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CLINICAL SECTION

Essix®-based molar distalization appliance

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A new design of molar distalization appliance and its fabrication are described in this article. This case report illustrates distal movement of mandibular molars with negligible loss of anterior anchorage. This new vacuum-formed Essix appliance can be a reasonable alternative to conventional appliances.

Key words: Essix, new appliance design, molar distalization

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Introduction

A new thermoplastic appliance called Essix® (Raintree Essix, Inc., 4001 Division St, Metairie, LA 70002, USA) was first introduced as a retainer by Sheridan and colleagues in 1993.[1] Since then, various usages of Essix have been described by several authors.[2–6] Sheridan and colleagues[7,8] used divots, windows and thermosealing, and Rinchuse and Rinchuse[9] used a spring added to the Essix plates in order to maintain tooth movement.

There are two types of Essix plastics: types A and C. Typical applications for type A are for minor tooth movement with divots and windows, bite planes, TMJ splints and intrusion appliances. Type A must be used when bonding acrylic to the appliance. Essix type C plastic has poorer aesthetics compared with type A, but its abrasion resistance is better than Type A. Type C is best used for anterior and full arch retainers.[10]

The removable Essix appliance can also be used for distalization. The purpose of this article is to describe the fabrication of an aesthetic Essix-based molar distalization appliance.

The laboratory technique

The fabrication sequence for the Essix-based molar distalization appliance is described on a demonstration case as follows:

- A polyvinyl siloxane or an accurate alginate impression must be taken to encompass the complete dentition and one-third of the alveolus. A working cast is obtained from quality die stone. To increase the efficiency of thermoforming, the long axis of the incisors should be perpendicular to the base of the cast and ideally, the cast should only be about 2 cm high.
- Vacuum a 0.040-inch (1 mm) sheet of Essix type A plastic over the prepared model, remove from the vacuum machine and allow it to cool. Do not cut off the excess plastic around the model (Figure 1).
- Place expansion screws (Dentaurum, Turmstrasse 31, 75228 Ispringen, Germany) just mesial to the molars, while the Essix appliance is on the model (Figure 2).
- To keep the orthodontic acrylic (to be added to the Essix plastic) minimal in the buccal sections, box out the vestibular aspects with baseplate wax. Apply the orthodontic acrylic only to the lingual side of the appliance (Figure 3).
- Cut away the plastic with a wheel saw and remove the appliance from the model after polymerization. Trim the lingual border of appliance in the same manner as

Figure 1 Thermoform a sheet of 0.040-inch type 'A' Essix material over the cast

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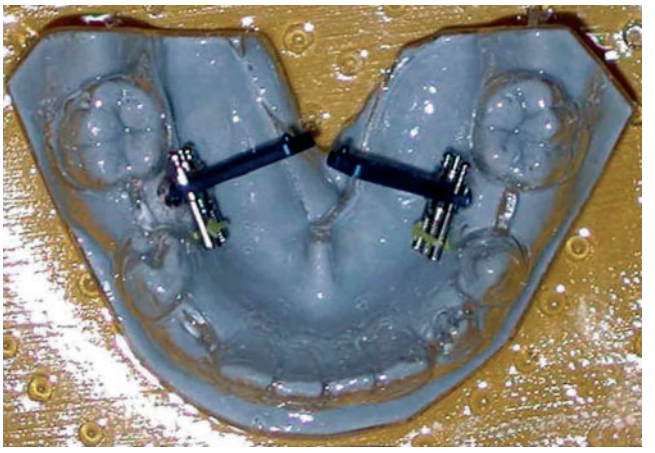

Figure 2 The screws are placed on the model

a conventional removable appliance. However, the Essix plate must be extended 3–4 mm onto the gingivae on the buccal side. On the working cast, remove the sections of the appliance covering the occlusal surfaces of erupting teeth. Finalize the fabrication by polishing (Figure 4a–c).

The clinical technique

The patient must wear the distalization appliance full-time, except during eating and cleaning. The appliance and the teeth must be rinsed after drinking any acid-containing beverages, such as fizzy drinks or fruit juice. These fluids can cause demineralization of the enamel if they are not rinsed from the appliance.

The appliance must be cleaned with a toothbrush and a commercial retainer cleaner. Toothpaste should not be used because its fine abrasive particles scratch the surface of the appliance and thus will compromise the aesthetic appearance.[11]

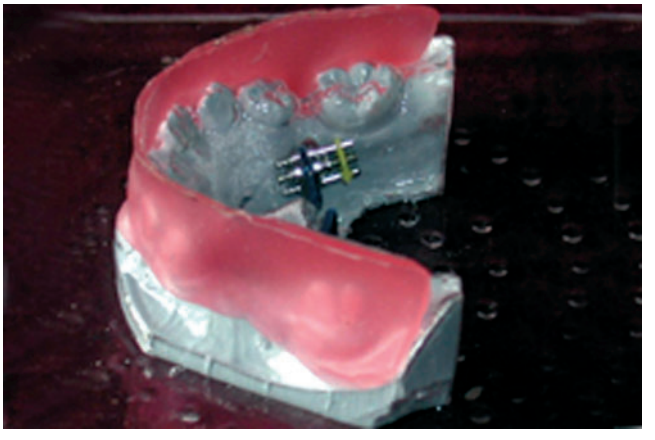

Figure 3 The buccal vestibule is boxed out with baseplate wax

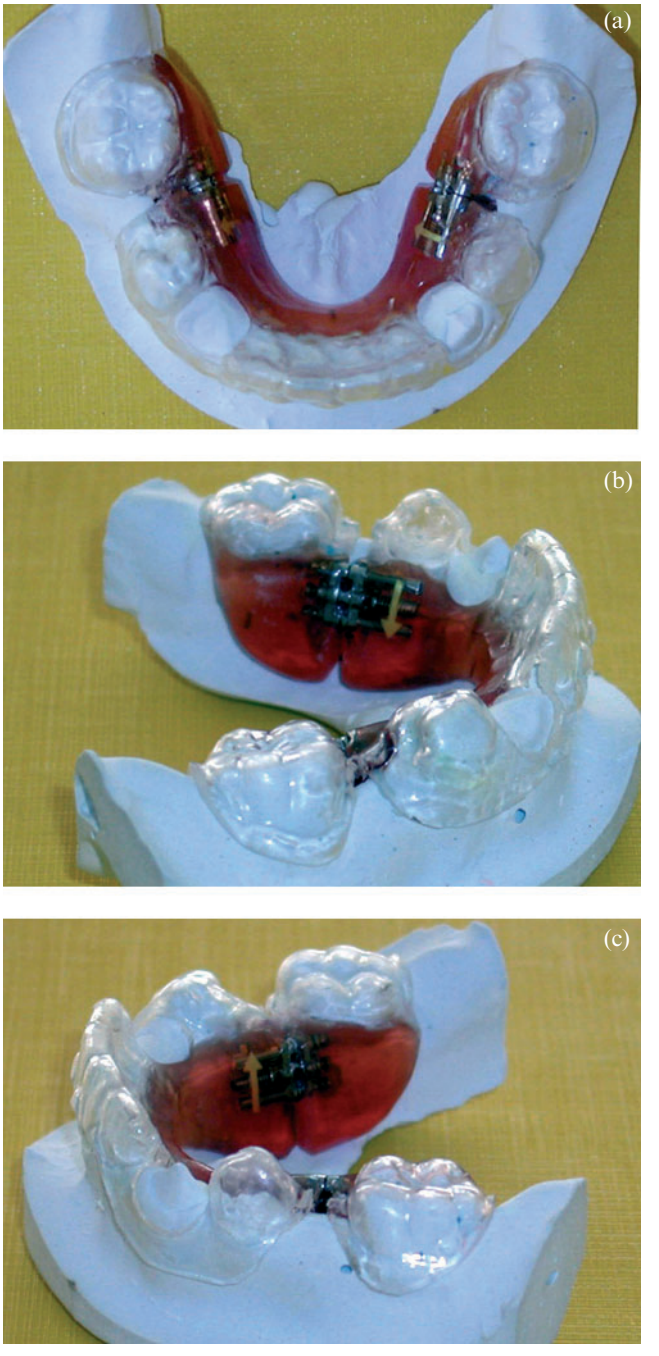

Figure 4 (a–c) The appliance from above and buccally showing acrylic lingually and extension of the Essix buccally. Note that sections of the appliance covering the occlusal surfaces of erupting teeth are removed

Case

An 8-year-old male patient in the mixed dentition displayed molars that had drifted mesially due to the early loss of deciduous second molars. The panoramic radiograph revealed that the left and right first

Figure 5 Pre-treatment panoramic radiograph

Figure 7 Intra-oral view after distalization

mandibular molars were tipped mesially into the eruption path of the unerupted second premolars (Figure 5). The Hays Nance[12] analysis indicated that 1.8 mm of space was required for each quadrant. Thus, in total, 3.6 mm of space was required. The patient was instructed to wear the appliance full-time, except during eating and cleaning, and instructed to activate both screws a quarter of a turn once every 4 days (a quarter turn approximates 0.09 mm) (Figure 6). After 21 activations, the required space for the eruption of mandibular second premolars had been achieved with distal movement of the molars occurring over a period of two months and one week (Figure 7). The same appliance was then worn as a retainer for 2 months.

Cephalometric analysis

The pre- and post-treatment cephalometric films (Figure 8a,b) were used for cephalometric assessment.

Figure 6 Intra-oral view of the appliance

An interval of three months separated the two radiographs, and no clinically significant changes in the cephalometric values could be seen (Table 1). Bodily movement of molars was measured as the distance from the reference planes, which were constructed as a tangent to the posterior margin of the symphysis that was perpendicular to the mandibular plane, and a parallel line passing through the furcation. The distance between these two reference points along the mandibular plane indicated the bodily movement of the molars (Figure 9).[13] A tangent to the occlusal surface of the first molar was constructed and a perpendicular line was drawn passing through the furcation. The superior-anterior angle was measured to assess molar angulation (Figure 10).[13] According to the reference planes, 1.8 mm of distalization and 4° distal tipping of the molars was achieved. The lower incisor to mandibular plane angle was increased 1° (see Table 1). The cephalometric superimposition of pre- and post-treatment tracings is illustrated in Figure 11 and was made on the corpus axis at PM. It shows the distal movement of the mandibular molars.

Discussion

This report illustrates a case in which mandibular molars have been distalized where they have migrated mesially due to early loss of primary second molars in the mixed dentition. Following the eruption of second molars, it is suggested that clinicians should not attempt to distalize first molars because of unerupted third molars and the dense compact bone character of the retromolar area.

Several methods have been proposed to move mandibular molar distally, e.g. lip bumper,[13] mandibular headgear,[14] Jones jig[15] and skeletal anchorage

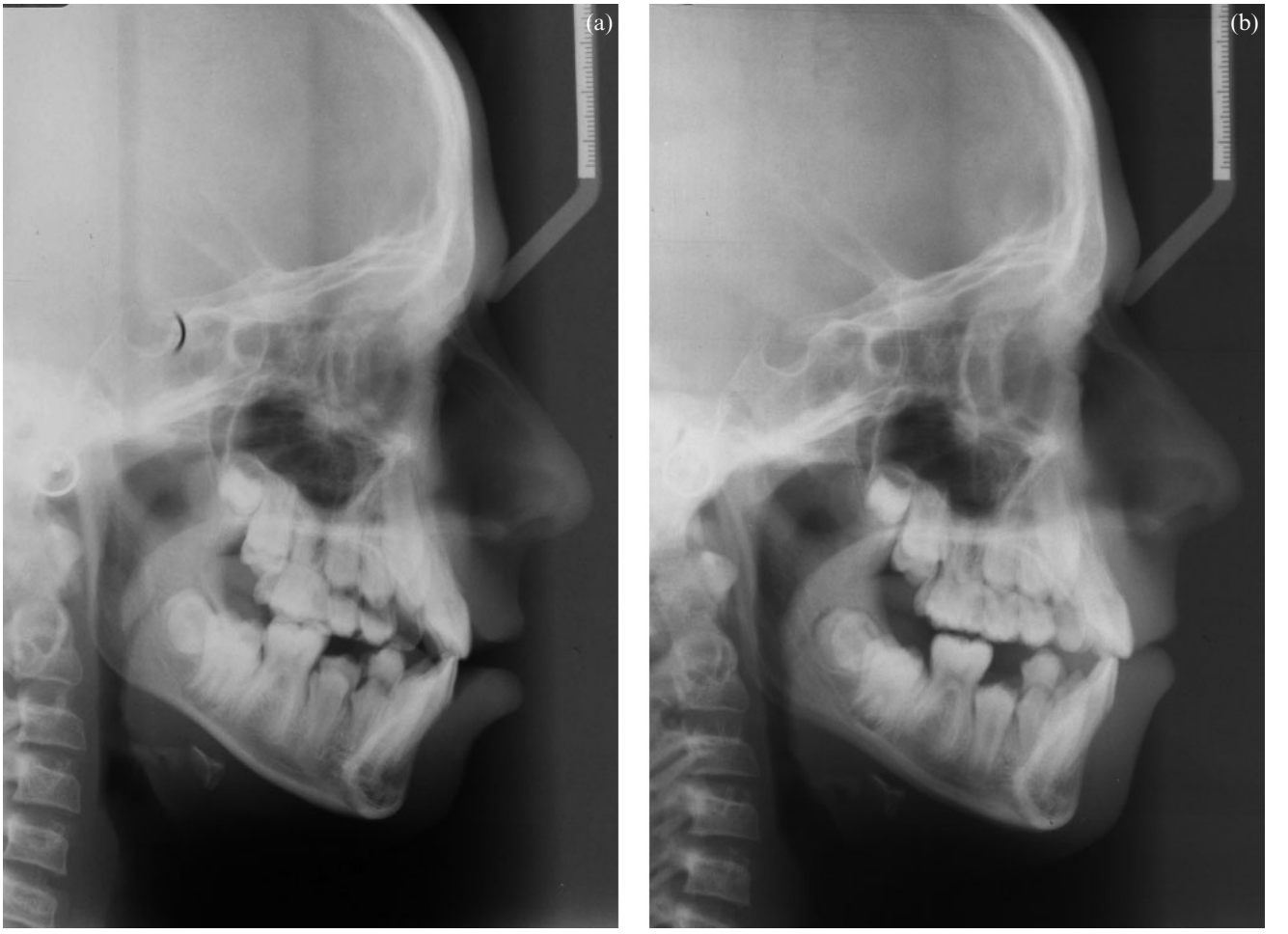

Figure 8 (a) Pre-treatment cephalometric film. (b) Post-treatment cephalometric film

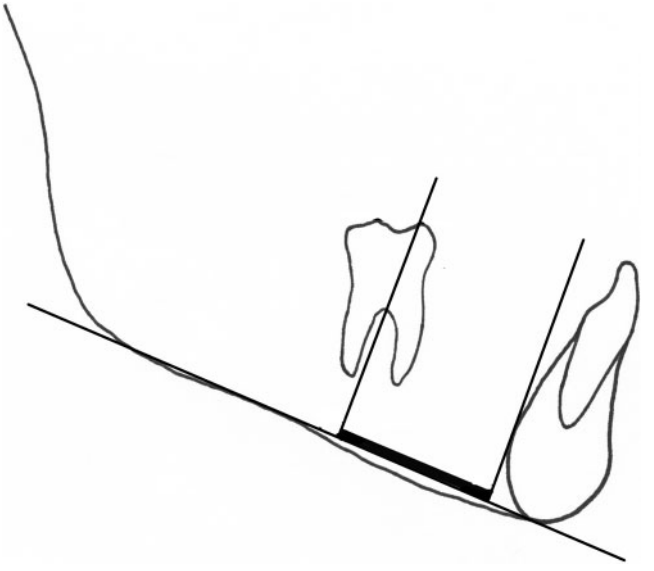

Figure 9 Measurement of bodily movement of first molar (see text for further details)

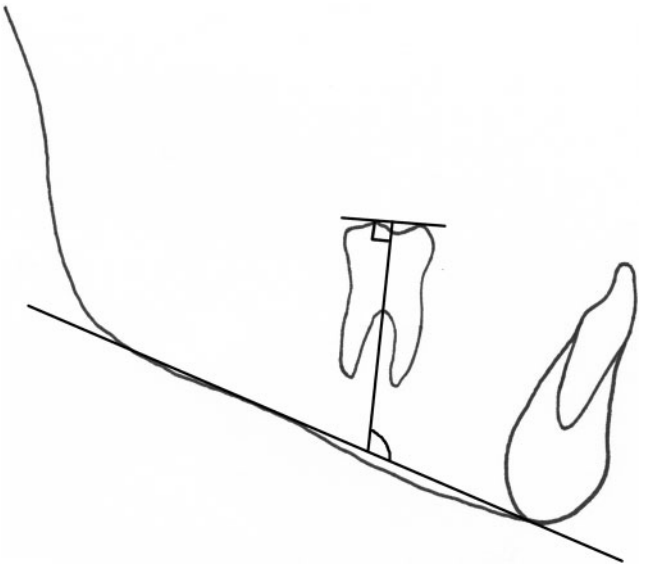

Figure 10 Angulation of the mandibular molar to the mandibular plane (see text for further details)

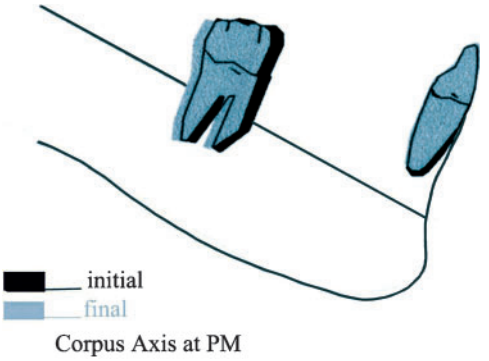

Figure 11 Cephalometric superimposition on the corpus axis at PM (using Quick Ceph Image Pro' diagnostic software). The User Guide definition of 'PM' is: the point where the curvature changes between B-point, and pogonion. Superimposition on other more extensive structures/planes away from the incisors would be beneficial for future assessments

systems.[16] All of these mechanical modalities are part of fixed appliance therapy. However, they have some disadvantages, such as distal tipping and rotation of molars, co-operation problems and unwanted flaring of the lower incisors, i.e. anchorage loss.[13–16]

Distalizing techniques are an integral part of non-extraction treatment. Many methods for moving maxillary molars distally have been described. However, in their systematic review, Atherton and colleagues[17] did not recommend any of these methods in order to move molars distally because of the poor quality of evidence to show that distal movement of molars occurred to any significant extent.

Distalization of molars with removable appliances has previously been attempted by adding screws to traditional Hawley-type appliances and adding finger springs to removable appliances. An Essix-based molar distalization appliance can be considered a reasonable alternative to these traditional removable appliances for use in both the mandible and maxilla. In addition, there are some advantages.

Table 1 Pre- and post-treatment cephalometric values

Angle	Pre-treatment	Post-treatment
SNA	82°	82°
SNB	80°	80°
ANB	2°	2°
GoGNSN	34°	35°
UI/Max plane	105°	106°
LI/Man plane	91°	92°

Since this appliance covers the occlusal surfaces of the lower teeth, this may reduce the occlusal forces from the opposing arch when moving molars distally, which in turn may facilitate the distal movement. The Essix appliance may also (as appears to have been the case here) provide better anchorage than traditional appliances because it covers the teeth both labially and lingually. The retaining component of the traditional removable Hawley-type appliances for the anterior teeth—a point contact of wire on the labial surface and a mass of acrylic approximating the lingual surface—is insufficient.[1] The appliance reported here completely encapsulated the dentition and the superior part of alveolus. Therefore, the stability of anterior teeth may have been increased. In this demonstration case, the angular changes of the anterior teeth were limited to only 1°.

This appliance was aesthetic and comfortable, and thus a high level of patient acceptance was gained. Laboratory time was minimal and the appliance could be placed on the same day that the impression was taken. It can also be used in the mixed dentition.

In conclusion, this newly designed mandibular molar distalization appliance was successful in this case. However, it would now benefit from being tested more rigorously in a prospective trial to assess its value in much greater detail and in relation to other appliances.

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