

Anterior esthetic fixed appliances for the preschooler: considerations and a technique for placement

William F. Waggoner DDS, MS Ari Kupietzky DMD, MSc

Dr. Waggoner is in private practice, Las Vegas, Nevada and Dr. Kupietzky is in private practice, Jerusalem, Israel, they are both Diplomates of the American Board of Pediatric Dentistry. Correspond with Dr. Kupietzky at drkup@netvision.net.il

Abstract

One of the pediatric dentist's greatest restorative challenges is the esthetic rehabilitation of a young toddler who has suffered multiple tooth loss subsequent to rampant early childhood caries or extensive dental trauma. An anterior esthetic appliance may be used to replace lost teeth. The most decisive factor for placing an anterior esthetic appliance is parental desire.

Other considerations include: space maintenance, masticatory function, speech development, and tongue habits. However, there is no strong evidence that early loss of maxillary incisors will have any significant, long lasting effect on the growth and development of the child. This paper discusses in detail one type of fixed anterior esthetic appliance and the considerations to be made when deciding when and why to place them. (Pediatr Dent 23:147-150, 2001)

One of the pediatric dentist's greatest restorative challenges is the esthetic rehabilitation of a young toddler who has suffered multiple tooth loss subsequent to rampant early childhood caries (EEC) or extensive dental trauma. This paper discusses one type of fixed anterior esthetic appliance and considerations to be made when deciding when and why it should be placed.

ECC, known previously as baby bottle caries, nursing bottle caries, baby bottle tooth decay, or nursing decay, is a relatively new term that describes rampant dental caries in infants and toddlers.¹ The condition, when associated with the bottle habit, has been characterized as first affecting the primary maxillary anterior teeth, followed by involvement of the primary molars. The extent of decay is almost always more severe in the maxillary incisors, and, frequently, by the time the child is brought to the dentist, much of the anterior clinical crowns are decayed or lost. ECC is found in epidemic proportions in some US minority populations and in developing countries, but is not limited to these high-risk groups. Children of all socioeconomic levels may present with ECC, including middle- and upper-class populations.

When extraction of primary incisors is necessary, many parents will seek an esthetic solution to replace the lost teeth. For the clinician seeking to construct and place an esthetic appliance in a preschooler there is very little information in the dental literature which addresses the need or indications for these appliances. A few articles have been published which describe a particular appliance design,^{2,3,4} but there is a scarcity of information available to aid the clinician in appliance design, placement, and counseling of parents.

Clinical considerations and parental counseling

When considering the need for an anterior appliance to replace missing primary incisors, the following points should be discussed with the parents. First, the strongest factor for placing an anterior esthetic appliance is parental desire. While space maintenance, masticatory function, speech development, and tongue habits may be of some consideration, there is no strong evidence that early loss of maxillary incisors will have any significant, long-lasting effect on the growth and development of the child.

Space maintenance

While space maintenance in the posterior region is an important consideration when there is early loss of primary molars, the anterior segment, from canine to canine, appears to be stable, even with the early loss of several incisors, with no net loss of space from canine to canine.⁵ Occasionally, especially in a crowded dentition, if one or more incisors are lost, there may be some rearrangement of space between the remaining incisors, but no space maintenance is usually required if the loss occurs after the eruption of the primary canines.⁶

Masticatory function

Children who have had all four maxillary incisors extracted due to EEC seem to function well without them. Empirically, many seem to have an improved ability to eat and function, likely because the badly decayed or infected incisors inflicted pain upon eating. Parents may express concern about their child's ability to eat without four incisors. They need to be reassured that feeding is generally not a problem.⁵ In a survey of parents whose children had all incisors extracted, parents reported that their child adapted to the lack of their anterior teeth and had no difficulty eating and chewing.⁷ In the unlikely event that any difficulties should arise, these may be overcome by altering a child's diet and substituting softer foods, but this measure is rarely necessary.

Speech

Yet another consideration is the child's speech development following extraction of all four incisors. This issue remains somewhat controversial. Many sounds are made with the tongue touching the lingual side of the maxillary incisors and inappropriate speech compensations can develop if the teeth are missing.^{5,8} Speech articulations and sounds that are most frequently in error due to dentition are: /S/ as in soap, /Z/ as in zebra, and /th/ as in think.⁹



Fig 1. A Groper appliance is to be placed in this four-year-old patient, replacing two maxillary central incisors.



Fig 2. Note there is some blanching of the gingival tissue which indicates child was biting down hard. Consideration should be made to raise the wire slightly with a three-prong plier to raise the teeth slightly off the gingivae.



Fig 3. Occlusal view immediately following extractions of all maxillary incisors.

One study demonstrated that children who had worn dentures from early childhood exhibited no articulation errors, while those who did not exhibited articulation errors directly related to dentition. This study concluded that patients who received prosthetic dental appliances (two years is optimal as related to speech) develop better articulation skills.¹⁰ Another study, by Riekman and El Badrawy,¹¹ found that loss of all maxillary primary incisors before age 3 years resulted in some speech problems in some children. However, the results of this study must be viewed cautiously because the study failed to have a control group and test the children's hearing, and the speech



Fig 4. This appliance was placed immediately following extractions of four upper incisors. Note that each individual tooth is welded and soldered onto the archwire. The archwire is particularly stable due to its short span and rigid attachment to stainless steel crowns. The palatal acrylic button of the traditionally designed modified Nance holding arch is eliminated. This button was a source of palatal irritation and inflammation.



Fig 5. Anterior view. Note how the prosthetic teeth fit into the socket. Gingival tissue will heal around them giving a very natural-looking appearance to the appliance.

tests were performed on a wide age range of children. Another better designed study by Gable, et al¹² found that early loss of incisors had no long-term effect on speech. In yet another study,⁷ the majority of parents of children who had their incisors extracted thought their children had no difficulty speaking and learning to speak without their teeth. While the data is incomplete, it may be prudent to consider appliances for children under 3 years of age who have not yet developed their speech skills. Children over 4 years will usually compensate for the tooth loss and not exhibit any long-term speech disorders.

Esthetic appearance

One of the most important and valid reasons for replacing missing incisors is to restore a natural and pleasing appearance and thus provide an opportunity for normal psychological development. As children grow and develop, they continually formulate a mental image about their bodies. However, body image alterations bear little significance in the very young.¹³ Most children are highly adaptable and preponderantly positive in mood. Children under 5 are seldom affected socially to any great extent due to their limited exposure to peers, unlike school-age children. However, it is possible that children who regularly attend daycare or preschool programs may become



Fig 6. At follow up, note excellent oral hygiene and subsequent healing.

more aware of their image and lack of teeth and be affected by their appearance. As these children approach school age, they may have a lesser problem fitting into groups of children who are in the mixed dentition and actively exfoliating the primary incisors.⁷

To summarize, if parents do not indicate a desire to replace missing anterior teeth, no treatment is usually required. But, if the parents do wish to replace missing teeth, they should not be discouraged from their decision.⁵

The possibilities of caries and growth interference are two other topics that should be discussed with parents considering a maxillary esthetic appliance. Plaque and food debris accumulation is increased with the fixed anterior appliance. Many children who had all incisors extracted are highly susceptible to caries risk due to EEC. It is imperative that the parents understand the risks involved in treating their child. A comprehensive caries prevention program must be initiated with a frequent recall schedule. Adequate measures of oral hygiene and a modified less-cariogenic diet should be achieved before placing any appliance in the mouth.

At the present time there is no evidence that prosthetic appliances might restrict a child's oral growth.⁸ The intercanine growth between the age of 2-4 years is minimal (< 0.5mm) and is clinically insignificant.¹⁴ Changes in arch length with tooth migration generally occur after the eruption of the first permanent molar. At that time, the fixed appliance may be removed as this represents the time that the incisors would normally be exfoliating.

Clinical procedure (Figures 1-9)

The contraindications for placement of an anterior fixed appliance include: patients with seizure disorders; mental retardation; poor ability to follow-up; very poor hygiene; immune-compromised patients; continuation of inappropriate feeding habits; and significant deep-bite, over-jet, or anterior crossbite.

Appliance design

There are many types of appliances that can be fabricated. However, the authors have had the most success with the design of the Groper appliance⁴ (Figs 1-6). This appliance is similar to a Nance holding arch, but with plastic teeth processed onto the wire instead of a palatal acrylic button in the rugae

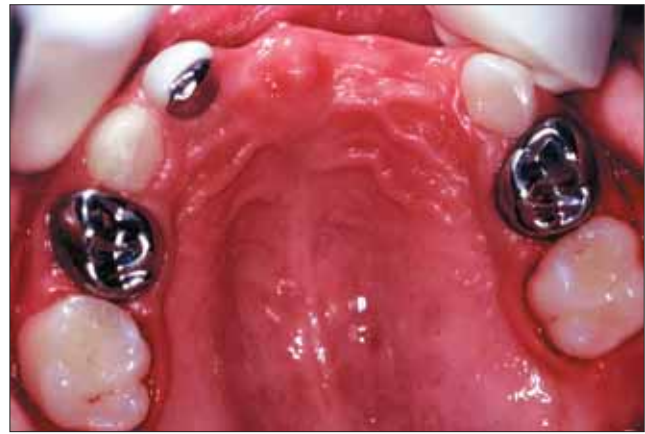


Fig 7. Occlusal view demonstrating missing both maxillary centrals and lateral incisor.



Fig 8. This appliance, replacing two maxillary centrals and a lateral incisor, was attached to second primary molars with orthodontic bands. Note longer span of archwire.



Fig 9. Anterior view. Note left lateral incisor restored with a stainless steel veneered anterior crown.

area. The round wire should be 0.036 to 0.040 inch in diameter and is attached to either the first or second primary molars with either stainless steel crowns (SSC) or prefabricated stainless steel bands.

First molars are preferred as abutments over second molars due to a shorter wire span and less potential interference with erupting six-year molars (Figs 7-9). Stainless steel crowns pro-

vide more secure abutments than orthodontic bands and are preferred by the authors. Short wire lingual rests can be placed on the canines, but they should not interfere with possible buccal or distal movement of the canine. The plastic or acrylic teeth are attached to metal cleats that have been soldered to the palatal wire bar (Fig 4). The teeth sit directly on the alveolar crest without any gingival colored acrylic extending into the vestibule or onto the palate.

Steps in fabrication

First appointment:

1. Prepare the molars for SSCs. If pulpotomies are indicated, perform them at this time. If the abutment teeth have minimal or no caries, minimal tooth preparation is required and local anesthesia may not be required. If bands are to be used, no tooth preparation is necessary.
2. Fit the SSC; do not expect a "snap" fit. Seat SSC with direct downward pressure, not lingual to buccal seating. Reduce buccal bulge if necessary. If needed, trim the lingual of the SSC. Remember that the draw of the finished appliance must allow for a seating, which is directly downward.
3. Take an alginate impression with the SSCs on teeth. Remove the impression, place and secure the crowns in the impression pour up with dental stone. If cooperation allows, take a mandibular alginate impression and wax bite registration.
4. Temporize the molars, if needed. If the anterior teeth have been symptomatic they should be extracted at this time. If not, leave them in place until the day of appliance insertion.

Second appointment: (Note: with commercial laboratories it generally takes 2-3 weeks to receive the completed appliance.)

1. If not done at the previous appointment, anesthetize and extract the anterior teeth. Small pieces of absorbable gelatin sponge placed into the sockets will aid hemostasis.
2. Try in the appliance. Adjust as needed with 3-prong pliers and crown crimpers (Fig 2).
3. Cement the appliance with a glass ionomer cement or a resin-modified glass ionomer cement.

Discussion

In most every instance, the placement of an anterior primary fixed appliance is an elective procedure and is based strongly on parental desires. Parents must be able to make an informed decision and the pediatric dentist should provide them with accurate information facilitating such a decision. As mentioned previously, space maintenance in this region is not generally necessary; eating and function are also not affected. Restriction of growth is not a problem. The only documented expansion during this age before eruption of the six-year molars is less than 0.5mm of intercanine growth. Speech problems in children over 4 years of age are not common, and, if they occur, are usually compensated and reversible. The chief reason to place this appliance is an esthetic one only.

The timing of placement is somewhat controversial. Historically, it was suggested to allow 6-8 weeks following tooth loss, before fabrication. This delay was thought to allow good healing and gingival shrinking to occur, which would result in

a better fitting, more esthetically pleasing appliance. However, personal experience has found that delay is not necessary and immediate placement is possible. Same-day extraction and appliance placement can result in an excellent clinical outcome (Figs 3-6). Perhaps, one reason to delay treatment is to ascertain when the parents' concern of esthetics is a real one. Many parents who contemplated an appliance will opt to change their decision and not place it after they observe how well their child adapts to their post-extraction situation. They may observe during this waiting period that no negative change in their child's functioning, eating, or speech has occurred. Esthetically, many parents' image of their child improves within the delay period and their esthetic concern will dissipate.

This paper has offered several considerations for the clinicians to make when considering the placement of a fixed prosthetic appliance to replace missing incisors in preschool children. A simple technique for appliance placement was also discussed. These appliances are almost always considered an elective appliance and their placement is usually dictated by the wishes of the parent.

References

1. Tinnanof N, O'Sullivan DM. Early childhood caries: overview and recent findings. *Ped Dent* 19:12-17, 1997.
2. Steffen JM, Miller JB, Johnson R. An esthetic method of anterior space maintenance. *J Dent Child* 38(3):154-157, 1971.
3. Klapper BJ, Strizak-Sherwin R. Esthetic anterior space maintenance. *Ped Dent* 5(2):121-123, 1983.
4. Jasmin JR, Groper JN. Fabrication of a more durable fixed anterior esthetic appliance. *J Dent Child* 51(2):124-127, 1984.
5. Christensen JR, Fields HW. Space maintenance in the primary dentition. in *Pediatric Dentistry: Infancy Through Adolescence*. Pinkham JR ed. 2nd ed. Philadelphia: W.B. Saunders Company; 1994:358-363.
6. Ngan P, Wei SHY. Management of space in the primary and mixed dentitions. in *Pediatric Dentistry: Total Patient Care*, Wei SHY, ed. Philadelphia: Lea & Febiger; 1988:462-470.
7. Koroluk LD, Riekman GA. Parental perceptions of the effects of maxillary incisor extractions in children with nursing caries. *J Dent Child* 58:233-236, 1991.
8. Dyson JE. Prosthodontics for children. In *Pediatric Dentistry: Total Patient Care*, Wei SHY, ed. Philadelphia: Lea & Febiger; 1988:259-274.
9. Fymbo L. The relation of malocclusion of the teeth to defects of speech. *Arch Speech* 1:204-216, 1936.
10. Coston GN, Salinas CF. Speech characteristics in patients with hypohidrotic ectodermal dysplasia in Birth defects: Original article series. 24:229-34, 1988.
11. Riekman GA, El Badrawy HE. Effect of premature loss of primary maxillary incisors on speech. *Ped Dent* 7:119-122, 1985.
12. Gable, TO, Kummer AW, Lee L, Creaghead NA, Moore LJ. Premature loss of the maxillary primary incisors: Effect on speech production. *J Dent Child* 62(3):173-179, 1995.
13. Lynch M. Special children, special needs: the ectodermal dysplasias. *Pediatric Nursing* 18:212-216, 1992.
14. Sures CC. Report of the increase in bicanine diameter in 2 to 4 -year-old children. *J Dent Child* 34:332-335, 1967.