

## USING A COMPOSITE RESIN LOWER INCLINED BITE PLANE TO CORRECT THE ANTERIOR CROSSBITE

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العضة المعكوسة للأسنان الأمامية الدائمة (صنف أول) يكون نتيجة لتشوه في الأطباق السني وذلك بسبب انحناء غير طبيعي للأسنان الأمامية العلوية، ونظراً للتوجه الحديث في مجال طب الأسنان للأقلال أو منع تعرض المرضى والعاملين في هذا المجال للمواد السامة ونظراً للتطور المستمر في مجال صناعة المواد، فإن مواد أخرى يمكن استخدامها بدلاً من تلك الضارة. مادة الكمبوزت كيميائية التصلب تم استخدامها لصنع جهاز يوضع في فم المريض لمدة أقصاها اسبوعين.

١٣ مريض تم اختيارهم ضمن شروط معينة، وكانت أعمارهم تتراوح ما بين ٨-١١ سنوات. الغرض من هذه الدراسة كان لتقييم مدى فعالية مادة الكمبوزت كمادة وتقنية لعمل جهاز سفلي لتصحيح العضة المعكوسة للأسنان الأمامية العلوية.

In the primary dentition, anterior crossbite is usually indicative of a skeletal growth problem and a developing Class III malocclusion. In permanent incisors (Class I), it is a dental-type malocclusion due to abnormal axial inclination of maxillary anterior teeth which should be treated without delay. Thirteen patients with central or lateral crossbites were selected with ages ranging from 8-11.5 years. Criteria for selection included: patient having normal occlusion at molar and canine areas (Class I); root of in-locked tooth must be completely developed; there must be sufficient room to move the crossbite tooth mesiodistally; parents' consent and medical fitness of the patient. In this report, composite resin type II self-cure, two paste system was used to construct the bite plates. The appliance was left in the patient's mouth for a maximum of two weeks and was then removed. The purpose of this report was to evaluate the effectiveness of self-cure composite resin as a material and technique for lower inclined bite plane to correct anterior crossbites. The use of composite resin lower inclined plane not only appeared effective in treating the selected cases, but also reduced the number of patient's visits and chair time. Enamel remained normal and healthy without etching. There was also no cementation or recementation needed to fix the appliance on the lower anterior teeth.

Anterior crossbite in the primary dentition is usually indicative of skeletal growth problem and a developing Class III malocclusion.<sup>1</sup> Whereas, in permanent incisors (Class I molar relationship), it is a dental-type of malocclusion due to the abnormal axial inclination of maxillary anterior teeth. It is an evidence of localized discrepancy that should be treated without delay especially during the mixed dentition stage. Delayed treatment can lead to

serious complications such as loss of arch length, traumatic occlusion, stripping of gingival tissue and pocket formation. Unsightly wear may also develop on the incisal and labial surfaces of the involved maxillary incisors.<sup>1,3</sup> Such delay in treatment may also impede the normal growth of the dentition. Moreover, it might cause serious malocclusions in permanent dentition (e.g., cuspal interferences, bruxism) and improper muscle balances, leading to habitual posturing of the mandible but would not generate the pathophysiology of temporomandibular disorders.<sup>1,2,4</sup>

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Most of the cases reported in the literature involve permanent teeth that should be treated during the mixed dentition, a period appropriate for occlusal guidance and the malocclusion interception. During this period, the dentist has greatest orthodontic challenges and finest opportunity for correcting anterior and posterior crossbites.<sup>15</sup>

Substantial evidence supporting the benefits of early correction of posterior crossbites have been reported. Perceptive observation on Class I type 3 cases had been made in that if there are anterior and posterior crossbites, the former should be treated first since it may lead to a crossbite of the first permanent molar.<sup>6</sup>

Anterior crossbite, often referred to as "in-locked" and "scissors bite",<sup>1</sup> is the result of a variety of conditions, such as traumatic injury to the anterior primary tooth, which may cause displacement of the developing permanent successor. It may also be due to the delayed exfoliation of primary incisor because of a necrotic pulp resulting from trauma or caries that causes deflection of permanent teeth in the area. Also, supernumerary teeth that may cause eruption of permanent teeth in a rotation or in a crossbite relationship, congenitally-caused eruption pattern, and trauma to erupted teeth<sup>1,3,7,8</sup>

#### Diagnosis of Anterior Crossbite

The molar relation should be noted carefully in its resting position and occlusion to recognize the anterior crossbite (Class I, type 3). If Class II or Class III malocclusion is seen at either position, the problem is not one of a simple anterior crossbite. Rather, it is a matter of simple tipped maxillary anterior teeth without serious disruption of the molar relationship.<sup>1,6</sup>

Factors which should be considered before correcting anterior crossbites are:

1. There must be sufficient room to move the in-locked tooth mesiodistally.
2. The patient should present a normal occlusion at molar and canine areas (Class I).
3. Patient's cooperation and parents' complete consent for the treatment.
4. The patient should be medically fit and has no other oral abnormalities (e.g., fetal alcohol syndrome, Apert syndrome) since treatment is particularly difficult and requires specific approach and methodologies.<sup>1,2,9,10</sup>

#### Treatment of Anterior Crossbite

There are various ways of correcting anterior crossbites and selection of the appliance is critical. The appliances suggested can be divided into two main categories: those that produce a rapid heavy intermediate force and those that produce slow-light continuous force<sup>7</sup> which should be considered beneficial by the practicing dentist. The appliances that produce heavy-intermediate forces are the tongue blade as a lever,<sup>11</sup> lower inclined bite plane,<sup>12</sup> and the steel crown.<sup>13</sup>

In this study, the lower inclined bite plane, which is one of the most popular methods, was used whereby an acrylic bite plane was cemented on the lower front teeth. The plane had to be steep enough to give a definite forward thrust to the upper tooth or teeth. Some dentists prefer using the metal inclined plane which offers great stability but difficult to adjust and, at the same time, expensive like the Acolite appliance which was used for this purpose. Others prefer a removable acrylic plane made out on a stone model from alginate impression where clasps should be used if there are suitable teeth present.<sup>1,6,12</sup>

The ideal appliance is the one that employs a fixed appliance which comfortably serves its purpose with no treatment demands on the part of the patient or the parents. Myers<sup>5</sup> found that poor patient cooperation resulted in discontinuation of 12% of the removable appliances but only 4% of fixed appliances. Also, 12% of the removable appliances were lost compared with only 1 % of the fixed appliances. Another appliance requirement is that it requires a minimum of uncomplicated clinical treatment time without anesthetic or sedation. It should be safe, easily placed and removed by the dentist but not by the patient and should give rapid correction with no damage to the affected tooth or associated periodontal tissues.<sup>14</sup>

The purpose of this study was to evaluate the effectiveness of the self-cured composite resin as a material and technique from which the lower inclined plane was constructed to make the treatment easy and decrease the chairside time.

#### Management of the Cases

Thirteen patients with central or lateral crossbites, ages ranging from 8-11.5 years old, were selected for this study. The criteria for selection of subjects were:

- a. The patient should present normal occlusion at molar and canine area (Class I molar and canine relationship).
- b. Root of the in-locked tooth should be completely formed or developed.
- c. There must be sufficient room mesiodistally to move the crossbite tooth.
- d. Patient must be cooperative with a proper parents' consent.
- e. The patient should be medically fit.

The lower anterior teeth were cleaned and polished with prophylactic paste and rubber cup, dried with air syringe and partially isolated with a cotton roll [Fig. 1]. Composite resin type II\* self-cure, two paste system was used [Fig. A1]. The amount of composite resin needed were mixed according to the manufacturer's instruction. Then the paste was placed over the cleaned polished lower incisors and canine covering the incisal and middle third of the lower anterior teeth. The cervical thirds were not covered to prevent gingival irritation. The composite was men shaped to take the form of lower inclined plane and was held in place until setting [Fig. 2]. The patient's occlusion was checked to ensure that the lower inclined plane was steep enough to correct the crossbite. Otherwise, the composite resin lower inclined plane was adjusted with a diamond bur and was polished with a carbide bur [Fig. 3].

The composite resin appliance was left in the patient's mouth for a maximum of two weeks. Patients were instructed to maintain good oral hygiene and were recalled three days after construction of the appliances. Additionally, the parents were advised to observe their children and minimize their outdoor activities.

Upon completion of treatment [Fig. 4], the appliance was removed with a coarse diamond bur by creating grooves on the labial side of the appliance to dislodge it [Fig. 5]. After the appliance has been removed, the teeth were polished with prophylactic paste and acidulated phosphate fluoride was applied on the lingual and labial surfaces of the lower anterior teeth [Fig. 6].

All cases treated with the composite resin lower inclined plane were successful as shown in Table 1. Generally, there was a slight wear of the appliance, however, treatment was not affected. None of the appliances was broken or detached from the enamel of the lower anterior teeth. The attachment of the



Figure A1. Material used in this study.



Figure 1. Clinical presentation showing a patient's occlusion after it has been polished and dried.



Figure 2. A photograph showing the composite after shaping.



Fig. 3. occlusion was checked to ensure appliance is steep enough to correct the crossbite.



Fig. 5. Clinical view after appliance was removed.



Fig. 4. Clinical view before removal of the appliance.



Fig. 6. Clinical photograph showing completion of treatment with the teeth in its normal occlusion.

Table 1. Distribution of patients' age, crossbite tooth and time of treatment.

Ages of Patients	Crossbite Tooth	Time of Treatment
11	22	14 days
08	22	14 days
08	21	14 days
09	21	10 days
08	11	12 days
10	11	14 days
11	22	12 days
08	11	09 days
08	21	14 days
08	11	14 days
08	21	14 days
10	11	14 days
11	11	11 days

composite resin to the lower anterior teeth was able to withstand the occlusal forces and was intact until it was removed. So far, no failure was recorded.

All treated cases were clinically satisfactory. Correlation test was applied (Table 1) relative to patient's age and crossbite ( $P=0.918$ ), crossbite tooth and treatment time ( $P=0.436$ ), patient's age and treatment time ( $P=0.833$ ). Data revealed that there was no correlation among them ( $P>.05$ ).

### Discussion

There has been a new interest in health as a positive state, not just as an absence of symptoms. It is viewed as each individual's responsibility to achieve and sustain such health. Although there is a considerable volume of data which casts doubt on the safety of polymethylmethacrylate (PMMA) monomer in dentistry, pure monomer is capable of toxic and

allergic reactions. The monomer has a dramatic physiological effect on those who inhale the vapor, specially in the dental laboratory. The amount of monomer present in the heat-cured material is far lower than that present in chemically activated material from which the lower inclined plane has been constructed. Moreover, the material has not been proved to the satisfaction of all investigators.<sup>1517</sup>

The ongoing concern and belief to minimize or prevent exposure of the patients and the dental clinicians to toxic materials and with the advancements in polymer, other material can be used.

In this study, the use of composite resin lower inclined plane not only appears effective in treatment management of the selected cases, but also reduces the number of patient's visits and decreases the chairtime.

The self-cured composite resin permitted the shaping of the lower incline plane. Attachment of the composite to the enamel and undercut was sufficient to retain the appliance in place until its removal after treatment so that the enamel is left normal and healthy without etching. Additionally, no cementation or re-cementation was needed to fix the appliance on the lower anterior teeth.

After shaping and setting of the composite lower inclined plane, minor corrections may be needed at a 45° angle with the long axis of the root proclining the inlocked tooth.

One of the disadvantages of the composite resin is wear when it was used as a filling material. However, in this technique wear became advantageous because, in case of miscorrected area of inclination of the appliance, it will be corrected mechanically by the occlusal force.<sup>18</sup> Fluoride was used as a prophylactic measure to remineralize the possibly demineralized enamel below the lower border of the appliance in the area where it was difficult for the patient to keep clean.

### Conclusion

1. The simple anterior crossbite cases, as they were selected in this study, should be treated early without delay to prevent the complications. At the same time, the treatment can be rendered by general dental practitioners due to its simple technique.
2. The method of constructing the lower inclined plane used in this report appeared effective in the treatment of anterior crossbite in the selected cases.

3. Not only did this technique simplified the treatment of crossbite, it also eliminated the use of laboratory procedures and prevented exposure to PMMA monomer.
4. All selected cases of anterior crossbite treated with the composite resin appliances were clinically successful.
5. There was no correlation among patient's age, crossbite tooth and duration of treatment.

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