

CASE REPORT

Space Management Appliance in Mixed Dentition: A New Concept

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ABSTRACT

Space maintainers play a vital role of preserving arch space following premature loss of primary molars as well as longstanding cases of proximal caries. In day-to-day clinical practice, there exist conditions requiring both a space maintainer for passive space maintenance and a space regainer to solve the problem of space deficiency in different segments of the same arch. Taking this into consideration, the current study describes a modified space management appliance simultaneously acting as space maintainer and regainer.

Keywords: Space maintainer, Space management, Space regainer.

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INTRODUCTION

The primary goal of preventive orthodontics is to maintain the integrity of the deciduous dentition until normal exfoliation for proper growth and development of dento-skeletal complex.¹ Space loss is inevitable following longstanding proximal caries and early loss of deciduous tooth. In such critical conditions, orthodontic intervention plays a critical role, thereby promoting favorable developmental changes.² Space management, particularly space regaining, evokes challenges during early mixed dentition stage, the period marked by transition of incisors, creating clinical conundrum due to insufficient anchorage in the anterior region. Thus, this paper introduces a new customized design of space management appliance in

a 6-year-old child in her early mixed dentition period serving the dual function of space maintainer as well as space regainer within the two different segments of mandibular arch.

CASE REPORT

A 6-year and 5-month old female child reported to the Department of Pedodontics and Preventive Dentistry of Swargiya Dadasaheb Kalmegh Smruti Dental College and Hospital, Nagpur (India), with a chief complaint of pain in the upper left back region of jaw since 10 days. General examination demonstrated that child was medically fit. Intraoral examination revealed severe early childhood caries. Deep occlusal caries were present with the deciduous maxillary and right mandibular second molars, smooth surface caries with all the deciduous canines, pit and fissure caries with mandibular right first permanent molar, root stumps in relation to deciduous maxillary anteriors and first molars, whereas deciduous left mandibular first and second molars were missing (history of extraction 1 year back). Radiographic evaluation was carried out, study model impressions were made, and mixed dentition space analysis (Arch Perimeter and Hixon and Oldfather) was carried out using study models, which indicated a space deficiency of 4 mm on the left side of the mandibular arch due to extraction of deciduous left mandibular first and second molars and failure of placement of space maintainer, resulting in mesial migration of the first permanent molar. Based on the investigations, treatment plan was formulated which included composite restoration with deciduous canines and mandibular right first permanent molar, pulpectomy followed by semi-permanent restoration with stainless steel crown (SSC) in deciduous maxillary second molars, extraction of root stumps and deciduous right mandibular second molar followed by space maintenance. It was decided to maintain the space in the maxillary arch using the Nance Space Holding Appliance whereas in the mandibular arch, a modified Space Management Appliance (Fig. 1) was given to serve the purpose of space maintainer on the right side and space regainer on the left side of the mandibular arch as the patient exhibited strong gag reflex contraindicating removable space maintainer.

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Fig. 1: Space maintenance appliance



Fig. 2: Nance space holding appliance cemented for space maintenance in the maxillary arch



Fig. 3: Modified Lingual arch appliance cemented for space regaining on the left side and space maintenance on the right side



Fig. 4: Follow-up visit after 4 months, demonstrating space of 3 mm regained in the mandibular arch on the left side due to distalization of left mandibular first permanent molar using space management appliance

Pulpectomy was performed followed by SSCs with deciduous maxillary second molars. Required extractions were carried out followed by insertion of the Nance Space Holding Appliance (Fig. 2).

FABRICATION OF APPLIANCE

Bands (Denta band material 0.006×0.180) were fabricated on mandibular first permanent molars. Molar tubes (1.1 mm diameter, 10 mm length) were welded to either side of molar band on left mandibular first permanent molar. Impressions were made and bands were transferred to the mandibular impression for the fabrication of Space Management Appliance. The lingual arch was fabricated using a stainless wire (0.8 mm width) leaving left side end free to allow it to pass through molar tube on the lingual aspect of molar band on left mandibular first permanent molar while the right free end was soldered on the lingual aspect of the molar band on right side. A loop was fabricated with its free end passing through

molar tube on the buccal aspect of molar band on left mandibular first permanent molar and moving anteriorly till its contact with distal surface of deciduous left mandibular canine just below its contact point. It was then directed lingually and soldered on the lingual arch, thus forming a closed loop. Ball-shaped stops were soldered on anterior aspect of the loop on both sides. Nickel titanium (NiTi) open coil springs (GAC Int. Inc., Central Islip, NY; 0.012 inch diameter; 0.045 inch lumen; 18 mm length) were loaded. A canine stopper was soldered mesial to deciduous left mandibular canine to restrict any mesial movement (Fig. 3).

The patient was recalled for follow-up visits scheduled after every 1 month duration, and it was observed that within 4 months, 3 mm of space was regained (measured on models which were prepared by taking impressions at monthly interval) (Fig. 4). Following this, Space Management Appliance was replaced with Hotz modified lingual arch space maintainer (Fig. 5).



Fig. 5: Space maintained in the mandibular arch using Hotz modified lingual arch

DISCUSSION

Uneventful loss of multiple posterior deciduous teeth before the normal exfoliation culminates into mesial migration of the erupting first permanent molars, the sequel of which is deficient room for accommodation of succeeding permanent teeth leading to ectopic eruption and in extreme cases, impaction. To intercept such consequences and regain the lost space, several methods for distalization of molars have been suggested that include headgears, space gaining appliances, sliding jigs with class II elastics, lip bumpers, space gaining appliances, NiTi open-coil springs, super elastic nickel titanium wires, and repelling magnets. However, the significant disadvantage of most of these techniques is that an equal and opposite mesially directed force leads to labial flaring of the incisors.³ Along with that the early mixed dentition characterized by transition of incisors creates situations resulting in insufficient anchorage in the anterior region. Utmost precaution should be taken prior to selecting a case for molar distalization, as it may cause extrusion of the molar and bring about an increase in lower vertical

height of the face. Hence, distalization should be done with caution particularly in patients within the vertical growth pattern.⁴ In the current case, the growth pattern was favorable.

In the present case, Space Management Appliance was used. This single assembly performed the dual function of space maintainer and regainer within the two different segments of mandibular arch, thereby obviating the use of two separate appliances.

NiTi open coils were used, due to excellent springback and super-elastic properties. It was used in the formed loop, because under compression, the springs exerted forces between stops anteriorly and molar tubes posteriorly bringing about distalization of permanent molar. As an extra precaution, to prevent the mesial migration of left deciduous canine and flaring of anteriors, if any, a canine stopper was introduced.

After 4 months use of this customized and regaining 3 mm of space, it was replaced with an active lingual arch appliance.

CONCLUSION

The novel design of Space Management Appliance along with ease of fabrication and cost effectiveness makes it an effective space maintainer and regainer in cases with loss of multiple deciduous posterior teeth, in the same arch.

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