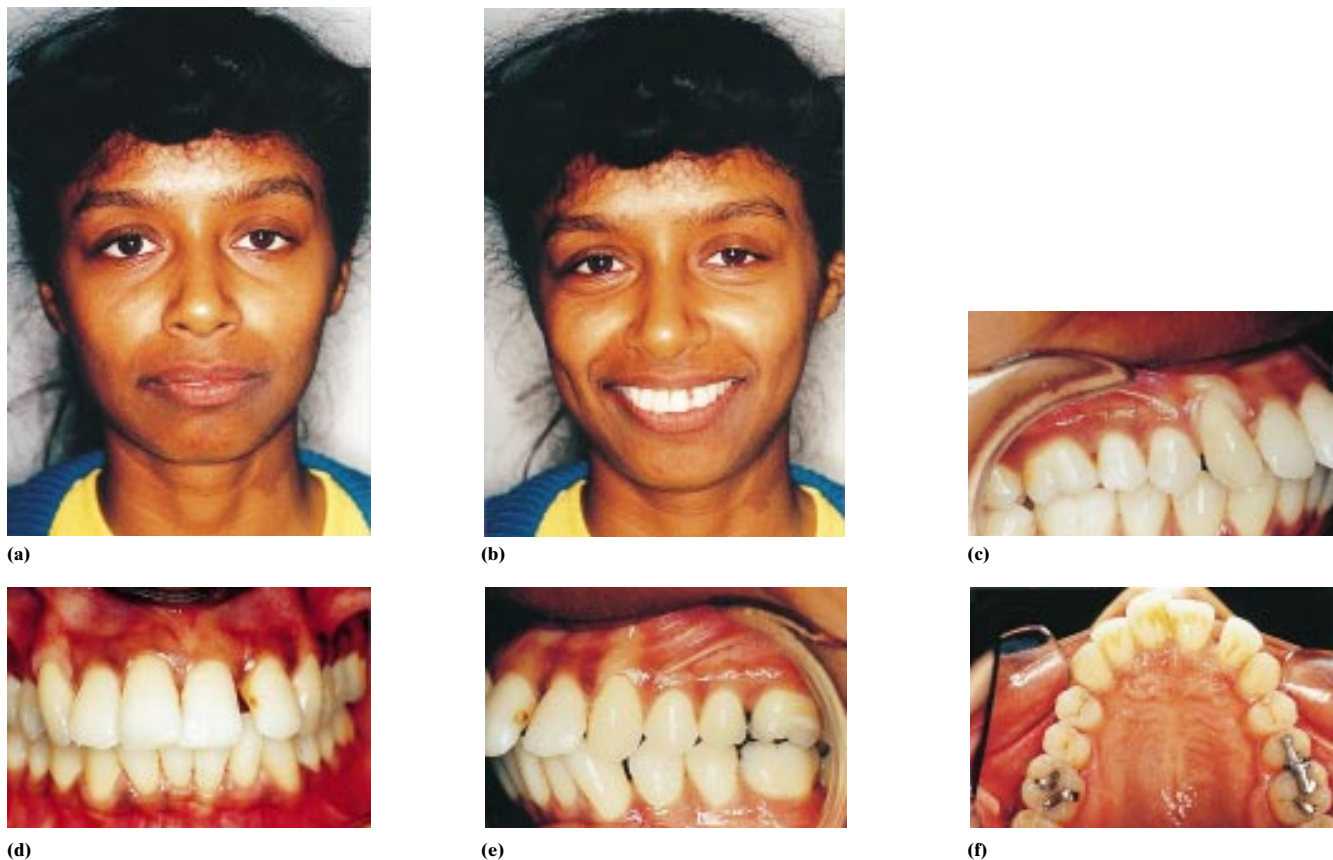


FIG. 1 (a-f) Pretreatment photographs showing the increased exposure of the upper incisors on smiling, along with spacing and malalignment in the upper labial segment.



FIG. 2 Illustrates the sectional fixed and removable appliance system in place. (a) Front view. (b and c) Lateral views demonstrating the positioning of the buccal arms to deliver a posterosuperior direction of pull in order to achieve intrusion of the anterior teeth.



FIG. 3 (a-f) End of active treatment photographs with good alignment and intrusion being achieved in the upper labial segment.

orthodontics the appliance technique described above was employed, with treatment confined to the upper arch in the first instance (Fig. 5a,b). In view of the fact that only the four incisors showed over-eruption the intra-oral elastics were only engaged under these brackets, to achieve optimal intrusion. Following upper incisor intrusion lower fixed appliance treatment was able to proceed and arch levelling was completed by placement of full archwires (Fig. 6a-c). Surgery involved a forward mandibular slide and maxillary impaction, with a very satisfactory outcome (Fig. 7a-f).

Discussion

The simultaneous use of a sectional fixed and removable appliance in this manner offers a number of advantages to a periodontally compromised dentition:

1. It enables incisor intrusion to be obtained with the use of light (100–125 g) measurable forces.
2. Provides valuable anchorage control in all three planes of space.
3. Facilitates controlled tooth movements, such as root torque and rotational control.
4. Maintains posterior arch form.
5. Facilitates oral hygiene control.
6. Helps monitor patient compliance and appliance care.
7. Relatively inexpensive.

There are, however, disadvantages to the technique.

1. Dependent on patient co-operation.
2. Risk of candidal infection.
3. Difficulties with mastication and speech.
4. Risk of enamel demineralization/caries.
5. Increased plaque stagnation.

The technique offers a valuable solution to what might otherwise involve more complex treatment mechanics. It is important that any appliance system utilized in patients with a history of chronic periodontitis should facilitate optimal oral hygiene and the use of molar bands is to be avoided (Diamanti-Kipiotti *et al.*, 1987). The use of brackets on the six anterior maxillary teeth and a removable appliance is of particular value.

The work of Melsen *et al.* (1988) demonstrated that orthodontic intrusion with light forces, on periodontally involved teeth in monkeys, increased the amount of new attachment formed. It is also important to appreciate that the loss of alveolar bone results in the centre to resistance, of the involved teeth, moving apically with the net effect being that the teeth are more prone to tipping instead of bodily movement (Williams *et al.*, 1982). Furthermore, the correction of a deep overbite and arch levelling in non-growing patients through molar extrusion is thought to be unstable as vertical condylar and alveolar bone growth is unlikely to occur to any significant extent and the use of segmental arch mechanics to provide incisor intrusion has been recommended (Burstone, 1977).



FIG. 4 (a-f) Pretreatment photographs showing mandibular retrognathism, excessive incisor display at rest, and a marked disparity between the vertical heights of the upper labial and upper buccal segments.

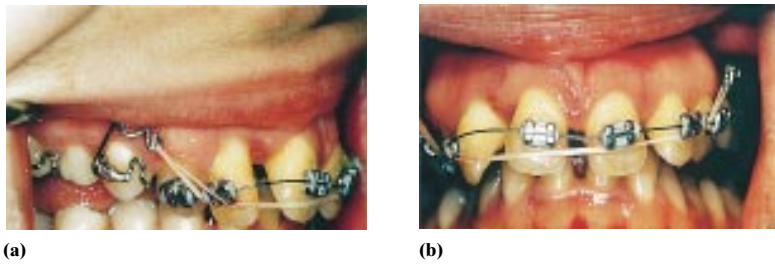


FIG. 5 (a,b) Front and lateral views illustrating the sectional fixed and removable appliance system in place.



FIG. 6 (a-c) Presurgical photographs demonstrating placement of 0.019 x 0.025-inch rectangular stainless steel archwires in both upper and lower arches, facilitated by the intrusion of the upper labial segment.

The planning of retention and stability of orthodontic treatment requires greater consideration in periodontally compromised dentitions. The teeth have an increased tendency to resume their pretreatment positions as biological remodelling of the supporting tissues takes longer

(Heasman *et al.*, 1994). The use of a bonded retainer helps to maintain alignment, rotational control, and space closure. The use of a Hawley retainer, on a full-time basis for 1 year, permitted the overjet correction to be maintained, whilst the soft tissues adapted to the new



FIG. 7 (a–e) End of treatment photographs illustrating good facial and dental aesthetics.

incisor positions. The retainer further serves as a stand-by retainer following this initial retention period should failure of a splint component occur.

Conclusions

The combination of the sectional fixed and removable appliance system, in periodontally compromised dentitions, enables forces to be very carefully controlled in both magnitude and direction with minimal complexity and chair-side time, whilst facilitating optimal oral hygiene.

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