



(CASE REPORT)



Space management using Transpalatal arch in mixed dentition phase: A case report

SREEJEETA DEY and SEEMA DESHMUKH *

Department of Pediatric and preventive dentistry JSS Dental College and Hospital, JSS academy of higher education and research, Mysore - 570 015 Karnataka, India.

International Journal of Science and Research Archive, 2024, 12(02), 1279–1283

Publication history: Received on 12 June 2024; revised on 24 July 2024; accepted on 26 July 2024

Article DOI: <https://doi.org/10.30574/ijrsra.2024.12.2.1347>

Abstract

Introduction: The early exfoliation of primary molars during the mixed dentition phase often results in disruptions to the normal development of occlusion. An alternative option for space management in the maxillary arch besides the commonly used Nance palatal holding appliance is the transpalatal arch which allows some amount of space regaining.

Case report: A 9 year old female reported with a complaint of missing tooth in the upper right back tooth region since 2 years. On examination, there was premature loss of the right primary maxillary first molar causing space deficiency in the arch form. A treatment plan was made for space regaining and distalization with transpalatal arch custom made with 0.9mm stainless steel wires and soldered to the molar bands. The treatment spanned for 10 months with the eruption of the permanent successor in correct arch form.

Conclusion: Although the use of transpalatal arch is limited in pediatric dentistry, it can be used for correcting minor space discrepancies of the maxillary arch. More number of cases need to be studied for extending the use of the appliance in interceptive orthodontics.

Keywords: Interceptive Orthodontics; Space Regainer; Molar Distalisation; Goshgarian Appliance; Space Management; Preventive Orthodontics

1. Introduction

The early exfoliation of multiple primary molars during the primary or mixed dentition phase often results in disruptions to the normal development of teeth, unless corrective measures are taken to maintain the alignment of remaining teeth and guide the eruption of new ones. Neglecting to intervene can lead to issues such as drifting of permanent molars resulting in complications such as ectopic eruption of premolars and, in severe cases, impaction due to the loss of space. (1) Traditionally, the preferred treatment for maxillary molar loss involves using a Nance appliance. However, an alternative option worth considering is the transpalatal arch (TPA) or bar.

The transpalatal arch is a dental appliance employed in the upper jaw consisting of either 0.036- or 0.040-inches thick wire, that extends across the palate, following its contour. This wire is soldered to the lingual surfaces of bands intended for cementation onto the first permanent molars. Its use is not recommended in cases of bilateral loss of second primary molars, and it should only be utilized when at least one second primary molar is present to prevent the forward tipping of the molars. The rationale behind employing the transpalatal arch lies in the tendency of the maxillary first permanent molar to rotate around its palatal root, which can lead to the closure of space in the anterior region. (2)

When the transpalatal arch is fitted onto permanent first molars alongside at least one maxillary primary second molar, its firm connection to the side with the second primary molar typically offers sufficient stability to counteract the

* Corresponding author: SEEMA DESHMUKH

inclination to rotate or tip. Incorporating an omega loop into the transpalatal appliance enables gentle distal force to be exerted on the first permanent molars, effectively preventing their anterior rotation or tipping.(3) It is employed in interceptive orthodontics to establish and maintain arch width, derotation of upper permanent molars, correction of unilateral crossbites as well as mesiodistal asymmetries.(4)

The following case report highlights the use of a transpalatal arch in aiding the eruption of a permanent successor by distalization and maintaining arch width after exfoliation of primary molar resulting in space loss.

2. Case Report

A 9 year old female patient reported to the Department of Pediatric and Preventive Dentistry with the chief complaint of missing tooth in upper right back tooth region since 2 years. The patient presented with a history of extraction of the maxillary right first primary molar due to carious etiology. No space maintainer was planned following the treatment. The patient did not report of any relevant medical history as well.

On clinical examination, it was observed that there was space loss in the maxillary right quadrant for eruption of the permanent first premolar . Upper and lower arch impressions were taken. After space analysis and radiographic assessment, a segmental deficiency of 5 mm was calculated. A treatment plan was made for space regaining and distalization with transpalatal arch custom made with 0.9mm stainless steel wires and soldered to the molar bands. The TPA was planned as it allows maintenance of arch width along with minor space regaining in an otherwise well-aligned arch without causing much tissue irritation. The treatment spanned for 10 months with 4 activation schedules following which there was eruption of the right permanent maxillary first premolar in the aligned arch form.

3. Discussion

The transition from primary dentition to permanent dentition is an intricate process involving the shedding of primary teeth, the emergence of permanent teeth, and the establishment of occlusion through a sequence that operates independently yet in harmony.(5) If deciduous teeth are lost prematurely due to decay or extractions, it can lead to a reduction in the length of the dental arch, a class II molar relationship, and difficulties in the proper eruption of canines and premolars, resulting in functional and occlusal problems.(6)

In 1998, Hoffding and Kisling observed that premature loss of primary teeth leads to space loss. Consequently, this space loss may result in the permanent tooth becoming impacted or erupting either buccally or lingually.(7)

A number of appliances like the pendulum appliance ,distal jet, Niti wires, Mini-implants and extraoral headgears have been employed for molar distalization and space regaining in the maxillary arch.(8)

However for mild corrections, the complexity and cost of these appliances restrict their application. In late mixed dentition, distalization can be applied in patients with straight profile, normal functioning temporomandibular joint, normal maxillary transverse width and help in establishing a harmonious class 1 molar relation and alleviate mild to moderate space discrepancy.(9) Regarding the timing of this intervention, Joseph M. Sims (1977) proposed that treatment should commence before the age of 9 years, as at this stage, the root of the molar to be repositioned has not finished its growth. This makes orthodontic procedures such as distal tipping or distal bodily movement easier to accomplish. Bondemark (2006) recommended that distalizing the first maxillary molars before the eruption of the second molars is more effective.(10)

The transpalatal arch is a unilateral, non-functional, passive maxillary fixed appliance for stabilization of maxillary first molars first reported by Goshgarian in 1972. The original version of the transpalatal arch featured a straight bar spanning the palate, called as transpalatal bar. A commonly used variation, the Goshgarian appliance or transpalatal arch, includes modifications for improved efficacy facilitating expansion, rotation, contraction, and torque of molars through an omega loop positioned centrally within the vault. Typically crafted from a 0.036-inch (0.9 mm) stainless steel wire, the central loop can be oriented mesially or distally. During activation, mesiobuccal rotation is applied to the arch to anchor the molar, while the force is directed distally to the opposite molar.(11)

Eyüboğlu et al studied the dentoalveolar and skeletal effects of a Goshgarian transpalatal arch in unilateral maxillary first molar distalization and showed that the TPA was effective in the asymmetric distalization of the maxillary first molars.(12) Raucci et al. found that while transpalatal arch devices resulted in an increase in arch length, this difference was not significant, but the transpalatal arch was significantly effective in reducing dental crowding in the maxillary

arch(13) Dahlquist et al discovered that the transpalatal arch effectively aids in derotating the maxillary first molar, often leading to a slight expansion in most cases.(14) Braun suggests that utilizing TPA can increase arch length by 2.1mm by applying a distal force equivalent to the center of resistance of the maxillary first molar.(15)

In the present case there was unilateral space loss in the upper right primary first molar region with minimal arch length discrepancy of 1.8mm while segmental discrepancy for eruption of the permanent successor was 5mm. The transpalatal arch provided a complaint treatment plan for minimal space regaining without any soft tissue irritation.0.2mm proximal splicing was done with respect to the right primary maxillary second molar to facilitate eruption .The permanent maxillary first premolar erupted in correct arch form in 10 months after 4 activation schedules. With this treatment measure, the eruption of the permanent successor was guided in a desirable position and any undesirable buccal deflection was avoided in an otherwise well-aligned arch. Moreover, the U-loop and vertical arm were adjusted in a manner so as to avoid any undesirable movement of the anchor molars.



Figure 1 (a) Pre-operative image showing space deficiency and missing tooth no.54 (b) Pre-operative radiograph showing insufficient arch space for eruption of 54 and tilting of adjacent teeth into the edentulous space

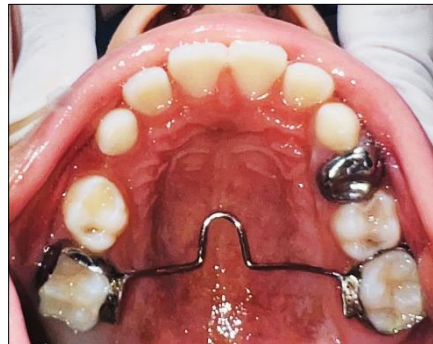


Figure 2: Transpalatal arch at 2 months



Figure 3 Transpalatal arch at 6 months showing regaining of space and at 8 months showing eruption on maxillary first premolar



Figure 4 Eruption of the permanent successor

4. Conclusion

Although the TPA is not commonly used by pediatric dentists, it can prove beneficial for correcting minor space discrepancies of the maxillary arch. More number of cases need to be studied for extending the use of the appliance in interceptive orthodontics.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

- [1] Dean JA, McDonald RE, Avery DR. Management of the developing occlusion. In: McDonald RE, Avery Dean JA, eds. *Dentistry for the Child and Adolescent*. 8th ed. St.Louis, Mo: CV Mosby Co; 2004:625-83.
- [2] McNamara JA Jr, Brudon WL. Orthodontic and orthopedic treatment in the mixed dentition. In: Spivey KB, Skidmore LM, eds. *Transpalatal Arches*. 2nd ed. Ann Arbor, Mich: Needham Press Inc; 1993:179-92.
- [3] Terlaje RD, Donly KJ. Treatment planning for space maintenance in the primary and mixed dentition. *ASDC J Dent Child*. 2001 Mar-Apr;68(2):109-14, 80. PMID: 11475685.
- [4] Kupietzky A, Tal E. The transpalatal arch: an alternative to the Nance appliance for space maintenance. *Pediatr Dent*. 2007 May-Jun;29(3):235-8
- [5] Fields HW. Treatment of orthodontic problems in preadolescent children. In: Proffit WR, Fields HW, eds. *Contemporary Orthodontics*. 3rd ed. St Louis, Mo: Mosby Year Book; 2000:417-523.
- [6] Chandak, Pratiksha, et al. "Space Regainers in Pediatric Dentistry." *International Dental & Medical Journal of Advanced Research - VOLUME 2015*, vol. 1, no. 1, 2015, pp. 1-5. DOI.org (Crossref), <https://doi.org/10.15713/ins.idmjar.11>.
- [7] Kisling E, Hoff ding J. Premature loss of primary teeth: Part 111, drift ing patterns for diff erent types of teeth aft er loss of adjoining teeth. *J Dent Child*. 1979; 46:34-8.
- [8] Cenzato N, Crispino R, Galbiati G, Giannini L, Bolognesi L, Lanteri V, Maspero C. Premature loss of primary molars in children: space recovery through molar distalisation. A literature review. *Eur J Paediatr Dent*. 2024 Feb 1;25:1. doi: 10.23804/ejpd.2024.2110.
- [9] Umale, Vinay, et al. "Molar Distalization – A Review." *IP Indian Journal of Orthodontics and Dentofacial Research*, vol. 4, no. 3, Dec. 2020, pp. 146–50.

- [10] Yadav, Deepanshi, et al. "Molar Distalization by Different Intraoral Device in Orthodontics: A Review." *International Journal of Applied Dental Sciences*, vol. 7, no. 2, Apr. 2021, pp. 432–36. DOI.org (Crossref), <https://doi.org/10.22271/oral.2021.v7.i2g.1242>.
- [11] Kashyap V, Rawat D. Molar distalization classification – A review. *IP Indian J Orthod Dentofacial Res* 2022;8(2):75-78.
- [12] YÜBOĞLU, SERHAT; BENĞİ, ALİ OSMAN; GÜRTON, ARİF ÜMİT; and AKIN, EROL (2004) "Asymmetric Maxillary First Molar Distalization with the Transpalatal Arch," *Turkish Journal of Medical Sciences*: Vol. 34: No. 1, Article 10..
- [13] Raucci, G., Pache[^] co-Pereira, C., Grassia, V., d'Apuzzo, F., FloresMir, C., Perillo, L., 2015. Maxillary arch changes with transpalatal arch treatment followed by full fixed appliances. *Angle Orthod.* 85, 683–689.
- [14] Dahlquist A, Gebauer U, Ingervall B. The effect of a transpalatal arch for the correction of first molar rotation. *Eur J Orthod.* 1996; 18(3):257–267.
- [15] Braun S, Kusnoto B, Evans C. The effect of maxillary molar derotation on arch length. *Am J OrthodDentofacialOrthop* 1997; 112(5):538–44