

Eruption guidance in the mixed dentition: a case report

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Management of space problems is an important factor in the mixed dentition. The Clear Aligner can carry out minor tooth movement with no brackets bonded to the teeth. In addition, it can provide tooth movement for the following: crowding resolution, space closure, arch expansion or constriction, space maintenance or regaining, intrusion or extrusion, guidance of the eruption, and other interceptive orthodontic treatment.

Keywords: Clear Aligner, mixed dentition, eruption guidance, crowding, and spacing

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INTRODUCTION

Proper management of space in the primary and mixed dentitions can prevent unnecessary loss in arch length. Diagnosing and treating space problems requires an understanding of the etiology of crowding and the development of the dentition to render treatment for mild, moderate and severe crowding cases. Most crowding problems of less than 4.5 mm can be resolved through preservation of the leeway space, regaining space or limited expansion in the late mixed dentition.¹ In cases where 5 to 9 mm of crowding is present, extraction of permanent teeth is required to preserve facial esthetics and the integrity of the supporting soft tissue. However, some of these cases can be approached with expansion after thorough diagnosis and treatment planning.²⁻⁴

The amount of crowding or spacing in the dental arch will determine the degree of which space loss can have a significant consequence. Treatment may be accomplished with fixed or removable appliances. Although removable appliances play only a supporting role in comprehensive treatment, they are an important part of preliminary treatment for preadolescents, adjunctive treatment for adults, and retention for all types of patients.⁵ Removable orthodontic appliances have two distinct advantages: they can be removed on

socially sensitive occasions, which make them more appealing to adolescent patients, and they are fabricated in the laboratory, reducing the chair time during preadolescents treatment.⁶ These advantages for both the patient and the dentist have ensured an ongoing interest in removable appliances. Compared with conventional removable appliances made of acrylic resin plate and wires, the Clear Aligner is transparent. In addition, patients of all ages can use it, especially if they want an esthetic orthodontic treatment option. It is a simple and low cost appliance which can be used by the dentist. It works quickly and is comfortable for most patients. The Clear Aligner could be replaced every four to eight weeks with a new impression. The Clear Aligner uses two different thickness levels of plastic sheets for patient's comfort. Plastic sheets are used along with a vacuum former. A set-up model is used with progressive movement of the teeth and arch, which are positioned to ideal position.^{7,9} During the treatment if sagittal correction is needed, class II or class III elastics can be applied to the aligner. For the permanent teeth eruption, certain amount of space is needed in the aligner. If the space is not enough mesiodistally for the permanent teeth to erupt into, then the aligner can work as a space regainer. The light curing, blue opaque block-out putty, Blue Blokker (Scheu-dental, Germany) is used to make room for eruption or space regaining (Figure 1, A and B). The aligner can move the teeth easily without braces (Figure 1, C). Clear Aligner is an efficient orthodontic appliance produced periodically.¹⁰ The orthodontic movement can be accomplished by wearing these plastic aligners at night only including sleeping time.

CASE REPORT

An 8-year and 9-month-old Korean female patient was referred to the orthodontist by her dentist for evaluation of malocclusion. A review of her medical history showed nothing remarkable. The patient presented with mesofacial, symmetrical face and a straight type profile (Figure 2). Clinical examination showed an early mixed dentition comprising the

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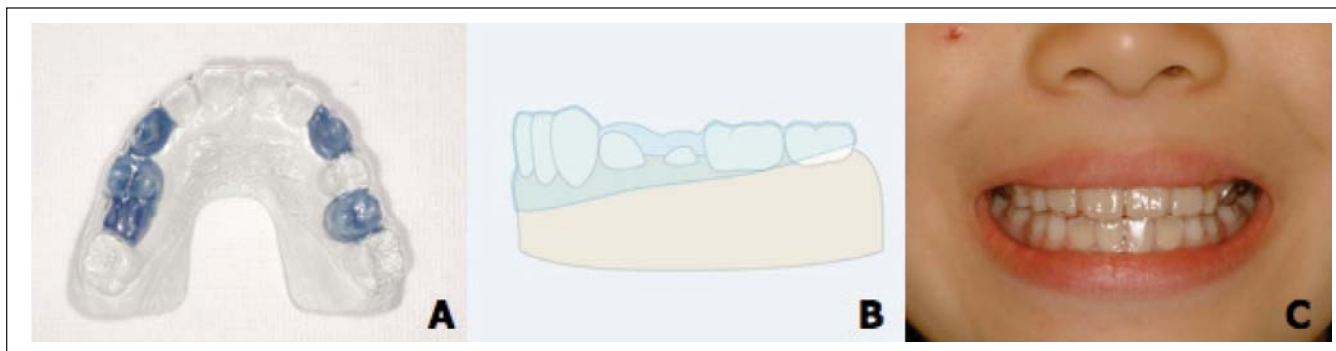


Figure 1. A set-up model for guidance of permanent teeth eruption. Blue Blokker is applied to the area of erupting permanent teeth (A and B). Intraoral view of a patient wearing the Clear Aligner (C).

maxillary right and left first molars, maxillary permanent central and lateral incisors, mandibular right and left first molars, and mandibular permanent central and lateral incisors. Stainless crowns were observed on primary upper right second molar, upper left first and upper second molars. Amalgam filling was noticed on primary upper right first molar. The patient showed mild crowding on the upper arch with a Class I molar relationship and a Class I primary canine relationship with normal overjet and overbite. The lower dental midline was deviated to the right side about 1 mm (Figure 3). Panoramic radiograph evaluation demonstrated the presence of permanent dental series (Figure 4, A). Cephalometric analysis revealed a skeletal Class I (ANB= 1) with normovergent growth pattern (SN-GoGn: 38°). The maxillary incisors were slightly proclined (U1 to SN: 112°) and mandibular incisors showed normal inclination (IMPA: 92°) (Figure 4, B).

The specific treatment objectives were to: 1. relieve the crowding on the maxillary arch and maintain a Class I molar

relationship and establish a Class I canine relationship. 2. Monitor the development of the permanent dentition along with mixed dentition space analysis to estimate the size of unerupted permanent teeth.^{11,12} 3. Slightly retrocline maxillary anterior dentition to increase an overbite. 4. Correct lower dental midline to improve facial esthetics.

After initial exam, in order to align the anterior teeth and slightly expand intermolar width, bilateral posterior expansion was done using the aligner (Figure 5).

Leeway space was observed in the mandible after the eruption of permanent premolars when she was 11-year and 3-month old. In the maxilla, there was inadequate space for the eruptions of upper right and left second premolar (Figure 6).

The space was regained in the maxillary arch by distalizing upper right first molars with the aligner. The Aligner Aid Program (AAP) (IV-Tech, South Korea) was used to measure the accurate amount of tooth movement. The movement of one tooth can easily be measured by eyesight, however, if



Figure 2. Initial facial photographs.



Figure 3. Initial intraoral views at age 8 years 9 months.

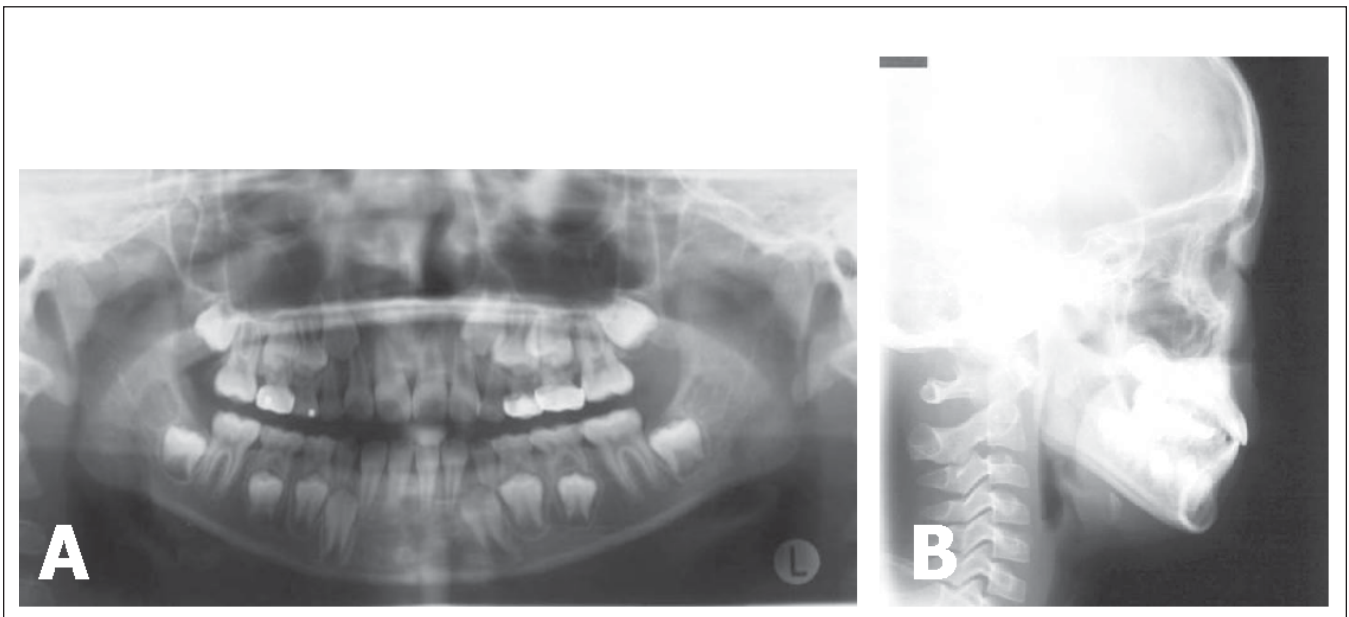


Figure 4. Initial radiographic views: A. Panoramic view; B. Lateral cephalometric view.

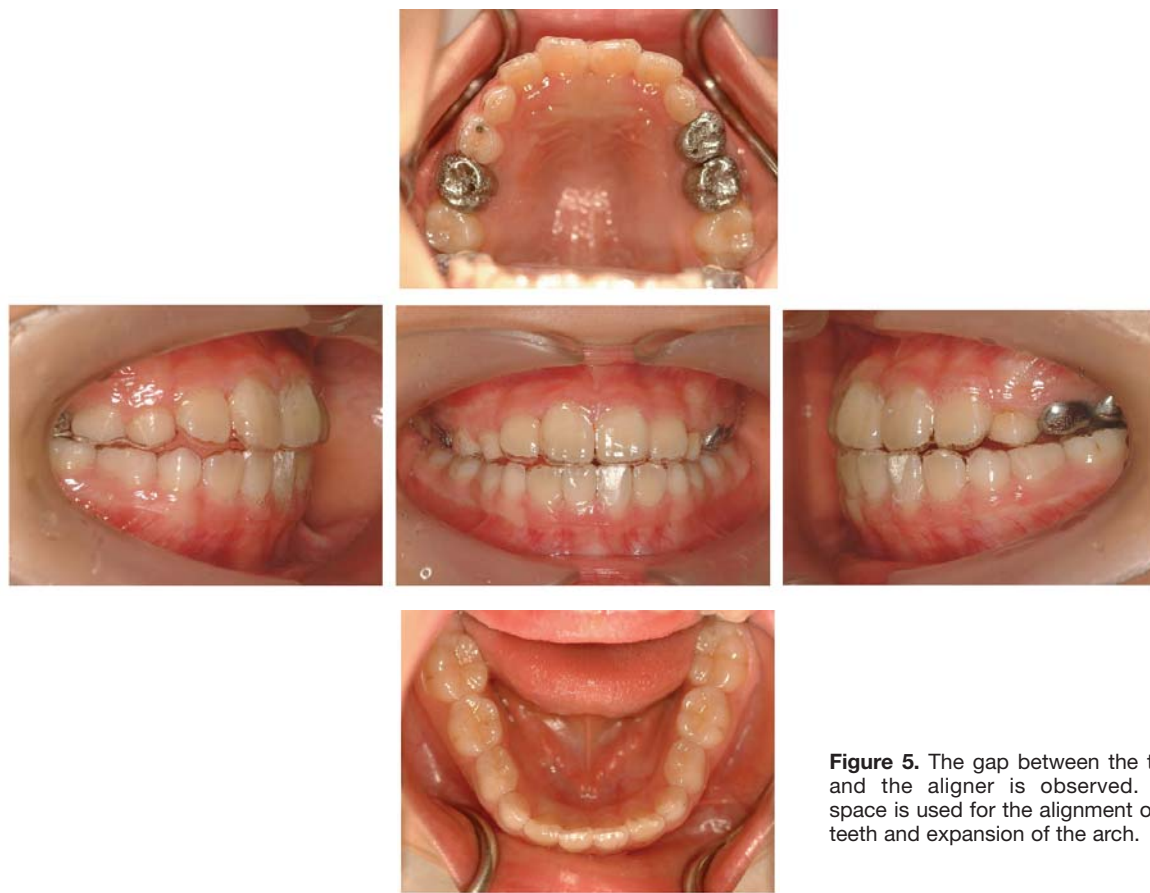


Figure 5. The gap between the teeth and the aligner is observed. This space is used for the alignment of the teeth and expansion of the arch.



Figure 6. Intraoral views showing crowding on the maxillary posterior segment and spacing on the mandibular premolar area.

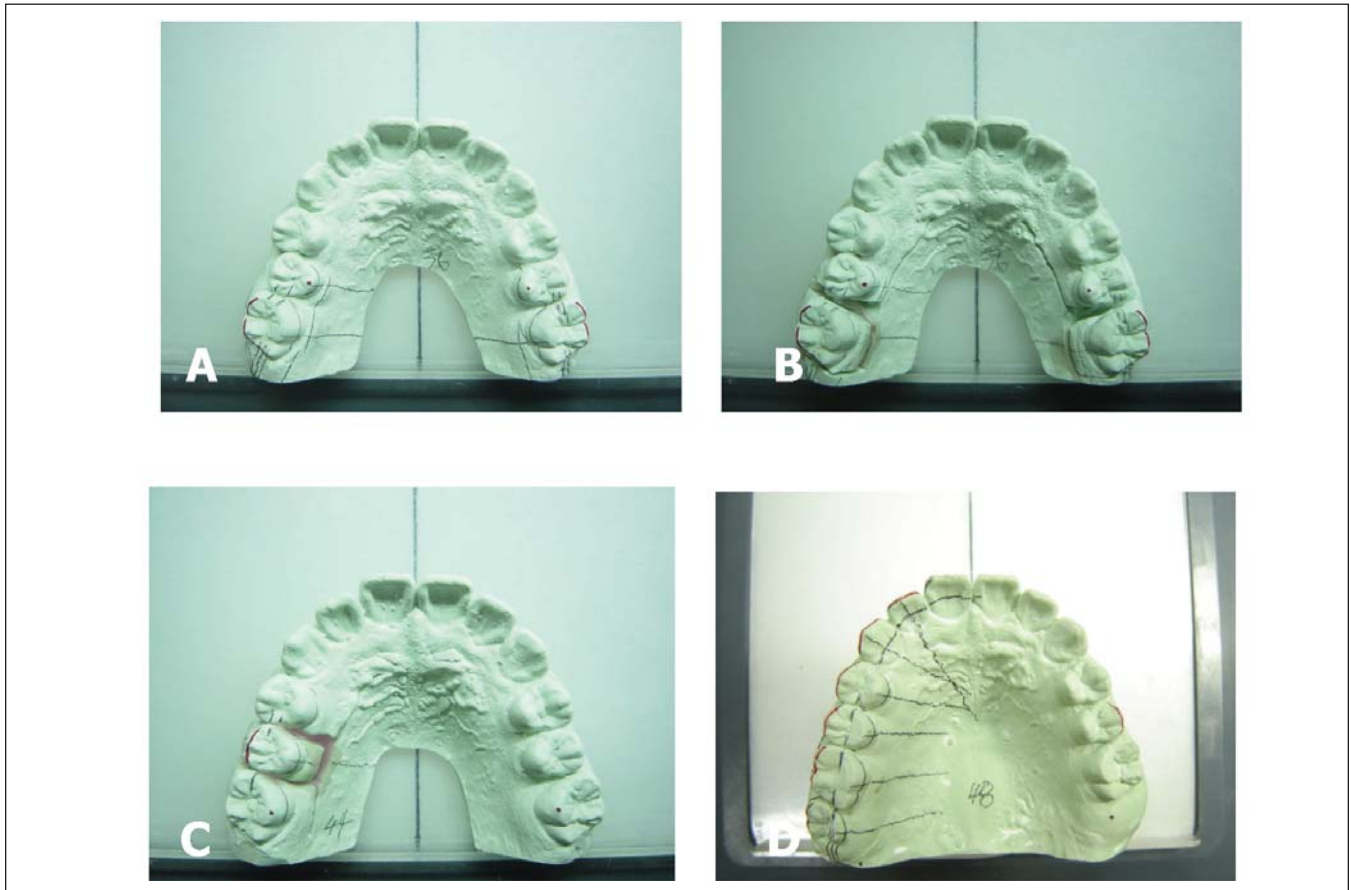


Figure 7. Photos of original (A) and set-up model (B) of upper arch after distalization of first molars. Set-up model showing buccal movement of the target tooth (C) and final model (D).



Figure 8. Intraoral views of at age 11 years 11 months. After eight months treatment, the maxillary crowding is resolved and the mandibular spaces are closed.

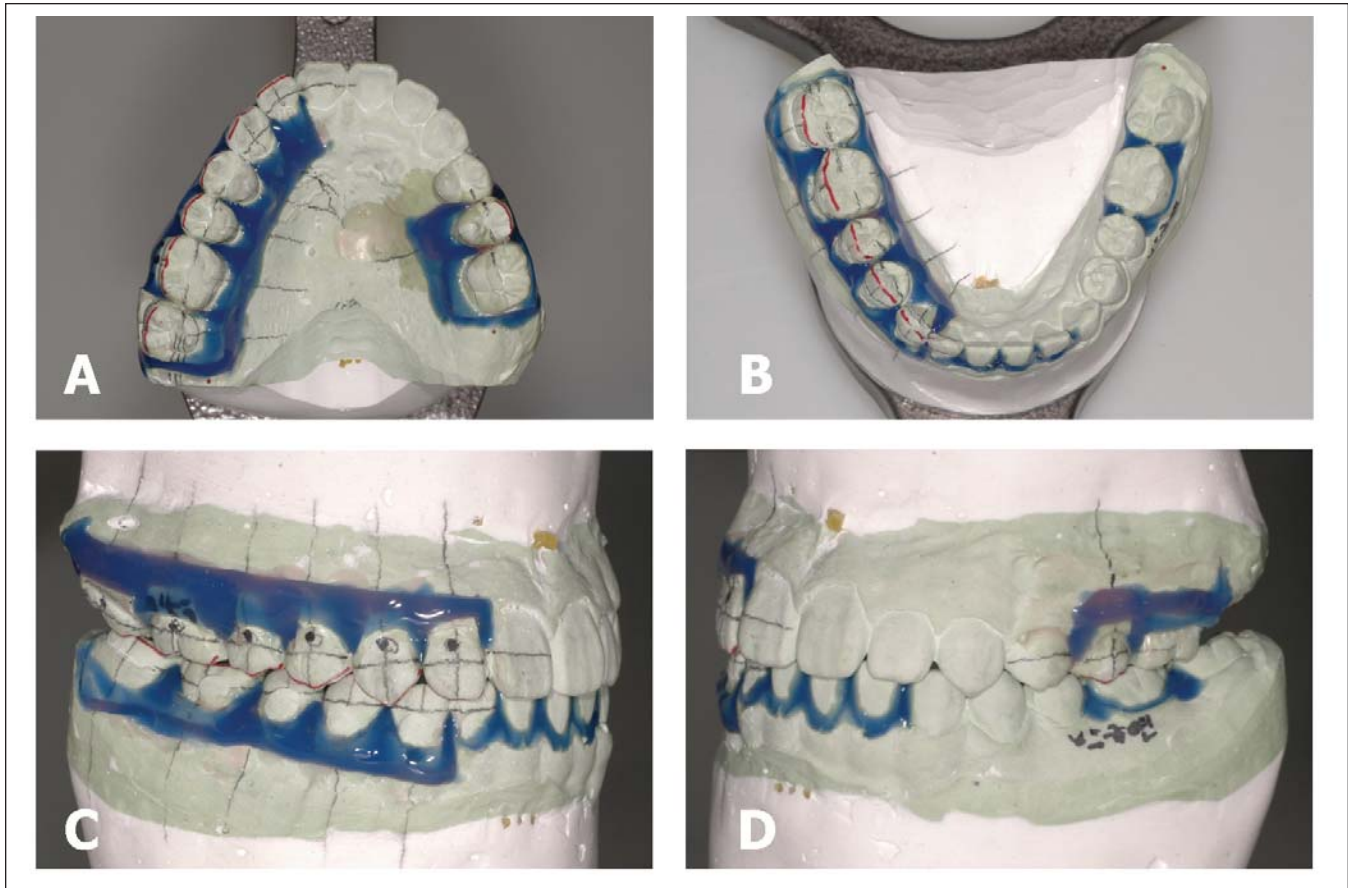


Figure 9. The set-up model mounted on an articulator. Upper occlusal view (A), lower occlusal view (B), right buccal view (C) and left buccal view (D).

more than one tooth is involved, the AAP combined with digital camera could be used to accurately measure the movement. In order to reduce the patient's discomfort and minimize insult to the periodontal tissue, it is advisable to limit the initial movement to approximately .5 mm. After eight months of treatment, upper second premolars were aligned (Figure 7, D) and the spaces in the mandibular arch were closed. However, after the lower spaces were closed,

lower midline was deviated to the right by approximately 3 mm (Figure 8). In order to correct the midline and establish an ideal occlusion, a construction bite was registered.¹³ A proper construction bite is essential for good appliance fabrication. The construction bite, usually taken with a horse wafer medium hard wax, must orient the upper and lower dental arches in three planes: sagittal, vertical, and transverse. An articulator was used to mount upper and lower

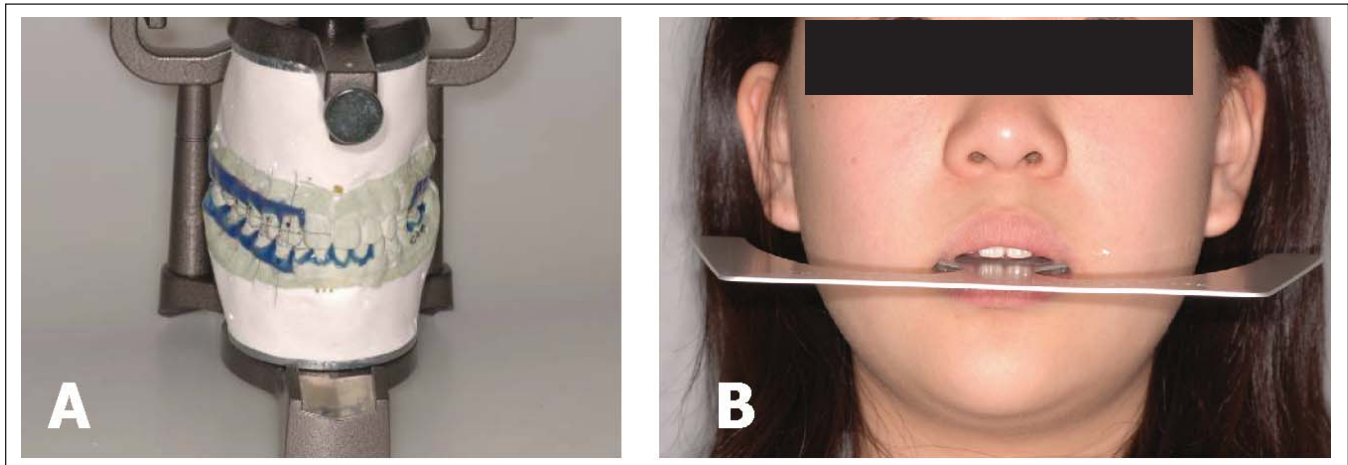


Figure 10. The set-up model mounted on an articulator before the fabrication of cow-catch Clear Aligner (A). Patient with a facebow to check for occlusal canting (B).

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Figure 11. Intraoral views showing the application of cow-catch Clear Aligner with intermaxillary vertical elastic, 1/8 Medium (3M Unitek, Monrovia, CA).

study models with the construction bite. Using the 0.25 mm Pindex handsaw (Henry Schein, Melville, NY), the target teeth were removed from the working cast. Afterwards the target teeth were set up so that they could be moved to the desired position on the working cast. After the target teeth were moved to the desired position, they were fixed with a baseplate wax. To withstand the pressure of the vacuum former during thermoforming, a sufficient amount of light curing, blue opaque block-out putty, Blue Blokker (Scheu-dental, Germany) was added over the baseplate wax. By overfilling the putty, it is easy to reduce and polish certain amount of composite to increase surface smoothness. This increases the patient's comfort by decreasing the pressure on the gingiva as well (Figure 9). After upper and lower set-up model fabrication, they were mounted on an articulator (Figure 10, A).

The Clear Aligner made from the set-up model with ideal occlusion was connected to the opposite arch with elastics using buttons attached to the Clear Aligner and teeth surfaces. Cow-catch Clear Aligner was used for midline correc-

tion and to achieve ideal interdigitation. When the expected correction of the target tooth is achieved, it touches the surface of the Clear Aligner and no additional extrusion occurs. It has the advantage of being a fail-safe appliance (Figure 11). During treatment, occlusal canting was checked by using a facebow (Fig 10, B). The main benefit of the cow-catch Clear Aligner over tooth positioner is the ability to extrude the teeth more rapidly with elastics. The cow-catch Clear Aligner was used only at bed time.

The patient started her treatment when she was 8-year and 9-month-old. During the treatment, the aligners were changed periodically for the guidance of the eruption and development of the primary and permanent dentitions. During the fixed appliance treatment, the importance of oral hygiene must be stressed, however, the aligner imposes no such burden on the patient's oral hygiene. Since the Clear Aligner is a removable appliance, etching and caries are held to an absolute minimum. Gingival exercise with the toothbrush maintains healthy soft tissues. Most goals of the treatment plan were achieved after treatment. The patient com-



Figure 12. Final facial photographs.



Figure 13. Posttreatment intraoral views at age 12 years 6 months.

pleted treatment with the same facial profile as pretreatment (Figure 12). The patient showed a Class I molar relationship and a Class I canine relationship with normal overjet and overbite. The dental midline was coincident with midsagittal plane (Figure 13). The panoramic radiograph showed excel-

lent root parallelism. All third molars need to be monitored every six months since they are still developing (Figure 14, A). Cephalometric analysis revealed a skeletal Class I (AN= 0°) with normovergent growth pattern (SN-GoGn: 34°). The maxillary (U1 to SN: 110°) and mandibular

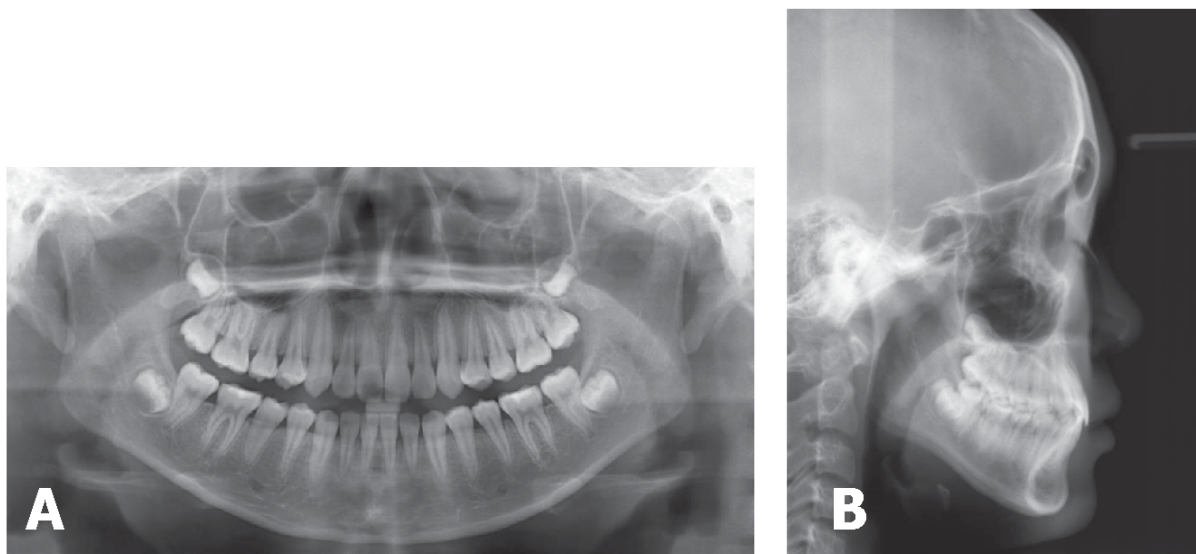


Figure 14. Posttreatment radiographic views: A. Panoramic view; B. Lateral cephalometric view.

incisors (IMPA: 91°) showed normal inclination (Figure 14, B). After the orthodontic treatment with the aligner was finished, the patient was given a new Clear Aligner as a retainer.

CONCLUSION

Eruption guidance should contribute significantly to the development of the permanent dentition in a harmonious, functional and esthetically acceptable occlusion. Early diagnosis and successful treatment of developing malocclusions can have both short-term and long-term benefits while achieving the goals of occlusal harmony, function and dento-facial esthetics. The combined treatment, traditional fixed appliances before or after the Clear Aligner application, increases the efficiency of the treatment and reduces the treatment time with fixed appliances. If the patient wears the aligners for the recommended period of time, the tooth movement is very efficient since the aligner contacts the whole tooth surface. Esthetics is excellent with aligners due to the fact that they are hardly visible. This can be a definite psychological advantage to teen-agers and adults alike. The Clear Aligner could be used as an alternative eruption guidance appliance for those who are reluctant with conventional orthodontic treatments.

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