A Modified Feeding Plate for a Newborn With Cleft Palate

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A Modified Feeding Plate for a Newborn With Cleft Palate

Mustafa Erkan, Şeniz Karaçay, Arzu Atay, Yumuşhan Günay

Objectives: **Cleft palate is a common congenital maxillofacial defect. We wish to present the fabrication of a modified feeding plate that will adapt to the changing palatal and velopharyngeal morphology during function.**

Case Report: **A neonate with unilateral cleft lip and palate was referred to our clinic for the fabrication of a feeding plate. Intraoral examination revealed a cleft involving the uvula and the soft palate, with an alveolar defect on the left side. An impression was taken and a dental cast was obtained. A 1-mm Bioplast clear soft plate was pressed on the model. After trimming the edges of the plate, several retentive holes were made for its attachment to the hard plate. With the Bioplast soft plate replaced on the cast, plaster was used to cover parts of the soft plate that were not to come in contact with the hard plate. Biocryl resin was put on the retentive holes and 2-mm Biocryl C Rosa-transparent plate was pressed. The edges of the plate were cut, trimmed, and polished.**

Conclusion: **This modified feeding plate effectively obstructed the soft palate defect. The adaptation of the flexible bulb of the appliance with the soft palate was excellent. Evaluation with nasoendoscopy revealed the synchronized movement of the bulb of the appliance with the soft palate during swallowing. Soft extension of the feeding plate eliminated the risk of irritation, and the baby accepted the appliance easily.**

KEY WORDS: *cleft palate, feeding plate*

The most common congenital defect involving the face and jaws is cleft lip and/or palate and, occasionally, cleft of other facial structures. Cleft pathogenesis occurs early during embryonic development and putatively results from the failure of fusion of the various facial processes (Proffit, 2000). The incidence of cleft lip, cleft palate, and cleft lip and palate varies with the races. American Indians have been reported to show the highest values followed by the Japanese, the Maoris, and the Chinese (Vanderas, 1987).

A multidisciplinary approach is needed in the treatment of infants with cleft. Lip repair is frequently achieved by the time the infant is 2 to 6 months old, but repair of the palate is usually delayed until 12 months to 2 years of age because early repair of the palate may have a negative effect on the growth and development of the maxilla due to the resulting scar tissue (Grabber et al., 2005). Until surgical intervention, maintenance of adequate nutrition is essential to allow normal growth of the newborn and to prepare the infant for the corrective surgery. However, the most serious problems that a newborn with cleft palate encounters are the difficulties during feeding. Oronasal communication diminishes the ability to create negative pressure, a necessary part of sucking (Osuji, 1995). Nasal regurgitation of oral liquid, frequent burping due to excessive air intake during deglutition, and choking are the associated problems that make the feeding complicated for both the cleft baby and the parent. These feeding complications not only delay the development of the newborn but also create parental anxiety (Goldberg et al., 1988; Saunders et al., 1989; Choi et al., 1991; Osuji, 1995).

There are different approaches to feed babies with cleft palate. Orogastric and nasogastric tubes may be effective but should be used only for limited times. Some reports suggest the use of specially designed nipples with enlarged openings to allow the flow of formula with less effort, but this option may not be a good choice for some patients (Goldberg et al., 1988; Saunders et al., 1989). A feeding plate is a prosthetic aid designed to obturate the cleft so that the infant can generate negative pressure within the oral cavity, which is necessary for sucking. Additionally, it corrects the tongue posture and helps it not only perform its functional role in the development of the jaws but also facilitates swallowing (Ziai et al., 2005). In addition, it has been shown that a feeding plate stimulates the spontaneous growth of the maxillary segments toward each other by preventing the tongue from entering the defect (Oliver, 1969; Goldberg et al., 1988; Osuji, 1995). Reducing the incidence of otitis media and nasopharyngeal infections by

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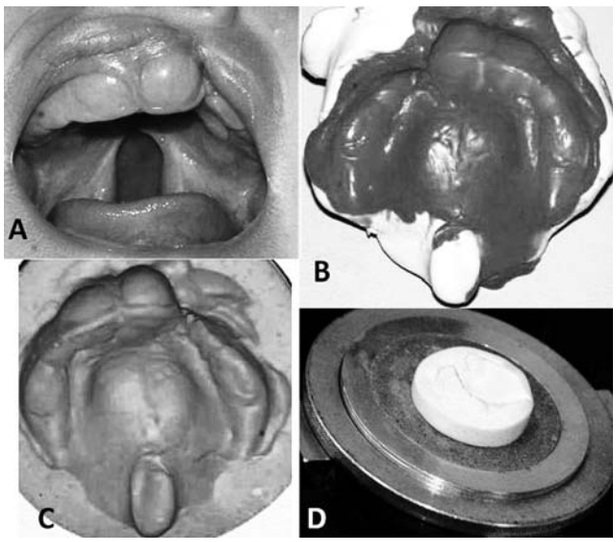

FIGURE 1 (A) Intraoral view of the infant with cleft lip and palate. (B) Impression of the infant. (C) Dental cast model of the infant. (D) Biostar device.

minimizing the passage of food into the nasopharynx are the other advantages of a feeding plate (Oliver 1969; Osuji, 1995).

Conventional feeding plates cover the hard palate and extend posterior to contact the soft palate. However, synchronized movement of the part covering the soft palate during swallowing is not possible because the material used for conventional feeding plates is rigid. In addition, it frequently injures the soft tissue due to this rigidity (Greyson and Maull, 2004; Savion and Huband, 2005; Ziai et al., 2005). In this case report, the fabrication of a modified feeding plate that can adapt to the changing palatal and velopharyngeal morphology during function is presented. The bulb part of the feeding plate that extended to the soft palate was constructed using a soft plastic. This part of the appliance was flexible and permitted synchronized movement with the soft palate during function.

Case Report

The patient was a 3-day-old female infant with cleft lip and palate who weighed 2.5 kg. The pediatrician referred the baby to the dental service because her mother was unable to feed her using typical cleft nipples or squeezable bottles. History taken from her parents showed no known clefting or other congenital defect within the family. Intraoral examination revealed cleft of the uvula and soft palate. There was also a defect of the alveolus on the left side (Fig. 1A).

To prevent the nasal regurgitation of the oral liquid, a feeding plate with a flexible bulb, capable of synchronized movement with the soft palate during swallowing, was designed. The face of the infant was positioned downward to prevent airway obstruction and aspiration of impression

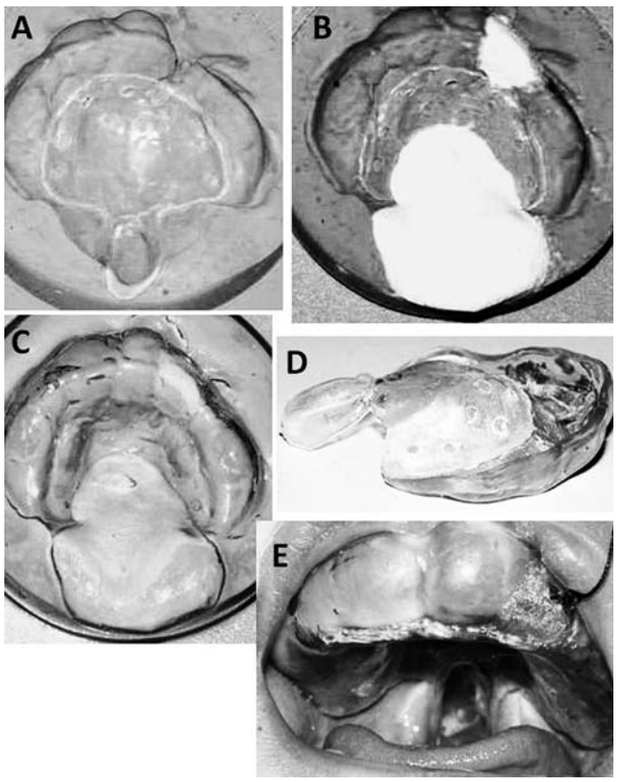

FIGURE 2 (A) 1-mm Bioplast clear plate covering the palatal vault and the cleft region. (B) Retentive holes were opened on the Bioplast clear plate that will be joined to the hard plate; other parts that will not contact with the hard plate were filled with plaster. The defect region of the alveolar bone was also covered with plaster. (C) Biocryl C Rosa-transparent plate pressed over the Bioplast clear plate. (D) The feeding plate fabricated with a flexible bulb covering the cleft area. (E) Intraoral view of the feeding plate.

material while the first and second impressions were being taken with viscous vinyl polysiloxane impression material (3M Express STD Putty, 3M Dental Products, St. Paul, MN) under the supervision of a pediatrician. Dental plaster was poured into the impression and a dental cast model was obtained for the construction of the feeding plate. The impression and the dental cast model revealing the cleft are presented in Figure 1B and 1C, respectively.

Prior to the fabrication of the feeding plate, lac was applied on the dental cast model and in the Biostar device (Scheu-Dental Gmbh 58642 Iserlohn, Germany) (Fig. 1D). 5
A 1-mm Bioplast clear plate (soft plate) was pressed on the model and the plate was cut so as to cover the palatal vault and the cleft region (Fig. 2A). The Bioplast clear plate was a soft plate and was used to construct a flexible bulb obturating the cleft region. After trimming the edges of this soft plate, several retentive holes were made in it to allow for later attachment to the hard plate. The soft plate was placed back on the cast, and portions that were not to come in contact with the hard plate were filled with plaster, including the alveolar gap and the soft palate extension (Fig. 2B). Acrylic resin was put on the retentive holes and a 2-mm Biocryl C Rosa-transparent plate (hard plate) was

pressed (Fig. 2C). The edges of the plate were trimmed and polished. The completed feeding plate with a flexible bulb covering the cleft area is shown in Figure 2D. A small hole was drilled in the anterior flange of the appliance with a round bur, and a piece of thread was attached through this hole for safety. The feeding plate was inserted into the mouth, necessary adjustments were made, and the appliance was polished again. The fit of the feeding plate and adjustment of the flexible bulb with the cleft region was optimal (Fig. 2E).

The infant accepted the feeding plate easily and the mother was able to bottle-feed the baby immediately. The feeding process was comfortable for both the baby and the mother. The flexible bulb of the appliance was compatible with the soft palate, and evaluation using nasal endoscopy revealed that this part was moving in a synchronized manner with the soft palate during swallowing. The parents were educated about insertion and removal of the appliance. They were also informed about how to clean the appliance and the oral cavity. The infant was seen weekly for necessary plate adjustments. It was observed that soft extension of the feeding plate eliminated the risk of irritation and the adaptation of the infant to the appliance was good. The feeding plate provided adequate nutrient intake, and her weight gain was normalized.

Discussion

Maintenance of adequate nutrition is essential for the growth and development of the infant because gaining weight is important for the preparation of the baby for the corrective surgery. However, a cleft palate creates an opening in the roof of the mouth and the infants have difficulties sucking because the necessary negative pressure cannot be produced in the oral cavity (Goldberg, 1988; Saunders et al., 1989; Choi et al., 1991; Osuji, 1995). Additionally, the expressed milk tends to escape to the nose. Various feeding devices have been used to feed these babies including the traditional feeding bottle, which may be rigid or squeezable with two types of nipples (a regular
6 Nuk or a cleft Nuk), a squeezable cleft palate nurser, a traditional feeding bottle with a crosscut nipple, the Hotz plate, the Haberman feeder, a prosthetic obturator appliance, a nasogastric tube, cup and spoon feeding, and syringe feeding (Greyson and Maull, 2004). In the presented case, a modified feeding plate was constructed using both hard and soft materials that permitted effective feeding and normal weight gain.

Cleft lip and/or palate should be treated by an interdisciplinary team. Timing and sequencing of orthodontic care may be divided into four distinct developmental periods as infant orthopedics (birth to 2 years), primary dentition stage (2 to 6 years of age), mixed dentition stage (7 to 12 years of age), and permanent dentition stage (Grabber et al., 2005). Infant orthopedics using an acrylic plate was proposed by Hotz and Gnoinski (1976, 1979), and it is initiated during the first week of life. Reported benefits of intraoral plates include facilitation of feeding, guidance of growth and development of the maxillary segments, normalization of tongue function, facilitation of surgery, better speech, and a positive psychological effect on parents (Oliver, 1969; Goldberg et al., 1988; Osuji, 1995; Ziai et al., 2005). The effect of infant orthopedics on the maxillary arch dimensions has been discussed for decades. Prahl et al. (2001) showed that infant orthopedics had a temporary effect on the maxillary arch dimensions, and its effect did not last beyond surgical soft palate closure. Bongaarts et al. (2006) reported that the effect of lip and palatal surgery was much greater than the effect of infant orthopedics. On the other hand, Tamita et al. (2010), after evaluating the associations between severity of alveolar cleft and treatment outcome of infant orthopedics in patients with complete unilateral cleft lip and palate, concluded that the severity of the width of the cleft significantly affected the efficiency of infant orthopedics. The efficiency was greater in more severe patients than in mild patients.

Feeding plates have the ability to adjust the position of cleft segments into a more ideal relationship before definitive surgical repair of lip so the popularity of the infant orthopedics is still considerable, although there are conflicting reports about eliminating future need of orthodontic treatment for the child (Grabber et al., 2005). In the presented case, the palatal cleft included the entire soft palate. The mother had difficulties feeding the baby due to nasal regurgitation. A feeding plate was used to obstruct the cleft and to improve the infant's ability to suckle. Feeding plates not only solve the feeding problems but also move the palatal segments nearer to their normal relation, facilitating surgical repair. Additionally, these appliances prevent the tongue from entering the cleft area (Choi et al., 1991; Osuji, 1995; Grabber et al., 2005; Grabowski et al., 2006). In the presented case, the feeding plate with flexible bulb efficiently obstructed the cleft area during feeding and prevented the entrance of tongue into the cleft.

In conventional feeding plates, the bulb part of the appliance is usually rigid and may cause irritation during swallowing (Greyson and Maull, 2004; Savion and Huband, 2005; Ziai et al., 2005). This irritation problem prolongs the adaptation period of the infant to the appliance. Another disadvantage of the conventional feeding plates is the rigid bulb that cannot move with the soft palate during swallowing. In some cases, the efficiency of conventional appliances is doubtful due to this inability to adapt to the movement of the soft palate and, therefore, failure to eliminate the problems during feeding. To overcome these shortcomings, the bulb part of the feeding plate should be flexible. Günay et al. (2009) constructed the bulb part from elastomeric impression material, and it was attached to the appliance by tulle (No. 01-Fine front and moustache lace, Nylon Art. 2429, Kryolon Gmbit, Berlin,

Germany), which is a flexible and durable material is used for theater productions. With the help of this material, the bulb part was connected to the palate as a mobile piece and this connection acted like a natural velopharyngeal extension. In this previous case report, the feeding plate with a mobile bulb provided comfortable swallowing for the infant.

In our clinic, a feeding appliance with tulle was fabricated for a series of infants who had cleft palate. However, when the feeding plate was used for a long time period, the flexible bulb part sometimes split off the tulle or the tulle sometimes ripped from the acrylic part of the appliance. To eliminate these complications, we constructed the bulb part using a soft 1-mm Bioplast clear plate (soft plate). Retentive holes were made on the part that covers the hard palate and acryl resin was put on these holes to connect the 2-mm Biocryl C Rosa transparent plate (hard plate) with the soft plate. During the treatment period these two plates remained together. Due to the soft structure of the bulb part, the posterior pharyngeal wall was not irritated. The baby adapted to the appliance very quickly and the mother fed the baby with ease. The appliance was fabricated by pressing plates with a Biostar device; the fabrication process was easy, quick, and inexpensive. The adaptation of the soft bulb of the appliance with the soft palate was excellent during swallowing. Evaluation with nasoendoscopy revealed the synchronized movement of this part with the soft palate during swallowing, which is very important for the efficiency of the feeding plate and for the infant's compliance. We believe this modified feeding plate has many advantages and can be used routinely as the initial treatment for infants with cleft palate.

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