Case Report

Application of a direct bonding lingual arch

Toshitsugu Kawata[1], Takuya Ninomiya[1], So Koizumi[1]*, Toshio Iwata[1]

[1]Department of Oral Science, Division of Orthodontics, Kanagawa Dental University Graduate School, 82 Inaoka-cho, Yokosuka, Kanagawa, 238-8580, Japan

ABSTRACT

Orthodontic treatments involve the fixation of appropriate appliances, such as the lingual arch (LA), which acts as an anchor to stabilize and/or prevent the movement of a tooth. However, application of the LA and transpalatal arch both requires complex laboratory procedures owing to the use of multiple bands. A modified direct bonding LA was developed to simplify laboratory procedures and promote versatile designs. A mesh plate and tube were welded together, and the LA was then attached using the directly bonded mesh plate and tube. Since the LA was only directly bonded on the lingual side, it could be removed according to anchorage requirements without disturbing the labially fixed appliances.

Key words: Direct bonding, Lingual arch, Orthodontic appliances without bands

Access this article online

Website: www.jpediatrdent.org

DOI: 10.4103/2321-6646.164883

Quick Response Code:

INTRODUCTION

A lingual arch (LA) is a device that is mainly used in orthodontics to treat pediatric patients[1,2] and is commonly 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 for application of multiple bands on teeth for fabrication and can often cause pain and discomfort. In addition, white spot lesions have been reported to develop underneath orthodontic bands.[5,6]

Since the cervical margin of a band is adjacent to the gums or subgingival margin, the presence of the LA may lead to poor oral hygiene in the cervical area, resulting in gingivitis and periodontitis. A previous study reported that the plaque index and bleeding scores were significantly higher for banded teeth than for control sites.[7] In addition, 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] Moreover, the incidence of bacteremia in venous blood samples of patients who rinsed their mouths with 0.2% chlorhexidine gluconate was still 2.5%.[9] In addition to these issues, not all dentists can apply banded teeth. Therefore, these findings suggest that orthodontic appliances without bands are preferable to those with bands.

In the current report, we present the laboratory and clinical procedures developed for a direct bonding LA to solve the issues described above. Our developed method did not require interdental separation or band transfer. Therefore, complex laboratory and clinical procedures could be eliminated. This method is expected to improve the effective application of LAs.

LABORATORY PROCEDURE

The patient was 4 years and 8 months of age. Panoramic

How to cite this article: Kawata T, Ninomiya T, Koizumi S, Iwata T. Application of a direct bonding lingual arch. J Pediatr Dent 2015;3:97-100.

***Address for correspondence**

Dr. So Koizumi, Department of Oral Science, Division of Orthodontics, Kanagawa Dental University Graduate School, 82 Inaoka-cho, Yokosuka, Kanagawa, 238-8580, Japan. E-mail: koizumi@kdu.ac.jp

X-rays [Figure 1a], a facial photo [Figure 1b], and intra-oral photographs [Figure 2a-d] are shown.

For construction of the LA, a mesh plate and tube were welded together (Mesh Plate and Tube Orthika International Ltd., Japan), as shown in Figure 3a, and then directly bonded to the tooth using light adhesive resin cement [Figure 3b]. The laboratory procedure is shown in Figure 4a-c. The LA was made to have a clearance of 0.7 mm in the plate [Figure 5a and b]. Images of the left and right sides of the LA are shown in Figure 5c and d.

For application of the LA, the base of the LA was placed on the tooth [Figure 6a]. The bonding lingual button base of the mesh plate and tube was fit to the tooth surface [Figure 6b].

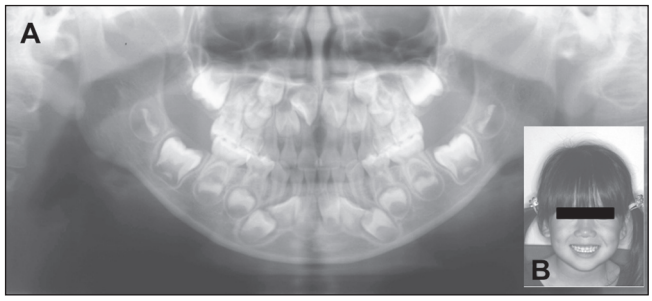

Figure 1: Pretreatment records (age, 4 years 8 months). Panoramic X-ray (a). Facial photo (b)

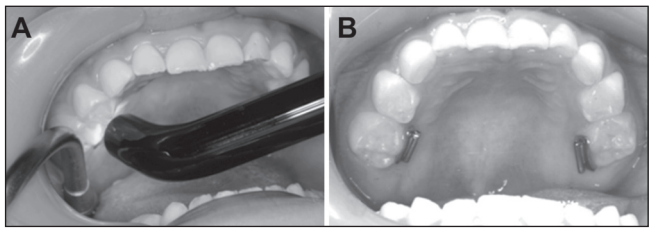

Figure 3: A mesh plate and tube were welded together (a). Direct bonding to the tooth was achieved with a light adhesive resin cement (b)

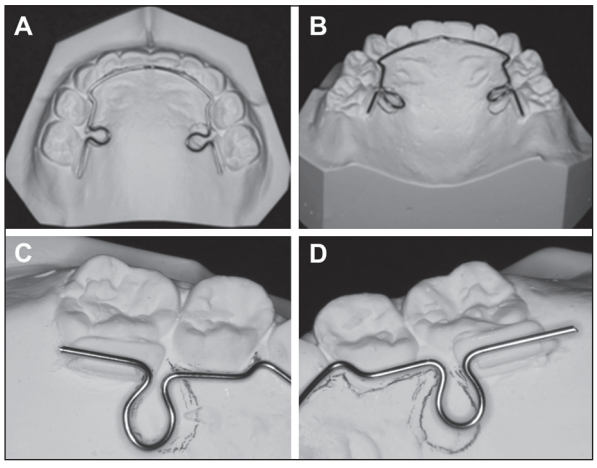

Figure 5: The lingual arch was with a clearance of 1.0-1.5 mm in the plate (a and b). The left side picture (c). The right side picture (d)

CLINICAL PROCEDURE

The teeth were cleaned with a rotating brush and fluoride-free pumice, followed by rinsing and drying with a three-way syringe. This step was also performed using air-powder polishing. Next, 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 then applied to the interior surface of the base [Figure 3a and b]. The base was then gently placed on the tooth [Figure 3b].

CLINICAL RESULTS

We then analyzed the results of application of the LA. The base was pressed with an explorer to the best-fitting position [Figure 6a]. The bonding lingual

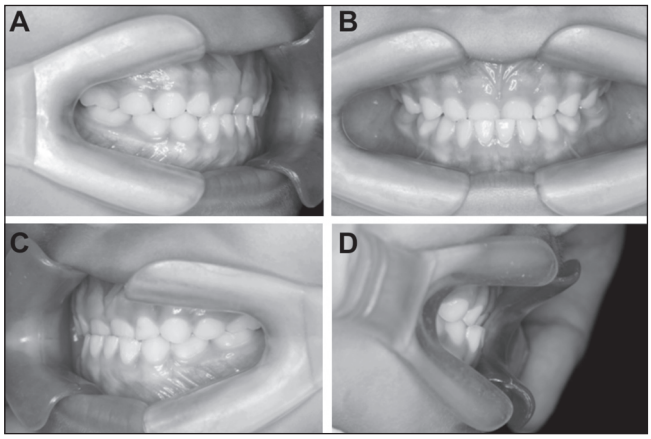

Figure 2: Pretreatment records. Intraoral photographs (a-d)

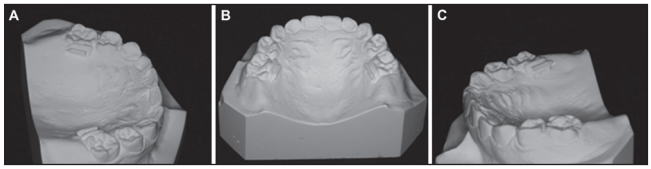

Figure 4: Laboratory procedure (a-c)

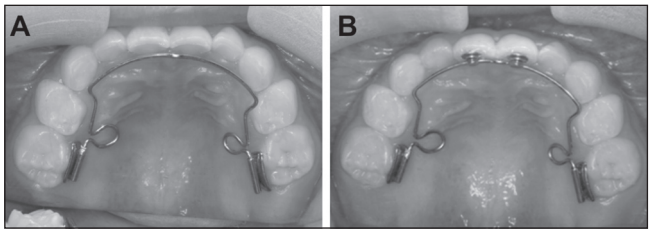

Figure 6: Clinical procedure. The base was placed on the tooth (a). The bonding lingual button base of M-transpalatal arch fit the surfaces of the maxillary deciduous lingual central incisors surface (b)

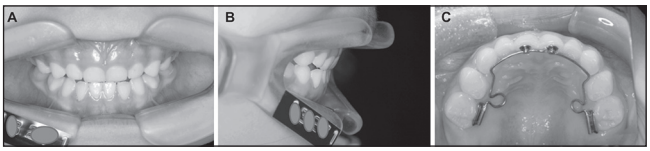

Figure 7: Posttreatment records. Intra-oral photographs (a-c)

button base of the direct bonding LA was fit well to the surfaces of the maxillary deciduous lingual central incisors surface [Figure 6b]. Intra-oral photographs 1-month after treatment are shown in Figure 7a-c.

DISCUSSION

In this report, we showed the laboratory and clinical procedures for construction of a direct bonding LA. This appliance was well-bonded and appropriately fitted to the patient.

The patient in our analysis had all dentitions of the deciduous teeth. Resorption of the root of the maxillary anterior tooth did not advance. The direct bonding LA contacted a large area of the retained tooth. Many landmarks exist on the lingual surface including the lingual glove, lingual ridge, and lingual fossa; these landmarks act as references for the bonding procedure to achieve a tight fit,[10] which prevents drifting of the direct bonding LA from the tooth surface when removing excessive cement with the explorer. Since the direct bonding LA does not require interdental separation or band transfer, it eliminates complex laboratory and clinical procedures and prevents technical errors associated with other appliances that involve bands. This simplified laboratory procedure allows for immediate application on the same day as the impression is taken.

In our patients, the upper right molars had already been moved forward [Figure 2a-d]. 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 to fabricate the LA. Since the direct bonding LA was independent of a labial active/fixed appliance, it could be removed if it was no longer necessary during treatment.

Although the number of retained teeth is limited when applying a conventional transpalatal arch (TPA) with bands, the direct bonding LA allowed the use of retained teeth. Therefore, versatile designs, such as that of the direct bonding LA with many retained teeth and an asymmetric architecture, are available. The conventional TPA can be adjusted for the expansion and derotation of molars. However, the direct bonding LA allowed for light-force adjustability due to its architecture. Furthermore, the orthodontic force generated by an LA depends on the maxillary deciduous central incisor and lingual button. The orthodontic force can be regulated by the loop of the LA with direct pliers in the oral cavity. In our case here, reversed occlusion was improved in only 1-month.

In the case of breakage of the direct bonding LA, repairs can be made with adhesive resin in the mouth at the 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, the appliance can be difficult to remove if strong bonding materials are used. LCR is a bonding material with a lower bond strength than composite resin;[11] however, no significant differences have been reported in failure rates of LCR versus composite resin.[12] In addition, the bond strength of LCR was significantly decreased, even when the enamel surface was contaminated with water and saliva. Therefore, LCR is considered useful for application of the direct bonding LA in the molar region in which it is difficult to maintain a dry field.[13]

In summary, our direct bonding LA could be attached and detached from the main arch and tube and could be easily changed to a TPA. The methods described herein can be used to construct and apply a direct bonding LA for use in a wide variety of dental applications.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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;81:202-8.
4. McNamara JA, Brudon WL, editors. Transpalatal arch. In: Orthodontics and Dentofacial Orthopedics. Ann Arbor: Needham Press Inc.; 2001. p. 199-209.
5. Øgaard B, Rølla 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, Işgüden 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. KommonBase for precise direct bonding of lingual orthodontic brackets. Int Orthod 2010;8:14-27.
11. 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.
12. 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.
13. 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.