Tooth Movement with Essix Mounding

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The Essix* system of tooth-moving mechanics is based on the philosophy that the orthodontist should have enough control over a case to make in-course corrections at the chair throughout treatment.[1-3] This can be done without using multiple laboratory-fabricated appliances, without resetting teeth, and without placing force-inducing projections in the plastic with heated pliers.

The present article describes a unique alternative method of producing force by bonding a small mound of composite to the enamel surface of the target tooth rather than altering the Essix appliance. Whether there is a thermoformed projection in the appliance or a mound of composite on the target tooth makes little or no biomechanical difference. Both methods will deliver force to the target tooth as the resilient plastic returns to its resting state. The advantage of mounding is an esthetically smooth plastic surface that is not distorted by placing bumps in it with heated pliers. Every time the depth of a projection is increased, the plastic becomes thinner; conversely, a mound becomes stronger with the placement of additional layers of composite at subsequent patient visits.

Moving teeth with plastic appliances also affords a biomechanical advantage over fixed edgewise appliances in that the application of force is not confined to the width of a bracket slot, but can be directed anywhere on the clinical crown. The location and dimension of the force-inducing mound will determine the type and magnitude of tooth movement. For instance, if the mound is placed incisally, more tipping will be evident; if placed gingivally, more bodily movement will be produced; if placed distally, movement about the mesial vertical axis will occur; if placed mesially, movement about the distal vertical axis will be evident (Fig. 1). Any combination of these movements can be pro-

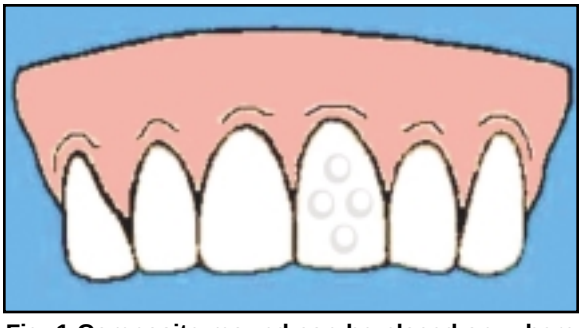

Fig. 1 Composite mound can be placed anywhere on crown of target tooth to effect various tooth movements.

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Fig. 2 Initial mound, about 1mm high, placed with composite-loaded syringe and light-cured.

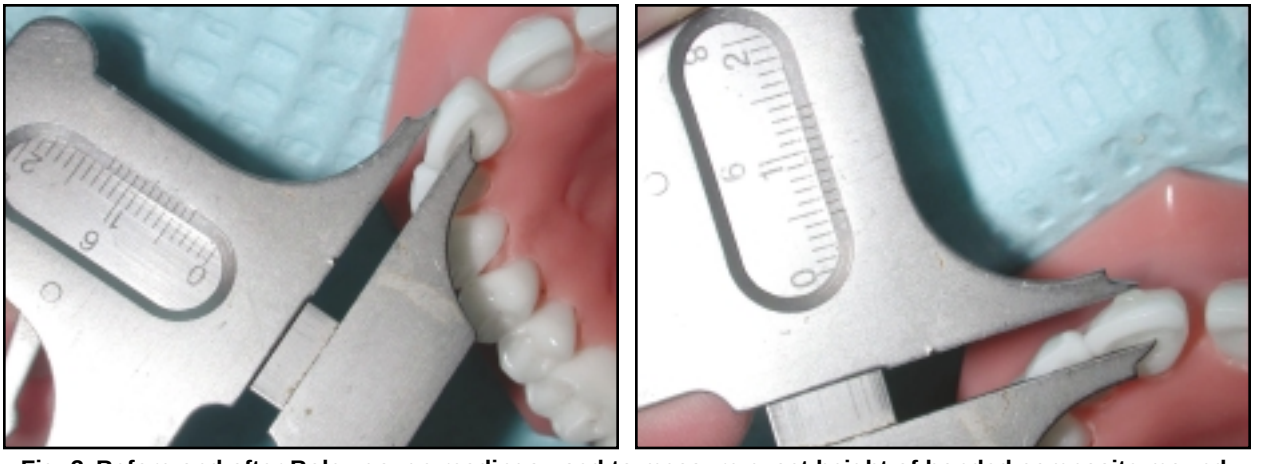

Fig. 3 Before-and-after Boley gauge readings used to measure exact height of bonded composite mound.

duced, making it possible to effectively torque, rotate, mesialize, or distalize teeth by strategically placing the bonded composite mounds and properly designing the Essix appliance.

Placement Procedure

Acid-etch the enamel surface to which the mounding composite will be bonded. The etched area should be no greater than 2-3mm in diameter; it is neither necessary nor advisable to etch the entire enamel surface.

Place a 1mm-high mound of composite on the etched enamel surface. This is most efficiently done with a composite-loaded syringe (Fig. 2). Any standard bonding composite will blend with the color of the enamel. The height of the composite mound can be measured with a Boley gauge before and after curing (Fig. 3). If necessary, the mound can be quickly amplified by adding a layer of composite or reduced with a sandpaper disk.

Insert the previously thermoformed Essix appliance in the mouth. It will press against the mound as it returns to its resting state, inducing tooth movement proportional to the height of the mound. If the patient feels pressure on the target tooth, the size of the mound is usually adequate. If no pressure is felt, add a small amount of composite. At times, the patient may feel no pressure when the appliance is seated, but will experience a proprioceptive feeling of force after it has been in place for 30 seconds and then removed. This indicates that there is adequate force to effect tooth movement. On the other hand, if the force is so great that the appliance is difficult to seat, reduce the height of the mound with a sandpaper disk.

The appliance should be worn full-time, except for eating and cleaning. At subsequent visits, add composite layers to the original mound to produce additional force and thus additional movement with the same plastic appliance (Fig. 4).

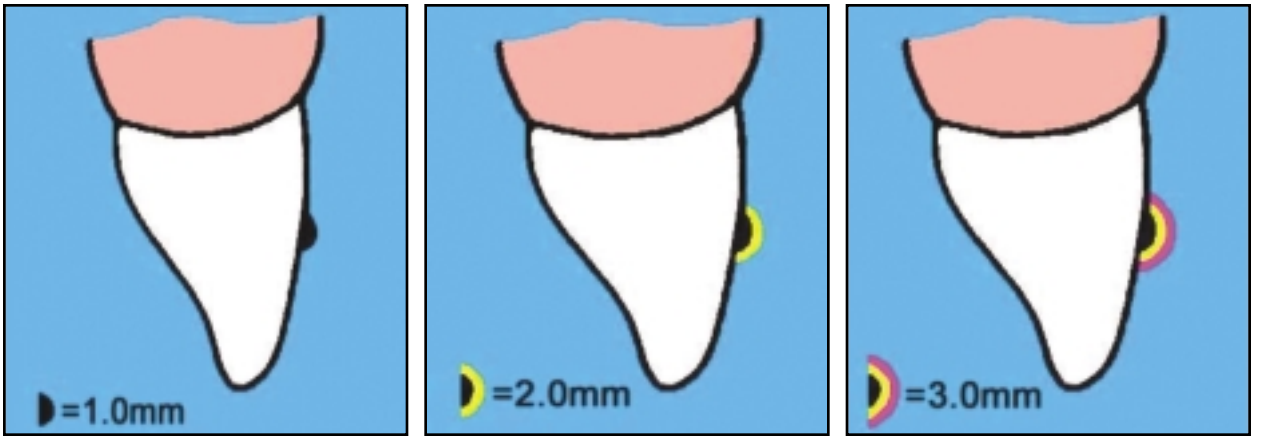

Fig. 4 Layers of composite added to initial mound at subsequent appointments for sequential tooth movement.

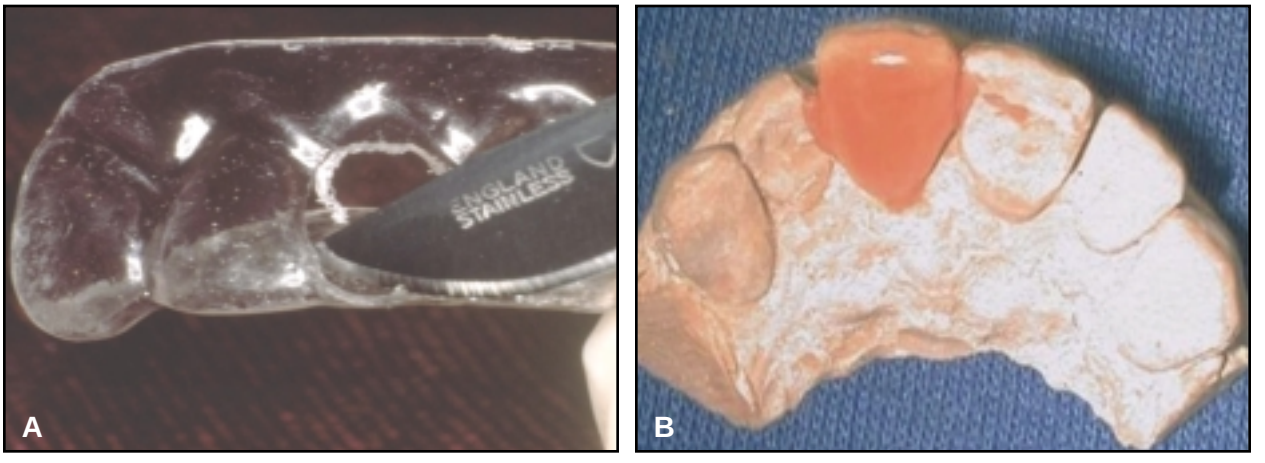

Fig. 5 Methods of creating space within appliance for tooth movement. A. Cutting window in thermoformed appliance. B. Blocking out working cast with Triad gel.

Obtaining Space to Resolve Crowding

Essix tooth movement is usually prescribed for the adult patient with mild-to-moderate alignment problems who, for whatever reason, does not want to wear fixed appliances. The patient's chief complaint usually concerns crowding of the anterior teeth, the resolution of which requires space either in the arch or in the appliance, or both.

Space generation within the arch by extraction or expansion should be approached cautiously, because finishing such a case will stress the capability of any plastic tooth-moving appliance. On the other hand, interproximal reduction can usually generate the space required to resolve mild-to-moderate crowding without appreciatively changing the basic arch dimensions or inducing pathology.[4,5]

Space generation within the appliance is obtained by cutting a window in the plastic or by blocking out the cast before thermoforming the plastic over it (Fig. 5). For labial or lingual movement, a window can be cut into the plastic with a bur and the border of the window finished with a scalpel. To leave enough space for the target tooth, it is advisable to err on the side of a larger rather than a smaller window. For rotation correction, and for mesial or distal movement, it's better to create space by blocking out the working cast, preferably with light-cured Triad** gel.

Labial and Lingual Movements

The following case report illustrates the basic principles of composite mounding for labi-

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Fig. 6 A. Labially flared upper lateral incisor requiring interproximal reduction and 2.5mm of lingual movement. B. Composite mound bonded to facial surface of incisor to initiate tooth movement with removable plastic appliance. C. Three layers of composite added to initial mound to achieve proper alignment.

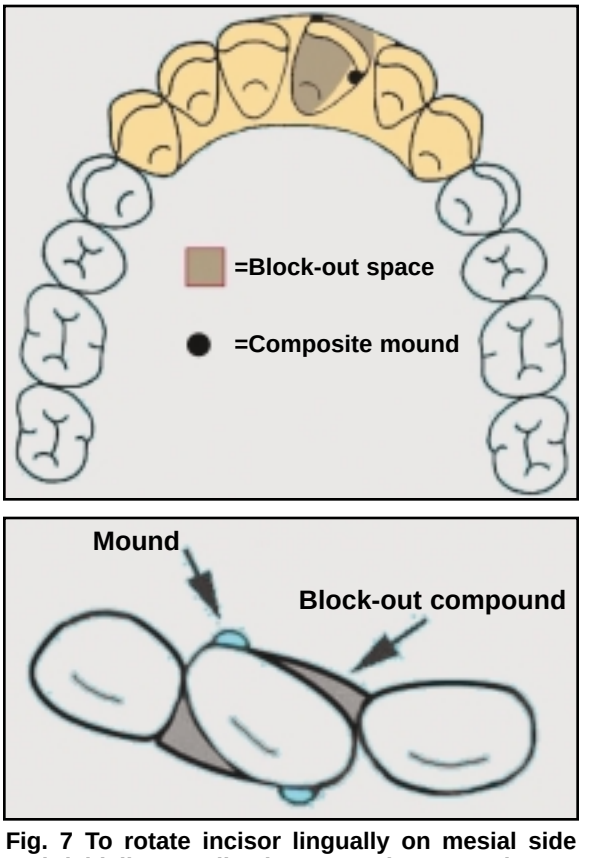

Fig. 7 To rotate incisor lingually on mesial side and labially on distal, composite mounds are placed mesiolabially and distolingually, and cast is blocked out mesiolingually and distolabially.

al and lingual movement and esthetic anterior alignment. An elderly male patient (Dr. Sheridan) had an upper left lateral incisor that was conspicuously out of alignment (Fig. 6A). The buccal intercuspation was acceptable. Correction of the upper lateral incisor required interproximal stripping and 2.5mm of movement to the lingual.

After the stripping was performed and an Essix appliance was fabricated, a mound of composite was bonded to the facial surface of the lateral incisor. A lingual window was cut out of the plastic to establish space for the tooth. When the resilient plastic pressed against the composite mound, tooth movement was initiated (Fig. 6B). Using the same appliance, three composite additions (two of 1mm and one of .5mm) at two-to-three-week intervals created the force necessary for alignment of the lateral incisor in three months (Fig. 6C). The chairtime required for taking impressions, bonding the initial mound to the lateral incisor, and adding the additional composite layers was minimal.

Rotational Movements

Rotation is a three-step procedure: blocking out areas on the working cast for the proximal surfaces to move into, placing composite mounds on the enamel surfaces to be moved, and seating the unaltered plastic appliance. For example, if an incisor is to be rotated lingually on the mesial side and labially on the distal, the mounds are placed mesiolabially and distolingually, and the block-out relief is done mesiolingually and distolabially (Fig. 7).

Interproximal reduction is usually needed to create enough room for the proximal surfaces to rotate. It is best to reduce these surfaces incrementally, in conjunction with the applied rotational force, during successive visits (Fig. 8). If

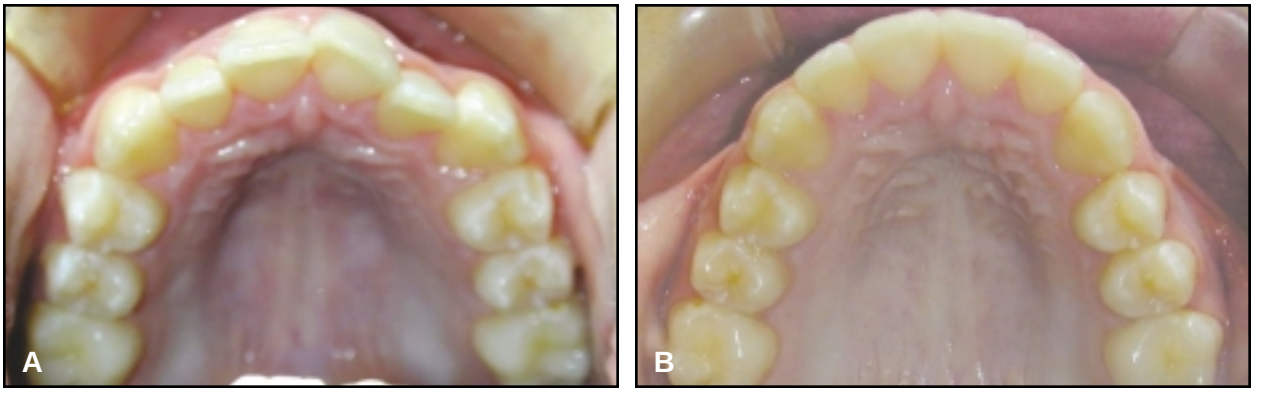

Fig. 8 A. Patient with rotated upper left central incisor and mildly malaligned lateral incisors. B. Rotation corrected by lingual movement of mesial surface and labial movement of facial surface.

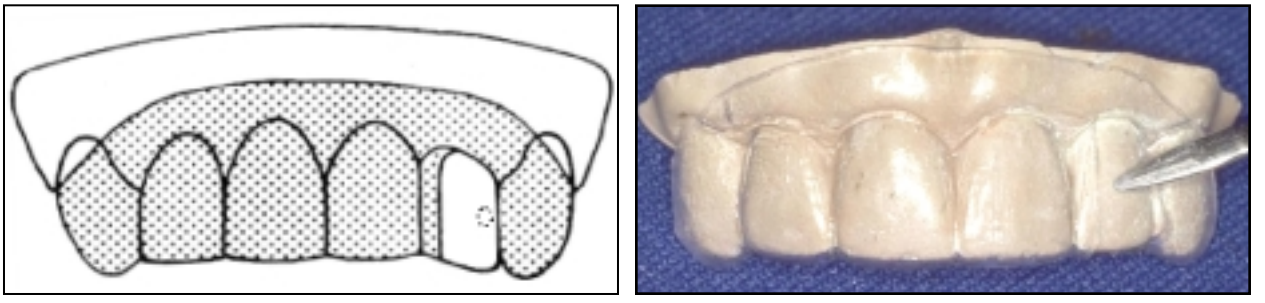

Fig. 9 Distolabial window cut into thermoformed appliance and composite mound placed distolingually to correct distal contact of upper left lateral incisor while maintaining mesial contact.

Fig. 10 Distal contact of upper right lateral incisor held in place within appliance while rotated mesial contact was corrected by sequential interproximal reduction and Essix mounding on mesiofacial surface (case treated by Dr. Tony Soileau, Lafayette, LA).

all the reduction is performed at once, there's a possibility of generating too much space.

If one proximal contact point is in an acceptable position, but the other is out of alignment, the rotation can be corrected while the other contact is maintained (Fig. 9). For instance, to rotate a tooth on the mesial side while holding an acceptable distal contact point, the cast should be blocked out mesiolingually, but not distolabially. The appliance will hold the distal contact in place while the mesial proximal surface pivots labially like a door on a hinge (Fig. 10).

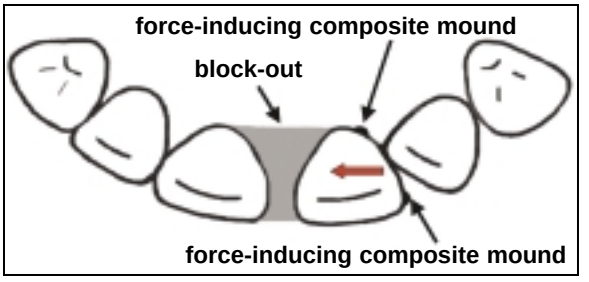

Fig. 11 Blocking out mesial interproximal area on cast creates channel for mesial lateral movement of central incisor when force is produced by resilient plastic pressing against distal composite mounds.

Lateral Movements

For lateral tooth movements, the working cast is blocked out on the side of the tooth where mesial or distal movement is required, thus creating a friction-free channel within the appliance. For example, if an upper central incisor is to move into a created or existing mesial space, Triad gel is placed in the mesial interproximal area of the working cast to allow space for the tooth movement (Fig. 11). After the Essix appliance is constructed, composite mounds are added on the distal of the target tooth. At subsequent visits, the mounds can be augmented for additional movement with the same appliance.

Torquing Movements

In general, root torque is produced by a couple established by equal and opposite parallel moments within the bracket-to-wire complex. With an edgewise appliance, the width of the bracket limits the distance between the moment arms to .022" or .018"—the size of the slot. Mounding is more efficient because the distance between the moments (the cervical mound and the incisal edge) is about 4-5mm rather than thousandths of an inch (Fig. 12).

Most removable devices are criticized for a limited biomechanical ability to control root positions.[6] That is not true of the Essix appliance, as the following case demonstrates. A middle-age female had a lingually positioned lower central incisor that required significant facial tipping and labial root torque (Fig. 13A). After interproximal reduction, a canine-to-canine Essix appliance was constructed, a 1mm mound of composite was bonded to the lingual surface of the incisor, and a facial window was cut into the appliance to create space. The initial mound was amplified twice with 1mm layers of composite.

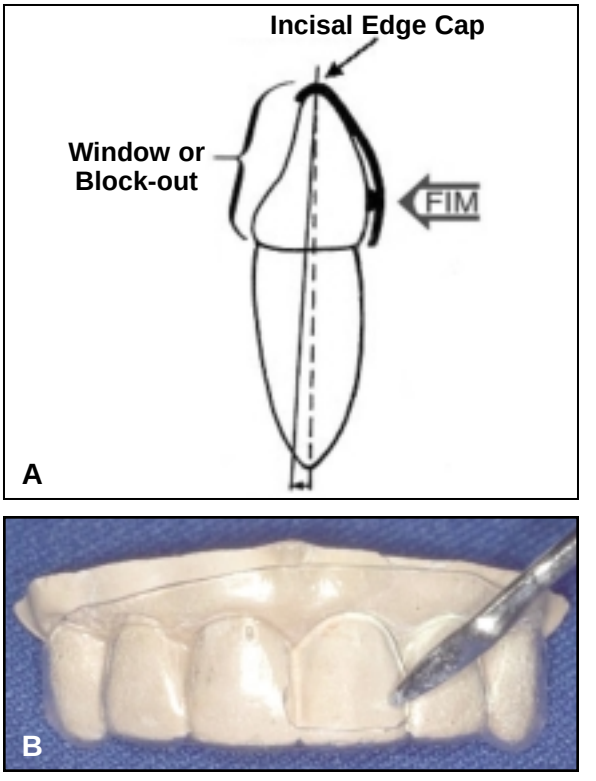

Fig. 12 A. Incisal cap and cervical force-inducing mound (FIM) produce root movement (dashed line = vertical axis before torquing). B. Window cut in thermoformed appliance for facial root torque.

These mechanics tipped the incisor into alignment, but the root still needed to be torqued under the crown. A second appliance was constructed with an incisal cap and a cervically placed lingual mound to produce facial root movement. After the addition of two 1mm composite layers to the original torquing mound, the root position was acceptable, as evidenced by the lingual alignment of the lower incisors (Fig.

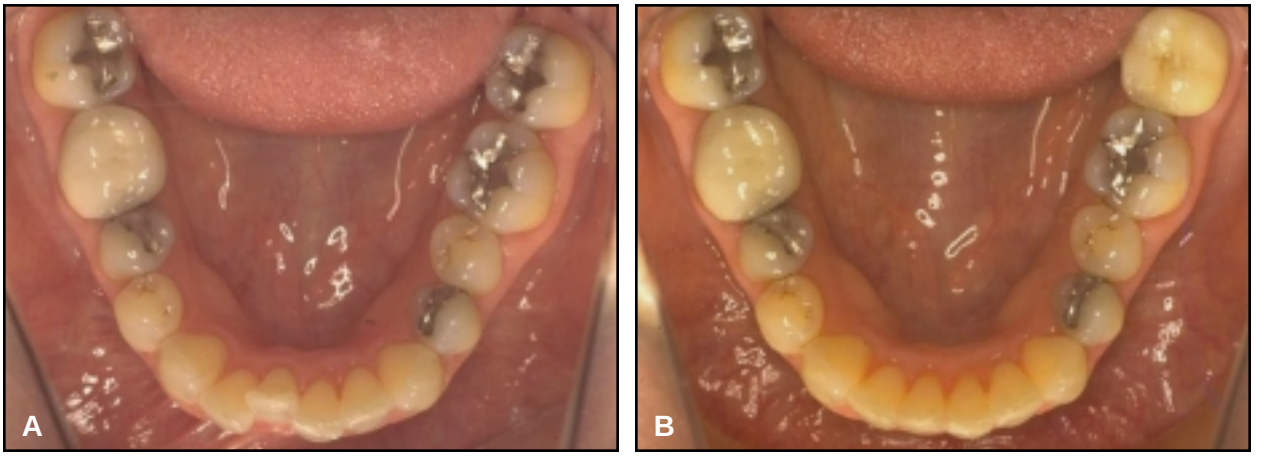

Fig. 13 A. Blocked-out lower right lateral incisor requiring substantial labial root torque. B. After interproximal reduction, crown was tipped labially with one appliance, and labial root torque was accomplished by second appliance with incisal cap and cervical composite mound on lingual enamel surface.

13B). An Essix retainer was constructed for night-time wear to retain the correction.

Conclusion

Essix mounding is a simple, effective, and inexpensive method of producing various tooth-moving forces using unaltered, previously fabricated Essix appliances. The composite mounds can be placed anywhere on the clinical crown to effect specific tooth movements, with layers of composite added for progressive movement at subsequent patient visits.

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