

Conceived of orthodontic treatment for a case of anterior cross-bite Hellman Dental Age IIA period with the combination of the direct bonding lingual arch and the prefabricated functional appliance

Takuya Ninomiya¹, Toshitsugu Kawata¹

¹Orthodontic division, Department of Oral Science, Kanagawa Dental University Graduate School, Yokosuka, Kanagawa, Japan

Address for Correspondence:

Dr. Takuya Ninomiya, Orthodontic division, Department of Oral Science, Kanagawa Dental University Graduate School, Yokosuka, Kanagawa, Japan.

ABSTRACT:

Background: The LA lingual arch is employed in orthodontic treatments that require anchorage. However, interdental separation is needed to apply multiple bands on teeth for fabrication, and often causes pain and discomfort. White spot lesions may develop underneath orthodontic bands. Here we describe an anterior cross-bite case successfully treated with a direct bonding lingual arch and the prefabricated functional appliance.

Methods: We fitted direct bonding LA and the prefabricated functional appliance to correct the anterior cross-bite.

Results: The new device brought improvement of the lid for the anterior cross-bite.

Conclusions: Using direct bonding LA and the prefabricated functional appliance, we were able to improve occlusion with simplicity and a low caries risk.

Keywords: Direct bonding, Lingual arch, Orthodontic appliances without bands, Prefabricated functional appliance,

INTRODUCTION

A lingual arch (LA) is a device that is mainly used in Orthodontics to treat pediatric patients.^{1,2} The LA lingual arch is employed in orthodontic treatments that require anchorage. The wires of the LA do not contact the oral mucosa.^{3,4} However, interdental separation is needed to apply multiple bands on teeth for fabrication, and often causes pain and discomfort. White spot lesions may develop underneath orthodontic bands.^{5,6} Since the cervical margin of a band is adjacent to the gum or subgingival margin, it may lead to poor oral hygiene, resulting in gingivitis and periodontitis. A previous study reported that the plaque index and bleeding scores were higher for banded teeth than for control sites.⁷ A microbiologic evaluation of the venous blood samples of 40 healthy orthodontic patients with good oral hygiene following orthodontic banding revealed a postoperative bacteremia incidence of 7.5%.⁸

The incidence of bacteremia in the venous blood samples of patients who rinsed their

mouths with 0.2% chlorhexidine gluconate was 2.5%.⁹ Not all the dentists can put on a banded tooth. These findings suggest orthodontic appliances without bands are preferable to those with bands. A direct bonding LA was developed to solve the issues described above. This method does not require interdental separation or band transfer. Therefore, complex laboratory and clinical procedures can be eliminated. The aim of study was to introduce the laboratory and clinical procedures of the direct bonding LA. We have experienced a case of reversed occlusion Hellman Dental Age II A period combination of direct bonding LA and Infant (Orthika International Ltd., Japan) prefabricated functional appliance.

MATERIALS AND METHODS

1. Laboratory procedure

1.1. Pre-treatment records (age, 4 years 8 months). Panoramic X-ray (Figure 1A). Facial

photo (Figure 1B). Intraoral photographs (Figure 2A-D).



Figure 1: Pre-treatment records (age, 4 years 8 months).
Panoramic X-ray (A) Facial photo (B)

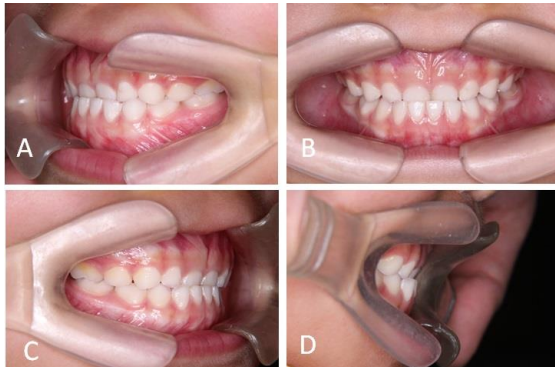


Figure 2: Pre-treatment records (age, 4 years 8 months).
Intraoral photographs (A-D).

2. Clinical procedure

2.1. The teeth were cleaned with a rotating brush and fluoride-free pumice, followed by rinsing and drying. This step was performed using air-powder polishing.

2.2. A 20% polyacrylic acid gel conditioner was applied for 10 s, followed by rinsing with the three-way syringe. A light-cured reinforced-resin (LCR, Transbond, 3M Unitek Corp., USA) was applied to the interior surface of the base. The base was gently placed on the tooth and light irradiation was performed (Figure 3 A-B).



Figure 3: A mesh plate and a tube were welded (A). This is tooth direct bonding by light adhesive resin cement (B).

2.3. Taking an impression and make a working model (Figure 4).

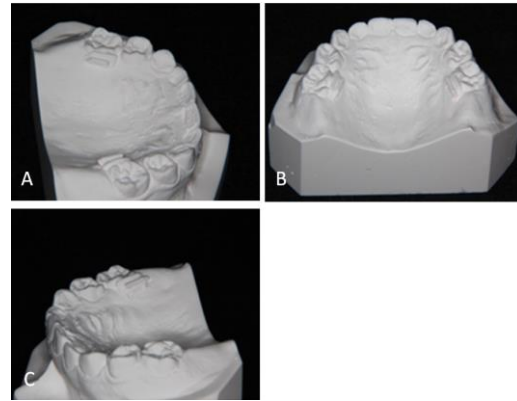


Figure 4: Laboratory procedure (A-C)

2.4. Make the LA with a clearance of 0.7 mm in the plate (Figure 5A-C). The right side picture (Figure 5D). The left side picture (Figure 5E).

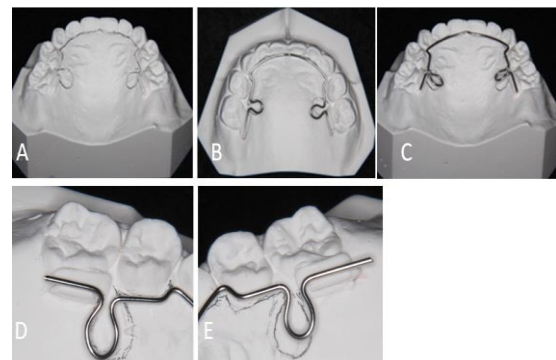


Figure 5: Make the lingual arch with a clearance of 1.0–1.5mm in the plate (A-C). The right side picture (D). The left side picture (E)

2.5. The LA was fitted with a plier to the best fitting position (Figure 6A). The lingual button base fitted the surfaces of the maxillary deciduous lingual central incisors surface (Figure 6B).



Figure 6: The Infant having various functions the prefabricated functional appliance: (1) align the teeth in a predetermined occlusal position; (2) separate the buccinators and the orbicularis muscle from the dental arch; (3) help guide mandibular repositioning; (4) tongue tag to stimulate tongue repositioning; (5) device to reduce activity of the menton musculature.

2.6. Incorporated loop LA was conducted activation in the mesiodistal direction in the oral cavity. It was used in combination with LA mounting after the Infant (Figure 7) (Figure 8).

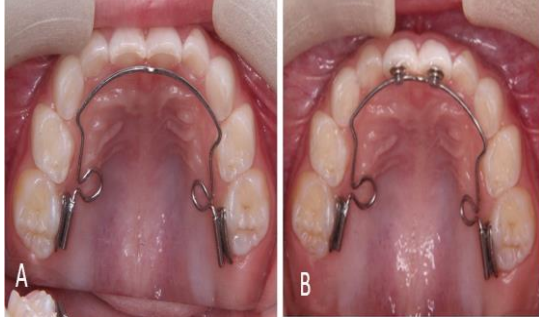


Figure 7: Clinical procedure. Place the base on the tooth (A). The bonding lingual button base of M-TPA fits tooth surface (B)



Figure 8: Combination of direct bonding lingual arch and T4K.

RESULTS

Post-treatment records. Intraoral photographs one month passed (Figure 9A-C) and six month passed (Figure 10A-C).

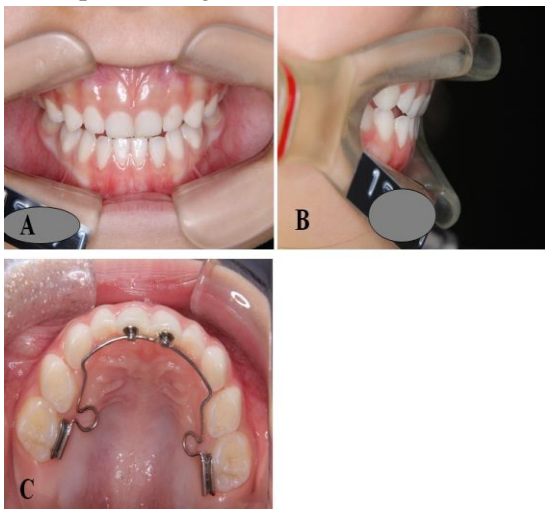


Figure 9: One month Post-treatment records. Intraoral photographs (A-C)

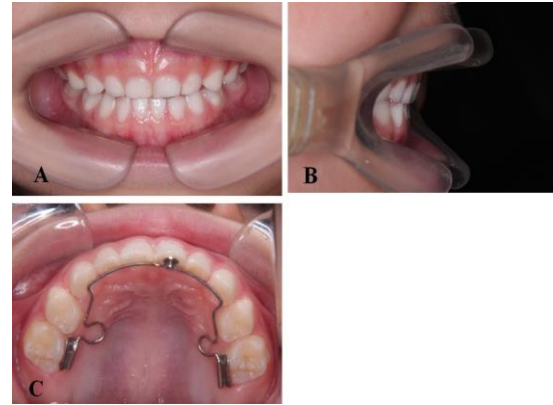


Figure 10: Six month Post-treatment records. Intraoral photographs (A-C)

DISCUSSION

This patient had all dentition of the deciduous teeth. Resorption of the root of maxillary anterior tooth did not advance. The direct bonding LA contacted large area of the retaining tooth. There are many landmarks exist on the lingual surface, including the lingual groove, and lingual ridge, and lingual fossa, and act as references for the bonding procedure in order to achieve a tight fit.¹⁰ A tight fit prevents drifting of the direct bonding LA from the tooth surface when removing excessive cement with explorer. Since the direct bonding LA does not require interdental separation or band transfer, it eliminates complex laboratory and clinical procedures and prevents the technical errors, associated with other appliances that involve bands. This simplified laboratory procedure, allows for immediate application on the same day as impression taking.

Figure 2A-D shows the lingual inclination of the maxillary front tooth. The upper right molars have already been moved forward. The direct bonding LA, which was retained with four molars, was designed to maximize anchorage. LA on the first molars was fabricated with 0.7-mm stainless steel wires and soldered to a mesh plate and tube. An impression was taken in order to fabricate the LA. Since the direct bonding LA is independent of a labial active/fixed appliance, it can be removed if it no longer becomes necessary during the treatment without the interruptions associated with active/fixed

appliances. Although the number of retaining teeth is limited with a conventional transpalatal arch with bands, the direct bonding LA allows the use as retaining teeth. Therefore, versatile designs, such as that of the direct bonding LA with many retaining teeth and an asymmetric architecture, are available. The conventional transpalatal arch can be adjusted for the expansion and derotation of molars. However, the direct bonding LA allows for light force adjustability due to its architecture. Furthermore, the orthodontic force generated by a LA depends on the maxillary deciduous central incisor with a lingual button.¹¹ The orthodontic force could regulate by the loop of the LA with direct pliers in the oral cavity. Reversed occlusion was improved in only one month.

In the case of breakage of the direct bonding LA, it can be repaired with adhesive resin in the mouth at site of the break. Even if the bonding base becomes detached from the tooth, the base can be rebonded with LCR after the surface has been cleaved by air-powder polishing with sodium bicarbonate. Since the direct bonding LA contacts teeth over a large area, it is difficult to remove if strong bonding materials are used. LCR is the bonding material with a lower bond strength than composite resin¹²; however, no significant differences have been reported in the failure rates.¹³ Additionally, the bond strength of LCR was significantly decreased even when the enamel surface was contaminated with water and saliva. LCR is considered useful for application of the direct bonding LA in molar region in which it is difficult to maintain a dry field.¹⁴ Our direct bonding LA can be attached and detached from the main arch and tube. Furthermore, it can be easily changed to a transpalatal arch. Using the prefabricated functional appliance, it is possible to also improve the oral habits. Prefabricated functional appliance has a dentoalveolar effect, in that it significantly reduces the inclination of the maxillary incisors while significantly increasing the inclination of the mandibular incisors.¹⁵ This

case, use the prefabricated functional appliance with direct bonding LA and front expansion of the maxillary anterior teeth.

CONCLUSION

Anterior cross bite was treated using direct bonding lingual arch. Over-jet was improved in six months.

REFERENCES

1. Steelman R, Holmes D, Byron M, Cupp D. Traumatic avulsion of the mandibular right primary lateral incisor and cuspid. *J Clin Pediatr Dent* 1991;15:249-50.
2. Ferdianakis K, Laskou M, Spyrou L. Lingual arch appliance fabrication in the dental office. *J Clin Pediatr Dent* 1998;22:277-80.
3. Baldini G, Luder HU. Influence of arch shape on the transverse effects of transpalatal arches of the Goshgarian type during application of buccal root torque. *Am J Orthod* 1982;81:202-08.
4. McNamara JA, Brudon WL. Transpalatal arch. In: McNamara JA, Brudon WL, editors. *Orthodontics and dentofacial orthopedics*. Ann Arbor: Needham Press Inc; 199–209, 2001.
5. Ogaard B, Rolla G, Arends J, Ten Cate JM. Orthodontic appliances and enamel demineralization. Part 2. Prevention and treatment of lesions. *Am J Orthod Dentofacial Orthop* 1988;94:123–8.
6. van der Linden RP, Dermaut LR. White spot formation under orthodontic bands cemented with glass ionomer with or without Fluor Protector. *Eur J Orthod* 1998;20:219–24.
7. Huser MC, Baehni PC, Lang R. Effects of orthodontic bands on microbiologic and clinical parameters. *Am J Orthod Dentofacial Orthop* 1990;97:213–8.
8. Erverdi N, Kadir T, Ozkan H, Acar A. Investigation of bacteremia after orthodontic banding. *Am J Orthod Dentofacial Orthop* 1999;116:687–90.
9. Erverdi N, Acar A, Isguden B, Kadir T. Investigation of bacteremia after orthodontic banding and debanding following

chlorhexidine mouth wash application. *Angle Orthod* 2001;71:190–4.

10. Komori A, Fujisawa M, Iguchi S. Common Base for precise direct bonding of lingual orthodontic brackets. *Int Orthod* 2010;8:14–27.

11. Kawata T, Ninomiya T, Koizumi S, Iwata T. Application of a direct bonding lingual arch.

12. Komori A, Ishikawa H. Evaluation of a resin-reinforced glass ionomer cement for use as an orthodontic bonding agent. *Angle Orthod* 1997;67:189–95.

13. Fowler PV. A twelve-month clinical trial comparing the bracket failure rates of light-

cured resin-modified glassionomer adhesive and acid-etch chemical-cured composite. *Aust Orthod J*. 1998;15:186–90.

14. Bishara SE, Olsen ME, Damon P, Jakobsen JR. Evaluation of a new light-cured orthodontic bonding adhesive. *Am J Orthod Dentofacial Orthop* 1998;114:80–7.

15. Ramirez-Yanez G, Sidlauskas A, Junior E, Fluter J. Dimensional Changes in Dental Arches after Treatment with a Prefabricated Functional Appliance. *J Clin Pediatr Dent* 2007;31(4):279-83.

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