

# Interproximal Stripping for the Treatment of Adult Crowding

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**C**rowding can be defined as a quantitative discrepancy between the clinical length of the dental arch and the sum of the mesiodistal widths of the teeth. While crowding may occur in the anterior or posterior areas of either arch, adults are most likely to have crowding in the mandibular anterior area. Geiger noted that 40-50% of adult patients display crowding, and that many of them reported having previous treatment.<sup>1</sup>

From an etiological viewpoint, crowding may be divided into three classifications. *Primary crowding* occurs as a consequence of a negative relationship between the length of the dental arch and the collective width of the teeth. *Secondary crowding* occurs belatedly and can be caused by functional or parafunctional habits, eruption of third molars, a posterior occlusal collapse, or problems related to the loss of vertical dimension. Both the shape and function of the oral musculature can affect the size and position of the dental arches and thus cause secondary crowding. *Crowding after relapse of orthodontic treatment* is one of the most frequent manifestations among adult patients. It is often difficult, however, to determine the cause of this type of crowding.

While Peck and Peck reported a clear relationship between the shape of mandibular incisors and their irregularity,<sup>2</sup> Smith found little correlation between the shape of mandibular incisors and the degree of crowding.<sup>3</sup> There is some disagreement regarding the role of incisor crowding in periodontal disease,<sup>4-16</sup> but there is no dispute about the improvement in oral esthetics that can be achieved by alignment of the teeth. Although treatment of mandibular anterior crowding must be individualized, clinicians should always keep in mind the high potential for relapse as they consider esthetics, treatment mechanics, periodontal conditions, and ultimate retention.

Crowding is best classified as follows:

- Mild (less than 3mm)
- Moderate (3-5mm)
- Severe (more than 5mm)

## Interproximal Stripping

One of the most conservative methods for the treatment of mild and moderate crowding is enamel stripping, first described by Ballard in 1944.<sup>17</sup> This treatment had its origin in aboriginal populations, which demonstrated not only occlusal wear, but also interproximal wear, the result being an absence of crowding. Stripping can be recommended for patients with Class I occlusion and mild-to-moderate crowding in the anterior areas, as well as for patients with relapse of as much as 3mm in the mandibular arch and 4mm in the maxillary arch. In these cases, stripping allows dental alignment with minimal change in the facial profile and no arch expansion.

Tuverson has suggested that stripping is the preferred technique for cases of mild crowding because it avoids extractions and provides stable results.<sup>18</sup> Stripping is also valuable in eliminating triangular spaces in adult patients (Fig. 1). When



Fig. 1 Triangular spaces in adult patient.

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performed correctly, it has few side effects. Stripping is inadvisable in patients with poor oral hygiene, since it could increase the risk of developing interproximal caries. Interproximal stripping is absolutely contraindicated in patients who have gingivitis, which must be corrected before any enamel reduction is performed.

As a rule of thumb, the thickest enamel on the mandibular anterior teeth is found on the mesial and distal surfaces of the cuspids and the distal surfaces of the lateral incisors. In the maxillary anterior segment, the thickest enamel is found on the mesial and distal surfaces of the cuspids and the distal surfaces of the central incisors. For patients with no growth remaining and Class I canines and molars, 3mm of mandib-

ular space and 4mm of maxillary space can be gained without risk. Zachrisson cautions, however, that to maintain correct interproximal anatomy, stripping should be started in the least crowded areas.<sup>19</sup>

Abrasive strips are preferable to diamond burs or discs for interproximal reduction, because they make it easier to control the quantity and quality of the enamel polishing. Abrasive burs have the advantage of speedier enamel removal, but they often leave plaque-attracting enamel grooves, which have the potential of fostering dental disease.<sup>20</sup> A special holder for steel strips can be used to direct the enamel reduction; some steel strips are available with abrasive material on one side only (Fig. 2).



**Fig. 2** Special instrument with steel strips to perform stripping. To avoid undesirable "steps", only one side of strips should be used.



**Fig. 3** Polishing after interproximal stripping in mandibular arch.



**Fig. 4** Topical fluoride varnish being applied.



Fig. 5 Case 1. 21-year-old female patient before treatment.

Relative dryness of the teeth improves the visibility of the stripping procedure and preserves the integrity of the abrasive strips. Once the stripping process is completed, all stripped surfaces must be polished with special composite polishing strips in a dry field (Fig. 3). Afterward, topical fluorides are applied to provide protection from caries. Topical fluoride varnishes have the advantages of better taste and more accurate placement (Fig. 4). Fluoride mouthrinses are also often prescribed for 45 days after interproximal stripping.

The treated surfaces must be recorded on the patient's chart to avoid repeated stripping, since visual inspection will often be unable to detect any change in the enamel. Although stripped enamel will never fully recover a normal texture, every effort should be made to leave the enamel as smooth as possible. Radlanski, Jager, and Zimmer have shown that mild grooves were still present in a 12-month follow-up of patients with interproximal stripping.<sup>20</sup> However, the electron microscope could not detect any greater incidence of caries than with unstripped enamel. Apparently, when caution is exercised and topical fluoride is applied, patients have no increased

incidence of cavities. In a nine-year study, Boese did not find any adverse clinical effects of interproximal stripping.<sup>21</sup>

After treatment, the final alignment should be maintained for three to four months before removing the brackets and placing retainers. If a fixed retainer is used, the retainer wire should be smooth and closely adapted to the teeth to prevent relapse. In patients with reduced periodontal attachment, a double retention system (a fixed retainer combined with a nocturnal splint) works well.

### Case 1

A 21-year-old female presented with the chief complaint of the position of her maxillary right canine. She had undergone orthodontic treatment as an adolescent. The patient had a symmetrical face with a mildly convex profile and competent lips (Fig. 5). Clinical examination showed irregularity of the maxillary cuspids, coincident midlines, and slight rotations of the maxillary lateral incisors. The posterior teeth were in a Class I occlusion, but the mandibular left and right canines were rotated. Oral hygiene





Fig. 6 Case 1. After 14 months of treatment.

was good.

Treatment objectives were to:

- Level and align the arches.
- Obtain a Class I canine relationship.
- Maintain correct overbite and overjet.
- Maintain the periodontal status.
- Maintain the profile.
- Achieve stable results.

This treatment was aimed at achieving esthetic, dental, and functional harmony by correcting the malposition of the maxillary right cuspid and mandibular canines without causing any major changes in the profile. Since the patient was unwilling to have any teeth removed, interproximal enamel reduction was selected as the therapy of choice.

Esthetic brackets were chosen, and compensatory bends were made in the archwires to correct the lateral incisor rotations. Interproximal stripping, performed every three weeks, was confined between the canines in both arches. Treatment was completed with topical fluoride applications, and the use of a fluoride mouthwash was prescribed twice a day.

After 14 months of treatment, the crowding was corrected (Fig. 6). The midline relationship

and facial harmony were maintained, and there was no visible evidence of the interproximal stripping in the anterior segments. Maxillary and mandibular Hawley retainers were worn full-time for 60 days and thereafter at night only.

## Case 2

A 22-year-old female presented with severe arch-length discrepancies in both arches, in spite of previous orthodontic treatment. Her chief complaint was her appearance when she smiled. This was an anxious patient who visited the office five times before making the decision to have treatment. Although such a patient requires a great deal of personal attention, she later became one of our best “public relations agents”.

Clinical examination displayed a somewhat convex profile that was within normal parameters and featured a good chin (Fig. 7). The patient had a slight intraoral asymmetry that became more obvious in smiling. Her gingival tissue was normal, and her oral hygiene was good.

Treatment objectives were to:

- Level and align both arches.
- Maintain a Class I molar relationship.



**Fig. 7 Case 2. 22-year-old female patient before treatment.**



**Fig. 8 Case 2. Rectangular braided archwires for final torquing after interproximal stripping and 17 months of treatment.**



**Fig. 9 Case 2. After 20 months of treatment.**

- Obtain a Class I canine relationship.
- Attain normal overbite and overjet.
- Keep the missing molar space open for prosthetic replacement.
- Establish periodontal health.
- Maintain the profile.
- Achieve long-term stability.

Interproximal enamel reduction was selected after consultation with the patient, who did not want to lose any more teeth or risk having her

profile changed. The plan called for 3mm of space reduction in the mandibular arch and 4mm in the maxillary arch (Fig. 8).

After treatment, the gingivae appeared healthy and normal, and the maxillary and mandibular incisors displayed proper position and inclination (Fig. 9). The overjet and overbite were corrected, and the occlusal plane was level. The patient's smile was wide and harmonious, with no dark spaces showing in the premolar



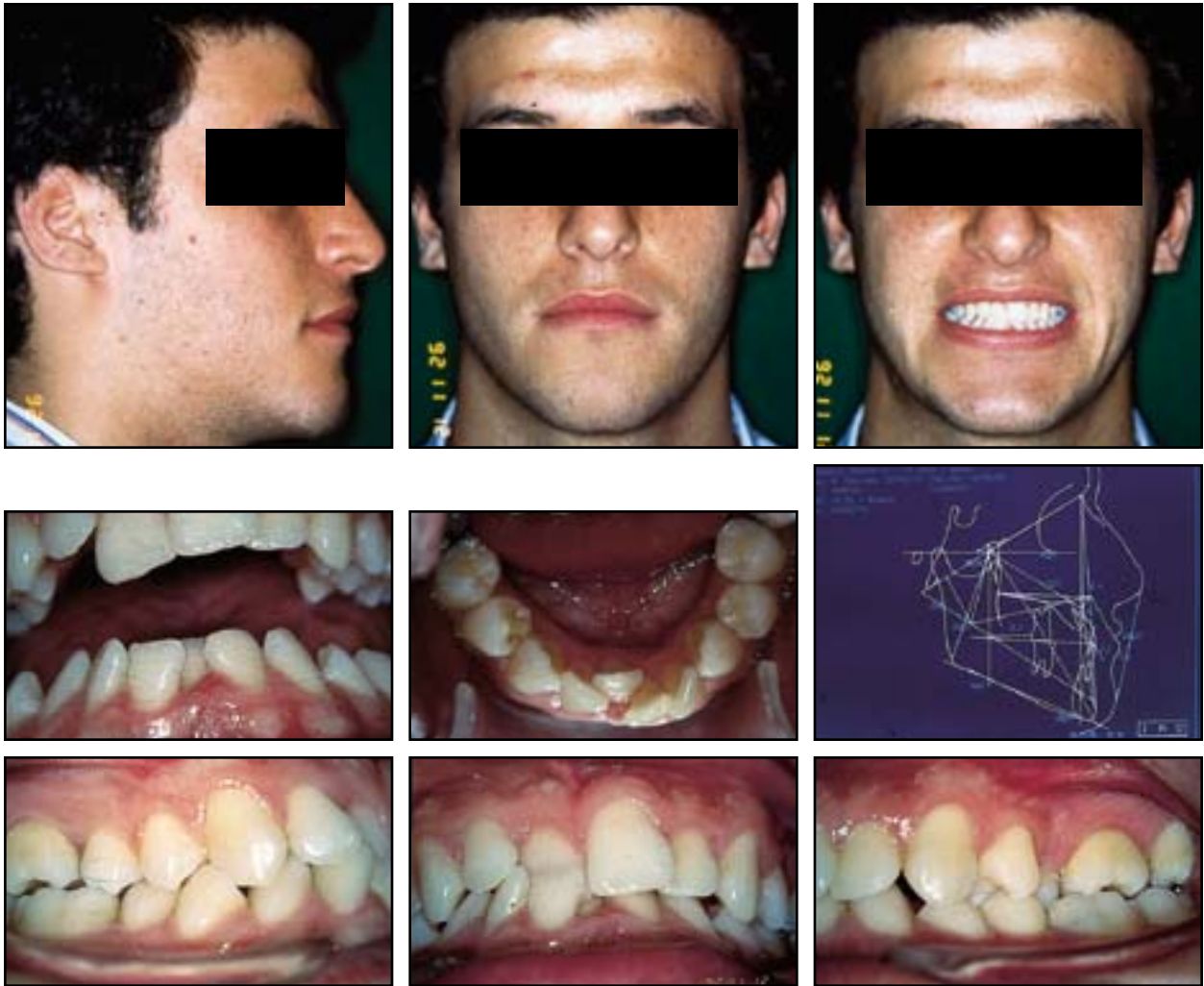


Fig. 10 Case 3. 21-year-old male patient before treatment.

areas.

An implant was planned to fill the space of the missing mandibular left first molar. A fixed retainer was used in the mandibular arch, and a removable retainer in the maxillary arch.

### Case 3

This 21-year-old male came for consultation because he had noticed that the maxillary right central incisor had begun to move lingually. His mandibular anterior misalignment did not

especially concern him, since it was a “family trait”. He had no signs or symptoms of TMD.

The patient displayed a harmonious, well-proportioned, symmetrical face with a straight profile and a pronounced chin (Fig. 10). He showed no gingiva when he smiled. The maxillary right central incisor was displaced lingually, the maxillary left incisors showed a deep overbite, and the mandibular incisors were lingually inclined. The molars and canines were in a Class I occlusion, but the maxillary left second premolar was palatally displaced. The gingiva was



Fig. 11 Case 3. After two months of opening space for palatally displaced maxillary central incisor with .014" nickel titanium archwire and nickel titanium open-coil spring.



Fig. 12 Case 3. After 20 months of treatment.



slightly inflamed.

Ricketts analysis revealed a brachyfacial biotype with an exaggerated interincisal angle of  $146^\circ$  and a convexity of  $-3\text{mm}$ . The mandible was also longer than normal.

Treatment objectives were to:

- Level and align the arches.
- Correct both maxillary and mandibular arch-length discrepancies.
- Maintain Class I canine and molar relationships.
- Normalize the overbite and overjet.
- Improve the gingival condition.
- Maintain the profile.
- Achieve long-term stability.

Both arches needed to be leveled to correct the maxillary and mandibular misalignments, considering that the patient had completed growth and presented with a somewhat concave profile, a reduced convexity, a large interincisal angle, and a mandibular incisor inclination of only  $13^\circ$ . The mandibular arch had an 8mm arch-length discrepancy and would require extractions or interproximal enamel reduction to gain enough space for alignment without excessive flaring of the mandibular incisors. The patient's concave profile caused us to select interproximal stripping as the space-gaining method.

Treatment was started in the maxillary arch with preadjusted esthetic brackets, except on the lingually displaced central incisor, which required a single metal bracket because of its position. An .014" nickel titanium wire was used with a nickel titanium open-coil spring to open space for the central incisor (Fig. 11). Later, a compressed coil was used to open space for the palatally displaced premolar. Interproximal stripping was done sequentially at four-week intervals.

All objectives were achieved in this 20-month treatment (Fig. 12). The arches were aligned and leveled without altering the facial profile. Cephalometric values were essentially unchanged. The gingival tissues were normalized, and the papillae occupied the entire interdental spaces with normal shape, height, and color.

### Conclusion

Interproximal stripping is a highly useful therapeutic tool as long as it is done judiciously, with respect for the biology of both hard and soft tissues. It is not recommended for growing patients, except in cases where no change in soft-tissue profile can be risked. Another contraindication is poor oral hygiene. Thus, the best patients for interproximal stripping are adults with minor to moderate misalignments, appropriate tooth shapes, good oral hygiene, and a low susceptibility to caries.

The technique shown here is relatively simple, but clinicians should be aware that excessive enamel reduction is irreparable, while inadequate reduction will prevent the required tooth movements from occurring. The proximal surfaces of the teeth must be shaped as naturally as possible to prevent wide contacts that restrict the space of the papillae. Another common error is failure to polish the stripped surfaces, which can lead to future cavities. Topical fluoride applications and the use of fluoride toothpaste are essential. When done properly, stripping has no deleterious effects on the alveolar bone or the interproximal tissue. In fact, authors including Tuverson,<sup>18</sup> Sheridan,<sup>22</sup> Boese,<sup>23</sup> and Geigerich<sup>24</sup> have shown patients whose gingival papillae was substantially improved after correction of dental malalignment by selective stripping.

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