Periodic Stripping of the Lower Anterior Teeth During Retention

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Retention of mandibular arch alignment for the correction of anterior crowding is one of the most challenging problems orthodontists face.[1-12] Overcorrection of rotations, judicious tooth removal, and root paralleling play important roles in maintaining treatment results, but interproximal stripping of anterior teeth appears equally useful in controlling the dynamic interrelationship among facial structures after treatment.[13,14]

Betteridge demonstrated acceptable esthetic results from stripping the anterior segments after one year without retention.[15] Boese showed the stability of fiberotomy and reproximation in 40 premolar extraction patients with crowded mandibular arches four to nine years after treatment, again with no retention.[16] Sparks found no difference in long-term stability of the mandibular incisors in 26 orthodontic patients who underwent interproximal stripping when their fixed lower lingual 3-3 retainers were removed, an average of three years after treatment, compared with 17 patients who had no interproximal stripping after retainer removal.[17]

The present investigation was designed to evaluate the effectiveness of periodic stripping as an alternative method of lower anterior retention.

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Materials and Methods

The study sample consisted of three male and 29 female orthodontic patients, with a mean age of 14.2 at debonding, all treated by a single private practitioner in Riyadh. These patients had been treated by conventional fixed edgewise mechanotherapy with four premolar extractions. The average treatment time was 24 months. Selection criteria were:

1. Availability of dental casts made before treatment, before debonding, and one year after debonding.
2. Mandibular incisor crowding prior to treatment, as determined by Little's Irregularity Index, which measures the total linear displacement of the five anatomic contacts (as distinguished from the clinical contact points) from the mesial of one mandibular canine to the mesial of the other[18] (Fig. 1).
3. Full-arch fixed orthodontic treatment to a normal overjet and overbite, with no occlusal interferences on maximum intercuspation.

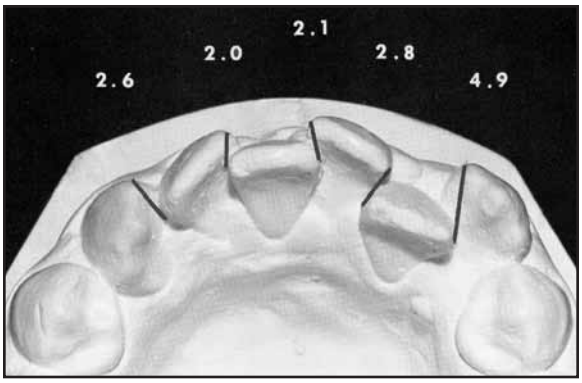

Fig. 1 Irregularity Index measures total linear displacement of five anatomic contacts of mandibular incisors (reprinted by permission[18]).

TABLE 1
CHANGES IN IRREGULARITY INDEX OF MANDIBULAR ANTERIOR TEETH ONE YEAR AFTER DEBONDING (MM)

	Control (N = 30)			Stripped (N = 32)		
	Mean	S.D.	Range	Mean	S.D.	Range
T1	5.0	3.3	0.7–16.8	5.0	2.7	0.8–10.2
T2	0.0	0.0	0.0–0.0	0.0	0.0	0.0–0.0
T3	0.7	1.2	0.0–5.9	0.1	0.3	0.0–1.2*

*p < .01.

4. Irregularity Index of 0 at debonding.
5. Satisfactory oral hygiene and low caries activity, as described by Tuverson.[19]

The control group, selected retrospectively from the Dental College at King Saud University, included four male and 26 female orthodontic patients, with a mean age of 15.2 at debonding. The average treatment time was 29 months, and each patient had been retained for one year with removable appliances. The control group was matched with the study group for age, sex, Irregularity Index, and root parallelism.

In the study group, the lower anterior contacts from the distal of one canine to the distal of the other were stripped at the time of debonding, using 4mm-wide handheld, single-sided, diamond-coated metal strips with medium grit.* Contact points were graded as open (no contact), light (no resistance to the metal strip), or tight (resistant). To ensure regular incisal contacts, pressure points were identified with articulating paper and eliminated using a flame-shaped diamond point. Topical fluoride was applied immediately after stripping, as recommended by Sheridan.[20] These procedures were repeated in each patient for one year at three-month intervals.

The lower study casts of both groups before orthodontic treatment (T1), before debonding (T2), and one year after debonding (T3) were all measured by a single examiner. Contact measurements for the Irregularity Index were taken parallel to the occlusal plane with a digital caliper calibrated in millimeters.** At each stage, cases were described as having perfect alignment (0mm), minimal irregularity (1-3mm), moderate irregularity (4-6mm), severe irregularity (7-9mm), or very severe irregularity (10mm). To assess the amount of stripping performed, the mesiodistal widths of the mandibular incisors before and after reproximation were measured as the distance between the anatomic contact points, as recommended by Hunter and Priest.[21,22]

A two-sample t-test was used to determine the statistical significance of differences in the Irregularity Index between the two groups.

Results

The reproducibility of the measurements was evaluated by having the same operator repeat the Irregularity Index measurements of 25 casts four weeks later. Lin's concordance correlation coefficient[23] was .9993; a concordance correlation of greater than .8 is considered "almost perfect".[24]

At T1, the mean Irregularity Index was 5mm for both the control group and the stripped group. At T2, both groups had improved to perfect alignment; a year later, however, at T3, the mean Irregularity Index had increased by .7mm in the control group, but by only .1mm in the stripped group—a statistically significant difference (Table 1).

Five patients in the stripped group (16% of the sample) showed some degree of relapse (Irregularity Index greater than 0) one year after debonding. Of these, two originally had moderate irregularity,

*Part No. 018-002-00, Dentaurum, Inc., 10 Pheasant Run, Newtown, PA 18940; www.dentaurum.com.

**Mitutoyo Corporation, Tokyo, Japan; www.mitutoyo.com.

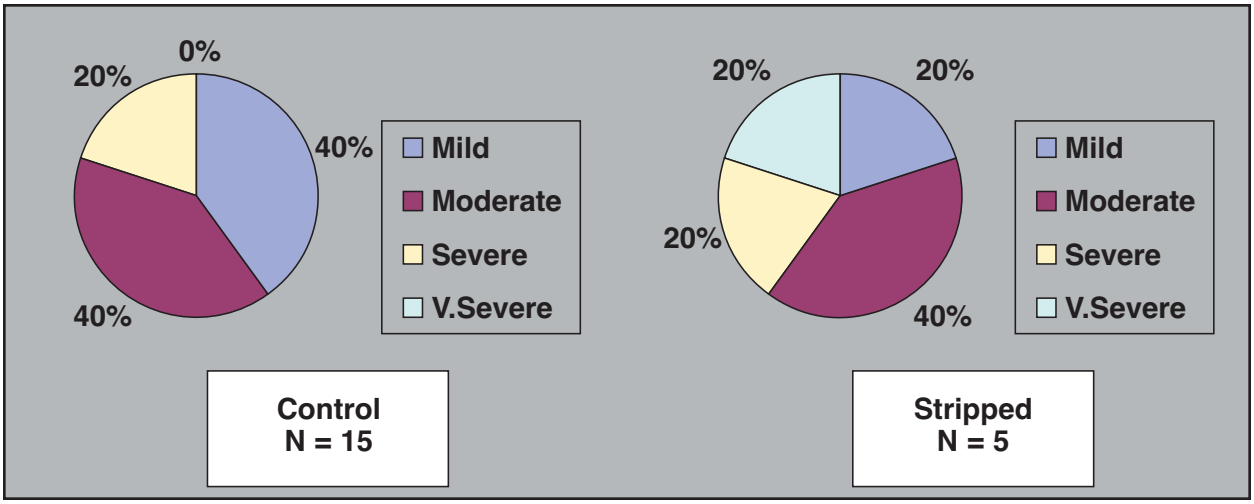

Fig. 2 Pretreatment severity of Irregularity Index in patients who showed relapse of crowding one year after debonding.

one mild, one severe, and one very severe (Fig. 2). On the other hand, of the 15 relapsed cases in the control group (50%), three initially showed severe irregularity, six mild, and six moderate. Chi-square testing showed no significant association between the initial severity of irregularity and the amount of relapse ($p = .5142$).

Discussion

This study indicates that interproximal reduction significantly lessens the relapse of lower incisor alignment during the first year after debonding. Although the long-term effect of this technique cannot be predicted by the present study, other authors have documented that the most relapse after the removal of fixed appliances occurs during the first 24 hours, and that approximately 50% of the total relapse occurs during the first week after closure of extraction spaces.[25,26]

Boese obtained similarly favorable results in his long-term study, using both reproximation and supracrestal circumferential fiberotomy (SCF) to improve post-treatment stability without retainers.[16,22] Little indicated, however, that 61% of rotated teeth did not relapse even without a "sulcus slice", and that relapse could occur with or without SCF.[27] In the present study, while SCF was not performed, the metal strips used for stripping were inserted gingivally, which would still cause transsection of the supracrestal fibers.

Elimination of tight interproximal contacts by stripping creates flat contact surfaces, which help resist labiolingual crown displacement and allow better distribution of occlusal forces. A dynamic equilibrium is thus created in which the teeth cannot move out of position, permitting the intrinsic forces of the tongue, lips, and orofacial musculature to be properly expressed.[28]

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