Tooth Movement With Vacuum Formed Retainer: A Case Report

Abstract
Nowadays, the adult patients demand for aesthetic alternatives other than casual orthodontic treatment is increasing. The current case report introduces a technique of correcting a minor crowding of maxillary incisors in an adult patient using a combination of thermoplastic retainer and bonded composite buttons as force delivering appliance. Treatment plan, protocol, progress and post retention pictures are presented throughout this article.

Key words: Aesthetic alternatives, Thermoplastic retainer, Bonded composite buttons.

Introduction
Adult patients are getting more interested in orthodontic treatment nowadays. This interest increased the demand for aesthetic alternatives to conventional fixed stainless-steel appliances. Lingual fixed appliances, ceramic brackets and removable appliances are the aesthetic alternative offered by the profession. Although the removable appliances cannot offer the wide range of movements such as the fixed appliances, in minor crowding cases such as post treatment relapse, removable appliances can produce equally good results as the fixed appliance when tipping movements are required. Removable appliances have the advantage of saving chair-side time.

In 1945 Kesling introduced the tooth positioner appliance as a finishing device to achieve minor tooth movements. Major movements can be accomplished with a series of positioners, by changing the teeth on the setup slightly as treatment progresses. Align Technology developed an “invisible” method of orthodontic treatment (Invisalign) that uses a series of computer-generated, clear removable appliances. Raintree Essix has developed a technique using aligners formed on plaster models and can create tooth movement up to 2-3 mm.

According to Sheridan, the first law of biomechanics states that in order to get tooth movement space, force and time are required. The space is created by Interproximal Reduction (IPR) with stainless steel strips or slow-speed discs and burs, or by Air-Rotor Stripping using high-speed burs. The force is applied by means of bumps formed at specific sites in the aligners using either Essix Divoter or the Hilliard Precision Thermoplier. In addition, windows should be cut with fine burs creating the space into which the teeth will move. The appliance should be worn full-time except while eating. The expected tooth movement is approximately 1mm per month.

Aim of this Article
Through this case report, we are presenting an alternative for correcting minor crowding using the concept of the aligners relying on a thermoplastic splint associated with composite buttons.

Case Presentation
A female patient (20 years old) presented to the Lebanese University complaining of crowding of her maxillary left central and lateral incisors. Her extraoral examination showed proper horizontal and vertical proportions but her upper lip is short, her profile is straight and her smile is not consonant with the lower lip (Fig. 1).

The intraoral examination shows weak Class I molar and canine on both sides. The overjet equals 3 mm and the overbite is 35%. The mandibular midline is on and the maxillary midline is deviated by 0.5 mm to the right relative to facial midline (Fig. 2).

The cephalometric analysis shows the presence of a prognathic maxilla and a normodivergent pattern, retroclined maxillary incisors and proclined mandibular incisors. The panoramic showed normal anatomic structures, missing maxillary third molars and multiple restorations. The frontal cephalogram showed symmetry and normal transverse relationship (Fig. 3).
Figure 1: Anterior and lateral extra-oral views

Figure 2: Intra-oral photographs

Figure 3: Frontal and lateral cephalograms with measurements and panoramic radiograph

SN=77 (70mm)
SN/H=10 (8)
SNA=82 (82)
SNB=76 (80)
ANB=6 (2)

PP/MP=24 (27)
PP/H=0 (0)
MP/SSN=33 (32)
MP/H=24 (25)
Normodivergent pattern

SN/A=10(22) -1 (4mm)
VSN=95 (104)
V/PP=105 (110)

Retroclined maxillary incisors

i/NB=31 (25)
i/Nb=6 (4mm)
i/Apo=26 (22)
i/Apo=2 (2mm)
i/MP=100 (90)

Proclined mandibular incisors

Figure 4: Photographs showing arch length deficiency
Treatment options
Two treatment options were offered for the patient:

1st option: Full maxillary and mandibular fixed appliances for the purpose of aligning and leveling and uprighting the mandibular right second molar.

2nd option: Correct the crowding on the maxillary incisors using a removable thermoplastic splint with composite buttons on the palatal side of the maxillary left central incisor and on the buccal side of the maxillary left lateral incisor.

Treatment protocol
The patient opted for the second option. An alginate impression was first taken and sent to the laboratory, one week after we received the thermoplastic retainer. The next step was to plan the movements in order to accurately bond the composite buttons on the teeth and then create windows through which the teeth will move. The windows were exactly equal in size to the moving tooth; the thermoplastic retainer was hard so no risk of breakage or bad retention was presented. The clinical examination showed that the maxillary left central incisor was rotated mesio-palataly and the left lateral incisor was tipped bucally (Fig. 4). In order to correct the misalignment of the incisors, space, force and time are needed. The space required was 1.5 mm. Enamel stripping using abrasive strips were performed to acquire the space needed. The enamel of the distal side of the central and...
both proximal sides of the lateral incisor has been stripped. The stripping was done sequentially: about 0.5 mm in each appointment. The force was planned in order to rotate the central incisor mesio buccaly and push the lateral incisor palatally. A composite button was bonded on the distal part of the palatal aspect of the central incisor and on the middle third of the buccal aspect of the lateral incisor. The composite buttons were about 1 mm thick (Fig. 5). To clear the way for the teeth to be moved, two windows were created in the thermoplastic splint using scissors. The first window was palatal to the lateral incisor and the second was buccal to the central incisor (Fig. 6). The patient was instructed to wear the splint 24 hours and only remove it during eating and brushing.

**Treatment results**
The patient was compliant wearing her appliance and was warned that the seating will improve over time. Alignment progressed gradually. At each appointment, stripping was performed and composite buttons were added, in order to create pressure at the location needed. After 4 months of treatment, complete alignment was attained (Fig. 7).

Aesthetical grinding of the edges of the incisors was done (Fig. 8). For retaining the results, a new thermoplastic splint was delivered to the patient. The patient was instructed to wear it 24 hours per day.

Nine months following treatment the patient presented for new records. The results were stable, the alignment was perfect (Fig. 9).

**Discussion**
The option of treatment presented throughout this case report offered many advantages for the patient than the fixed bimaxillary appliances. First the treatment was aesthetic and less cumbersome, second the treatment time was less and third the cost of treatment was much more less and in terms of stability the post retention records showed a great stability 9 months following treatment.

**Conclusion**
The previous case report offered a simple, aesthetic and inexpensive alternative to fixed appliances. Fixed appliances are often a frustrating option to adult patients complaining of minor crowding.

**References**