International Journal Dental and Medical Sciences Research
Volume 5, Issue 2, Mar - Apr 2023 pp 923-927 www.ijdmsrjournal.com ISSN: 2582-6018

An Innovative Space Regainer in Space Management: A Case Report

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Date of Submission: 20-04-2023 Date of Acceptance: 30-04-2023

ABSTRACT

Introduction: To encourage positive developmental changes, early orthodontic intervention is frequently initiated in the developing teeth. The intricacy of orthodontic treatment, overall expense, and severity of a growing malocclusion can all be eliminated or reduced with early intervention.

Case Report: A male child aged 9 years reported to the department of Pediatric and Preventive Dentistry, with the chief compliant of mal-aligned lower left posterior teeth and difficulty in chewing. Clinical and radiographic examinations revealed premature loss of the mandibular left second molar and subsequent drifting of the mandibular left first premolar, resulting in severe space deficiency for lower left second premolar.

Discussion: Banded open coil space regainer appliance helps for both regaining the lost space as well as maintenance for the eruption of permanent tooth.

Conclusion: The banded open coil space regainer proved efficient at reclaiming space quickly.The appliance's dual purposes will save time for the dentists as well as the patient and cut down on costs for the parents.

Keyword:open coil space regainer, space loss, mesial migration, interceptive orthodontics

I. INTRODUCTION

An important component of preventative and interceptive orthodontics is the effective management of space loss caused by the early loss of primary teeth. The most frequent reason for the early loss of primary teeth is dental caries. Congenital diseases, early primary tooth root resorption, ectopic eruption, and trauma are additional causes. Greater space loss is anticipated when a second molar is lost before a first molar, when tooth loss occurs early in life, in crowded dentitions, or in any of these situations.[1]

The ectopic eruption or impaction of the second premolar is brought on by the premature loss of primary teeth, especially primary molars, which also permits distal drifting of the primary canine and mesial migration of the first permanent molar[2].It frequently occurs in the lower arch.[3]A lack of space and subsequent misalignment of the permanent tooth in that quadrant arise from the premature loss of about 51% of first primary molars and 70% of second primary molars[4].Early primary molar loss can potentially disrupt the formation of a normal occlusion by causing crowding, midline shift, and other problems.[5]Premature loss of deciduous teeth increases the likelihood of vertical, transverse, as well as sagittal malocclusion.[6]Early deciduous molar loss has reportedly been linked to poor quality of life in terms of oral health.[7]

When space is lost, space regainers are frequently needed. The appliances known as "space regainers" shift the tooth mesially or distally in order to recoup the lost space.Additionally, they assist in guiding the eruption of the permanent teeth.[8] Molar distalization can rectify mild-to-moderate arch length disparities as well as molar-to-molar relations if it is carried out effectively in specific situations with well-developed biomechanics.[9]

Numerous intra-arch devices that are less dependent on patent cooperation have been discovered. One of these tools is made by using a nickel-titanium (NiTi) spring and two bands called a double-banded open coil space regainer. This device can recover space because the NiTi wire is super elastic. The double-banded open coil space

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regainer aids in the impacted tooth's eruption process.[10]The device aids in both regaining lost space and maintaining it so that the permanent tooth can erupt. The appliance's dual purpose will save time for both the patient and the dentist while lowering the expense to the parents.[8]

The present case report discusses the fabrication of double-banded open coil space regainer for prevention of space loss in mandibular left second premolar region.

II. CASE REPORT

A male child aged 9 years reported to the department of Pediatric and Preventive Dentistry, with the chief compliant of mal-aligned lower left posterior teeth and difficulty in chewing. The child was co-operative and showed Frankel's positive behavior (score3). Past dental history revealed traumatic extraction of mandibular primary second molar in private dental clinic two months back, leading to development of past bad dental experience.

Clinical examination showed prematurely missing of mandibular primary second molar owing to gross decay, with class I molar relationship on right and left side. (Fig 1)The mandibular left posterior quadrant showed the presence of rotated first premolar, a distal drifting of the first premolar and canine and mesial titling of first permanent molar leading to space closure, thus obstructing the path of eruption of the second premolar.

Figure 1: Intraoral examination of mandibular arch

Radiographic examination revealed severe space loss with obstruction of the eruption pathway of the second premolar.(Fig 2)

Figure 2: Pre-operative radiographic examination

Space analysis was done to determine the required space for the eruption of permanent canine, first and second premolar and modified Tanaka-Johnston equation was used. The available space for the eruption of these teeth in the hemi-arch of space loss was determined on the stone models.For the purpose, the distance between the distal surface of the lateral incisor and the mesial surface of the 1st permanent molar was measured using a digital caliper. The calipers were applied on the midline with the measurement of the sum of mesio-distal width of central and lateral incisors in the hemi-arch of the space loss.Using this method, the available space was measured on pre- and post-treatment stone models, and the difference determined the recovered space.

Design and fabrication of appliance

The permanent first molar was banded with buccal and lingual welded molar tubes (1.1 mm in diameter, 4.2mm in length).(Figure 3)

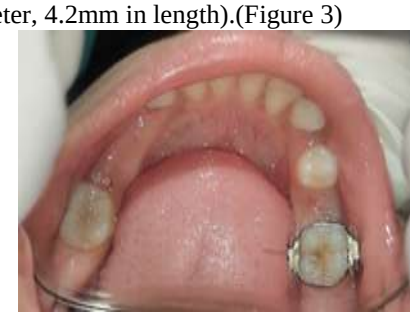

Figure 3: Banding of permanent molar with buccal and lingual molar tube

An alginate impression was taken. Impressions, along with bands, was washed and disinfected with sodium hypochlorite solutions. The model was made with dental stone, keeping the band in the impression.

On the working model, stainless steel (0.9 mm) wire was adapted by making a loop on first premolar, extending posteriorly to insert into molar tubes of the permanent first molar. The NiTi open coil springs were cut 4mm longer then the distance

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between the anterior stops, and incorporated into the stainless steel wire within the molar tubes.(Figure 4)

Figure 4: Design of double-banded open coil space regainer

The finishing and polishing of the appliance was done and the device was cemented to the teeth using luting Glass Ionomer Cement.(Figure 5)

Figure 5: Cementation of double-banded space regainer

Patient was recalled every one month, assessed clinically and radio graphically. After that, spring was removed and device remained passive as space maintainers until eruption of second premolar happened.

III. DISCUSSION

To encourage positive developmental changes, early orthodontic intervention is frequently started in the developing teeth. The intricacy of orthodontic treatment, overall treatment time, and expense can all be decreased or eliminated with preventive orthodontics.

The integrity of a typical occlusion might be ruined by the premature loss of primary teeth. The most significant issue that might result from early loss of deciduous teeth is space loss.[11]The space loss leads to mesial migration of the first permanent molar or distal drifting of the anterior teeth leading to space closure. This may cause either impaction or ectopic eruption of the second premolar.[12]

As the primary method of treating space loss, space regaining is possible for both the upper and lower arch. . However, space regaining in the lower arch is more cumbersome than upper arch.[9]Due to its wide root area, irregular root morphology, and higher bone density in the lower jaw when compared to the upper jaw, the mandibular first permanent molar is the toughest tooth to shift.[13,14]

Patients using removable appliances have better dental health, less plaque, and less gingival inflammation[15].While maintaining good oral hygiene is more challenging for patients with fixed orthodontic appliances, and decalcification of the enamel surface next to these appliances is a common occurrence in this individuals.[16]

Since the use of removable appliances requires considerable patient cooperation, so in the present study, we used double-banded space regainer.For molar distalization, the Double-banded open coil space regainerемploys Ni-Ti coil springs, which can produce constant light forces over a broad range of activation. Additionally, compared to other appliances, this one doesn't require as much activation.

In the present study, to determine the required space, the modified Tanaka-Johnston equation was used, which has been shown to accurately estimate the size of unerupted canines and premolars. The amount of space required is 3.5mm in lower left arch.

Understanding the velocity of tooth movement and the degree of anchoring loss is essential for effective orthodontic therapy.[17] The double-banded open coil space regainer appliance used in the current study is fixed appliance, ensuring constant forces are applied to the target teeth without requiring specific patient compliance. However, in our investigation, [18] space recoveries with the DBSR took longer than time in other studies. This might be as a result of the maxilla's enhanced trabecular structure and tough spongy bone[19]. In comparison to the maxilla, the mandible's cortical bone is denser and remodels more slowly.[20] As a result, it has been noted that teeth move in the upper arch more quickly and farther than in the lower arch.[19]The advantage of earlier molar distalization is that the permanent first molar roots are incomplete, and it is easier to tip or move the tooth bodily.[18]

IV. CONCLUSION

This case shows the role of interceptive orthodontics in Paediatric dentistry. It displays a method of space regaining which may be utilized for early intervention in the mixed dentition period.Additionally, it demonstrates how an early diagnosis and treatment can lessen the severity of a developing malocclusion. The study concluded that whenutilized in patients with mixed dentition, the device was able to restore mild to severe unilateral space loss, leading to an increase in molar angle, IMPA, and molar extrusion. The treatment time was shorter and the appliance appeared to be more effective. With the advantage of better oral hygiene maintenance, the device can be used on patients with low incisor protrusion and good cooperation.

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