Clinical Article

The Transpalatal Arch: An Alternative to the Nance Appliance for Space Maintenance

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Abstract: *The loss of multiple primary molars in the primary or transitional dentition will, in many instances, lead to disturbances of the developing dentition. To prevent this, an appliance can be constructed to maintain the relationship of the remaining teeth and to guide the eruption of the developing teeth. Traditionally, the treatment of choice for maxillary loss is the placement of a Nance appliance. An alternative appliance that may be considered for use is the transpalatal arch or bar. The purpose of this clinical report was to describe the transpalatal arch appliance and present its advantages over the more common Nance appliance, thus encouraging clinicians to prescribe its use in certain clinical situations. (Pediatr Dent 2007;29:235-8)*

KEYWORDS: SPACE MAINTENANCE, NANCE, INTERCEPTIVE ORTHODONTICS, TRANSPALATAL ARCH

The loss of multiple primary molars in the primary or mixed dentition will, in many instances, lead to disturbances of the developing dentition unless an appliance is constructed to maintain the relationship of the remaining teeth and to guide the eruption of the developing teeth.[1] Sequelae of non-intervention following loss of the primary maxillary molars may include drifting of the permanent molars and a resultant posterior crossbite. Due to space loss, premolars may erupt ectopically and—in extreme situations—may become impacted. Traditionally, the treatment of choice for maxillary loss is the placement of a Nance appliance. An alternative appliance which may be considered for use is the transpalatal arch (TPA) or bar. The purpose of this report was to describe the transpalatal arch appliance and present its advantages over the more common Nance appliance, thus encouraging clinicians to prescribe its use in certain clinical situations.

The maxillary lingual arch

Historically, a maxillary lingual arch with adjustment loops has been described for use in the upper jaw. The wire is soldered to molar bands and contacts the cingula of the maxillary incisors.[2] Maxillary lingual arches of this type are not commonly used and are not familiar to many clinicians, but theoretically are contraindicated only in patients whose bite depth causes the lower incisors to contact the archwire on the lingual side of the maxillary incisors.

The Nance appliance

A modified maxillary lingual arch was described by Nance in 1947 and has since been commonly known as the Nance appliance (NA).[3] The NA is simply a maxillary lingual arch that does not contact the anterior teeth, but approximates the anterior palate. The palatal portion incorporates an acrylic button that contacts the palatal tissue, which, in theory, provides resistance to anterior movement of the posterior teeth (Figures 1). The appliance is an effective space maintainer, but soft tissue irritation can be a problem. The accumulation of bacteria and food debris will often result in palatal inflammation and, in many cases, pain (Figure 2). The acrylic portion can become embedded in the soft tissue if the palatal tissue hypertrophies because of poor oral hygiene or if the appliance is distorted (Figure 1b).

The TPA

The issue of palatal soft tissue irritation and inflammation is avoided when using a TPA. The TPA is soldered to molar bands and runs across the palatal vault, avoiding contact with the soft tissue (Figure 3). The wire follows the vault of the palate, is comfortable, and does not interfere with normal speech. Different designs of TPAs exist. The original design included a straight bar extending across the palate. It should

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be referred to as the transpalatal bar. A variation of the bar and the type most frequently used is called the Goshgarian appliance or, more commonly, the transpalatal arch (Figure 4). The TPA offers the option of expansion, rotation, contraction, and torque of the molars due to an omega loop in the center of the vault. It is constructed from a 0.036-inch (0.9 mm) stainless steel wire. The central loop is oriented either mesially or distally. This traditional form can be bent by a technician, or the clinician can directly use prefabricated arch forms available in different lengths. When used as a space maintainer, the arch is most commonly soldered directly onto the bands. Another method uses prefabricated lingual attachments welded to the molar bands, into which the arch form is inserted and may also be removed. Care must be taken to ensure that the TPA is passive when cemented. If the appliance is not passive, unexpected vertical and transverse movements of the permanent molars may occur.[2]

Rationale

When permanent maxillary molars move anteriorly, they rotate mesiolingually around the large lingual root. The space between the buccal and lingual cortical plates becomes narrow anterior to the first molar roots, preventing the molar from advancing directly and limiting its movement to a rotation.[4] The large lingual root contacts the lingual plate and acts as a pivot, allowing the 2 buccal roots to rotate mesiolingually. The TPA reduces anterior molar movement by coupling the right and left permanent molars together and, thus, preventing any possibility of rotations.

Discussion

The TPA is not commonly used by pediatric dentists. Two studies investigating success of different types of space maintainers did not include any TPA appliances in their sample.[5,6] The only bilateral fixed appliances studied were the lingual arch and NAs. A cursory review of a selection of popular pediatric dentistry textbooks revealed that the TPA is far from being recommended as being a first-choice appliance for space maintenance following loss of primary maxillary molars. Suggestions range from: (1) obligatory brief mention; to (2) no mention; to (3) discouragement of its use.

One textbook states that, "although the TPA is a cleaner appliance and is easier to construct, many clinicians think that it allows the teeth to move and tip mesially, resulting in space loss."[7] Another textbook states that "considerable controversy exists regarding effectiveness of the TPA as an alternative to NA theapy in maintaining maxillary molar position. Theoretically, if maxillary molar migration resulted exclusively in mesiolingual rotation, the TPA would be as adequate an appliance in stabilizing molar position. Clinical experience, however, does not support this hypothesis; continued use should be discouraged."[8] No references to scientific evidence, however, have been presented that support this view. Regarding the Nance, on the other hand, positive statements appear (also unsupported by referenced papers), such as "tissue irritation beneath the acrylic button is uncommon, for it appears to be self-cleansing."[9] However, it is unclear how the button can be self- cleansing. If it is needed to prevent movement, it must be constructed to touch the palate. Impingement of the button against the palatal tissue can cause irritation, degeneration from the pressure, and lack of hygiene in the area of the rugae.

The Nance anterior acrylic component may not contribute to the anchorage of the appliance as once thought. If it is constructed a minimal distance away from the palate to allow proper hygiene and yet it is crucial for space maintenance, then it would be expected to allow space loss to occur accord-


Figure 1a

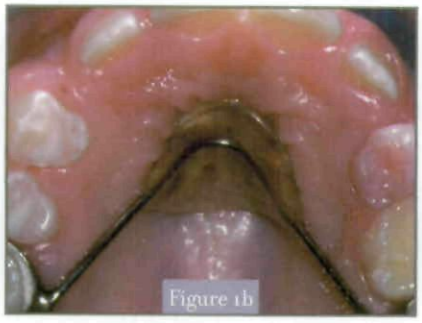
Figure 1b


Figure 2

1a. A NA placed following extraction of first and second primary molars. The appliance has successfully allowed the eruption of both premolars. Note, however, the unerupted, blocked-out canines.

1b. The acrylic portion has become partially embedded in the soft tissue. Inability to clean area underneath button may lead to accumulation of bacteria and food debris, resulting in palatal tissue hypertrophy.

2. At a 6-month recall visit, a Nance appliance was removed due to the patient's complaint of pain. The palatal tissue is red and inflamed.

ing to the gap between the button and the tissue no matter how small this may be. Indeed, a study investigating the survival of various types of space maintainers reported that 11% of the NAs failed due to soft tissue lesions.[5] Another study found that soft tissue lesions were encountered more in bilateral (7% of total failures recorded for bilateral appliances) than in unilateral space maintainers.[6] Clinicians should be aware of this problem when using the NA and should periodically remove the appliance for cleaning.

Other uses. TPAs are regularly used in orthodontics in both permanent and transitional dentition treatments to:

1. establish and maintain arch widths;
2. derotate unilaterally or bilaterally rotated molars;
3. control upper molar eruption;
4. correct unilateral crossbites for maxillary expansion and buccal root torque of upper molars; and
5. correct mesiodistal asymmetries (Figure 5).[4]

Orthodontists routinely use the TPA to increase posterior anchorage in maximum anchorage cases.[10] The TPA, resulting in an increase of posterior anchorage, will change the ratio of anterior retraction to posterior protraction to approximately 2:1.[10] Usually, in these cases an expansion loop in the palatal section is not used, thereby allowing maximum rigidity. In this capacity, the appliance may be referred to as a maxillary stabilizing lingual arch.

Another advantage of the TPA is its potential control of the vertical dimension of the permanent molars. This feature may also contribute to the TPA's ability to hold the molars in place and prevent overeruption or tipping. The vertical control that may prevent molar extrusion is produced by the tongue during deglutition and mastication.[11-13] The tongue affects the dentition and the alveolar bone during mastication, deglutition, speech, and at rest.[14,15] The average frequency of deglutition is between 1,600[16] and about 2,400[17] times a day. The tongue, therefore, delivers orthodontic forces with considerable frequency. The TPA may be able to control vertical movement of the molars through tongue pressure on the appliance's loop, which occurs during deglutition when the base of the tongue is moved forcibly upward and backward toward the hard palate.[12,18,19] The clinical significance of this force remains ambiguous, however, and conflicting evidence may be found in the literature.[20]

Management of premature tooth loss in the primary and transitional dentition requires careful thought by the clinician. Choosing the appropriate appliance is crucial to a successful outcome. No space maintainer—with the exception of the primary tooth—can fulfill all the requirements of an ideal appliance, including: (1) preservation of space; (2) eruption of adjacent, succedaneous, and abutment teeth; (3) restoration of masticatory function; (4) prevention of overeruption of antagonists; (5) compatibility with soft tissues; (6) effective hindrance of torquing forces on abutment teeth; (7) economy of construction and resistance to distortion; (8) allowance for adjustment or minor repair; and (9) universal application.[8]

The TPA offers many advantages over the more common NA, including: (1) better compatibility with soft tissues; and (2) increased vertical control. Practitioners wishing to avoid controversies—such as the TPA's ability to hold the space following bilateral loss of primary molars—should consider its use when one side of the arch is intact and several primary

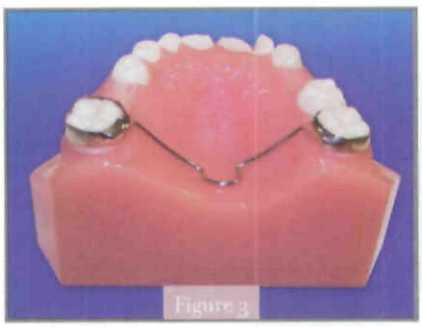
Figure 3


Figure 4


Figure 5

3. The transpalatal arch is soldered to molar bands and runs directly across the palatal vault, avoiding contact with the soft tissue. The wire follows the vault of the palate, is comfortable, and does not interfere with normal speech (photograph courtesy of Space Maintainers Laboratory, Chatsworth, Calif).

4. This transpalatal arch has succeeded in maintaining the space in an 11-year-old patient who had undergone multiple extractions of primary molars. The appliance has an omega-type central loop. The central loop may be oriented either mesially or distally.

5. Transpalatal arches are regularly used in orthodontics in either permanent and mixed dentition treatments to: (1) establish and maintain arch widths; (2) derotate unilaterally or bilaterally rotated molars; (3) control upper molar eruption; and (4) correct unilateral crossbites.

teeth are missing on the other side. In this situation, the rigid attachment to the intact side may provide adequate stability for space maintenance.[2]

Conclusions

Clinicians are encouraged to experience the transpalatal arch appliance as an alternative to the Nance appliance. Further research is needed to determine its efficacy and success in clinical situations involving bilateral loss of primary molars.

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