

Innovations

A Multipurpose Space Regainer- Case Report

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Abstract: Primary teeth are essential for promoting alveolar growth and creating space for the successful eruption of permanent teeth, ensuring proper dental alignment and accommodation. The transition from primary to permanent dentition often encounters challenges such as early loss of primary teeth, premature exfoliation, arch length-tooth size discrepancies, and irregular tooth eruption sequences. These issues can lead to misalignment and other orthodontic problems, necessitating careful monitoring and early intervention. Premature space loss, especially the loss of the primary second molar, results in the loss of "E space," disrupting the alignment and eruption of permanent molars. Timely intervention is crucial to prevent malocclusion and ensure proper dental development. Space regainers are designed to recover lost space by moving teeth mesially or distally, thereby ensuring proper eruption of permanent teeth in their correct positions. These appliances are critical for maintaining dental alignment and preventing malocclusions. In suitable cases, effective space regainers can achieve molar distalization, correct arch discrepancies, and restore normal molar relationships, playing a key role in optimal dental alignment and function. This paper discusses an innovative use of an orthodontic appliance, initially employed as a space regainer and later repurposed as a space maintainer for retention purposes. A case report of

a nine-year-old female patient illustrates this application. The patient, who had a history of tooth extraction, presented with mesial migration of tooth 36 into the edentulous space, causing insufficient space for the eruption of the permanent second premolar. A modified Hotz lingual arch with a U-loop was used to achieve targeted distalization while ensuring arch stability. After six months, successful distalization allowed proper eruption of the second premolar. The appliance was then used for retention for an additional three months, resulting in a total treatment time of nine months. This case highlights the importance of primary teeth in maintaining space for permanent teeth and demonstrates the effectiveness and versatility of space regainers in orthodontic treatment.

Keywords: *Space regainer, Hotz Lingual Arch, Space loss, Space maintainer, Premature loss.*

Introduction:

The importance of primary teeth lies in their role in promoting favourable alveolar growth and creating space for the successful eruption of permanent teeth upon their physiological exfoliation. This process ensures proper alignment and accommodation of permanent teeth, highlighting the critical role of primary dentition in overall dental development.⁽¹⁾

The transition from primary to mixed dentition or from mixed to permanent dentition is often fraught with challenges. Issues such as early loss of primary teeth, space loss due to premature exfoliation of primary teeth, discrepancies between arch length and tooth size, and variations in the sequence of tooth eruption can all complicate this process. These hurdles can lead to misalignment and other orthodontic problems, necessitating careful monitoring and potentially early intervention to ensure proper dental development and alignment.⁽²⁾

Premature space loss can result in malalignment and compromised aesthetics, and can also lead to mesial or distal movement of adjacent molars. Among these, the most common scenario involves the premature loss of the primary second molar, resulting in the loss of "E space." This loss of space can disrupt the eruption and alignment of permanent molars in the oral cavity. Consequently, timely intervention is crucial to mitigate these effects and ensure proper dental development and alignment.⁽³⁾

Space regainers are appliances designed to move teeth mesially or distally to recover lost space, ensuring that permanent teeth erupt properly in their correct positions. These devices play a crucial role in maintaining proper dental alignment and preventing malocclusions.⁽⁴⁾

In appropriately selected cases, employing space regainers with effective biomechanics and design can contribute to molar distalization, rectify arch discrepancies, and even restore normal molar relationships. This approach plays a pivotal role in achieving optimal dental alignment and function. ⁽⁵⁾

This paper sheds light on an appliance design initially employed as a space regainer, which was subsequently repurposed as a space maintainer for retention purposes. This innovative use underscores the versatility and adaptability of orthodontic appliances in addressing various dental needs throughout the treatment process.

Case Report:

A nine-year-old female patient presented to the outpatient clinic at the Department of Pediatric Dentistry in Thai Moogambigai Dental College, Chennai, with the chief complaint of a missing tooth. The patient provided a history of extraction of tooth 75 a year prior at another dental clinic.

The clinical examination of the patient indicated the absence of tooth 75 and mesial migration of tooth 36 into the edentulous space. It was recommended to proceed with an intraoral periapical radiograph for further evaluation.

The intraoral periapical radiograph of the 36 region showed mesial migration of tooth 36, and there was insufficient space for the eruption of the permanent second premolar, which was at Nolla stage 6 of development. Further, the radiograph revealed root resorption of 74 followed by permanent tooth bud 44 in Nolla Stage 7. Maxillary and mandibular teeth impressions were taken for the patient, and study casts were obtained. Model analysis was performed using the Tanaka-Johnston analysis, revealing a space loss of 3.6mm. Since there was space loss in the arch hindering the eruption of premolars, the treatment plan was to regain the lost space, hence the choice of treatment was a space regainer.

The treatment plan involved fabricating a space regainer for the patient. Initially, a Ni-Ti open coil space regainer was considered, but due to the mobility in the primary first molar due to root resorption, it was decided to distribute the force evenly across the entire arch. This led to the fabrication of a Hotz lingual arch. The U-loop was incorporated only on the side where the molar needed to be distalized, resulting in a modified Hotz lingual arch space regainer. This design provided targeted distalization while ensuring stability across the arch. The wire component was made of 19-gauge stainless steel wire with a U-loop incorporated in the third quadrant and soldered to molar bands. This assembly was then luted to the permanent first molars using Type 1 glass ionomer cement (GIC).

The patient was recalled every 15 days for activation of the appliance. During each visit, the appliance was removed, the U-loop was activated, and the appliance was luted back into position. After six months, distalization of the molar was achieved, and the second premolar erupted into its proper position. Radiographic examination confirmed that the first and second premolar had erupted and was at Nolla stage 8.

Follow up:

The patient was advised to continue using the same appliance as a retention appliance for an additional 3 months, after which it was removed. The total treatment time was approximately 9 months.

Discussion:

Interceptive orthodontics is defined as a phase of science and art of orthodontics employed to recognize and eliminate the potential irregularities and malpositions in the developing dentofacial complex. ⁽⁶⁾ In 1998, Hoffding and Kisling reported that the premature loss of primary teeth can lead to significant space loss in the dental arch. This space loss can result in permanent teeth remaining impacted, or erupting in abnormal positions, either buccally (towards the cheek) or lingually (towards the tongue). Additionally, the premature loss of primary second molars tends to result in more significant space closure compared to the premature loss of primary first molars. ^(7,8)

Fixed-space regainers are favoured over removable ones in severe space loss cases due to their elimination of patient compliance needs and provision of better precision and control to the clinician. Prior to appliance use, a comprehensive space assessment by the pediatric dentist is essential to determine the extent of space loss. This assessment allows intervention at the appropriate age, maximizing benefits for the patient. ⁽³⁾

Lower lingual arch appliances have been widely utilized in pediatric dentistry since 1989 to preserve mandibular arch length and prevent positional changes in the mandibular first molar and lower incisors following the premature loss of the second primary molar during transitional dentition. ⁽⁹⁾

Pradeep et al devised a space regainer using a combination of fixed edgewise bracket therapy and a NiTi coil space regainer with a lingual arch. Remarkably, they achieved a space increase of 7mm within a 2-month period. ⁽³⁾

Chandwani et al developed a modified space regainer with one side serving as a space regainer and the other as a space maintainer. One side featured a NiTi open coil space regainer connected to a lingual arch space maintainer, within a span of 4 months, the patient regained 3mm of space. ⁽¹⁰⁾

Mala Devi et al crafted a space regainer, succeeded by a functional space maintainer. The space regainer comprised a helical loop soldered to a band on one side. Subsequently, upon completion of the space regainer therapy, a lingual arch functional space maintainer was fitted for the patient's benefit.⁽²⁾

Tatiya et al designed a banded helical space regainer, with both the primary and permanent first molars banded. An active arm featuring a helix was soldered to the band. Patient was scheduled for activation every week, resulting in a notable 2.5mm increase in space within 3 weeks.⁽¹¹⁾

Negi designed a NiTi bonded space regainer using a 0.016-inch NiTi wire bonded to the buccal side of the first premolar and permanent molar. The composite was shaped like a tube and tunnel system, and a bent wire was bonded. Due to the shape memory properties of the NiTi wire, space regaining was effectively achieved in this case.⁽¹²⁾

Conclusion:

Awareness among parents about the impact of space loss in primary dentition and its deleterious effect on permanent teeth can significantly reduce the risk of malocclusion in children. Proper treatment planning and accurate diagnosis by pediatric dentists are crucial for effective management. Advances in dental technology and innovative treatment approaches, such as fixed space retainers and combined appliances, enhance treatment outcomes and patient comfort, ensuring better dental health and development for children.

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Figures:



Figure 1,2: Preoperative photograph and radiograph showing loss of E space.



Figure 3,4: Fabricated Hotz lingual arch inserted in the oral cavity of patient



Figure 5: Medial view showing the U loop used for distalisation of molar.



Figure 6: After 6 months second premolar erupted into the regained space.



Figure 7: Postoperative radiograph showing second premolar erupted and in Nolla Stage 8.



Figure 8: Postoperative photograph after 9 months