

Table Of Content

Journal Cover	2
Author[s] Statement	3
Editorial Team	4
Article information	5
Check this article update (crossmark)	5
Check this article impact	5
Cite this article	5
Title page	6
Article Title	6
Author information	6
Abstract	6
Article content	8

Academia Open



By Universitas Muhammadiyah Sidoarjo

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Management and Outcomes of Severe Submergence in Second Premolar

Penanganan dan Hasil dari Submergensi Parah pada Premolar Kedua

Wanda Karisma Dian Sari, wandakarismadiansari@umsida.ac.id, (1)

Universitas Muhammadiyah Sidoarjo, Indonesia

Windy Yuliartanti, wandakarismadiansari@umsida.ac.id, (0)

Universitas Muhammadiyah Sidoarjo, Indonesia

Eka Setyawardana, wandakarismadiansari@umsida.ac.id, (0)

Universitas Muhammadiyah Sidoarjo, Indonesia

⁽¹⁾ Corresponding author

Abstract

General Background: The early loss of primary molars is a prevalent dental issue that can lead to significant occlusal disturbances, including space reduction and misalignment of permanent teeth. **Specific Background:** Submergence of the second permanent molar following premature exfoliation of primary molars exacerbates these issues, complicating the eruption pattern and dental arch integrity. **Knowledge Gap:** Despite existing treatment modalities, there is limited evidence on the effectiveness of specific appliances in managing severe submergence cases in pediatric patients. **Aims:** This study aims to evaluate the efficacy of the Gerber Space Regainer in restoring lost space and correcting the alignment of submerged second premolars in a pediatric patient. **Results:** A 10-year-old patient experiencing significant space loss due to premature exfoliation of tooth 85 was treated with a Gerber Space Regainer. Over a 7-week period, the appliance successfully regained 8 mm of space, with notable uprighting of the affected premolar, achieving complete recovery of the dental arch. **Novelty:** This case report highlights the practical application and success of the Gerber Space Regainer, emphasizing its efficiency in a short time frame, which has not been extensively documented in similar clinical scenarios. **Implications:** The findings suggest that the Gerber Space Regainer is an effective and reliable option for managing complex orthodontic cases involving submergence and space loss, contributing to the enhancement of treatment protocols in pediatric dentistry.

Highlights:

- Effective space recovery: The Gerber Space Regainer successfully restored 8 mm of lost dental arch space in 7 weeks.
- Improved alignment: The treatment led to the uprighting of the submerged second premolar, ensuring proper occlusion.
- Pediatric applicability: The appliance demonstrated high efficiency and compliance in a young patient, showcasing its potential in pediatric cases.

Keywords: Premature Loss, Space Regainer, Submergence, Second Premolar, Eruption Disturbance

Academia Open

Vol 9 No 2 (2024): December

DOI: 10.21070/acopen.9.2024.9919 . Article type: (Medicine)

Published date: 2024-08-27 00:00:00

Introduction

The primary dentition is crucial to a child's development in terms of morphology, function, and psychosocial aspects through establishing occlusion, mastication, phonation, and aesthetics, as well as favorable conditions for skeletal and muscular growth. Additionally, preserving has a significant impact on the growth of the permanent dentition, maintaining the dental arch length, and preservation of the space required for the eruption of succeeding teeth [1][2]

The early loss of primary molars can result in occlusal irregularities and misalignment in the permanent teeth. When a second deciduous molar is prematurely lost in the lower jaw, it often leads to the first permanent molar shifting mesially. This displacement can have several consequences: potential impaction of the succeeding tooth, a shift in the dental arch's midline towards the affected side, decreased arch length, compromising the space needed for proper alignment of the underlying permanent teeth, excessive eruption of the opposing tooth. These changes can collectively impair proper dental function. [3]

Reduction in arch length is a common consequence of premature tooth loss, typically occurring within the first six months following the tooth's extraction. This phenomenon is particularly pronounced during the active tooth eruption phase. However, the need for space maintenance is generally limited to cases where primary first molars are lost prematurely [4]. As the permanent first molar undergoes active eruption, typically between 5 and 7 years old, mesial forces can lead to the loss of space originally occupied by the first primary molar. Furthermore, space reduction may occur due to anticipated occlusal adjustments of the molars. This is particularly likely when the first permanent molar is in a cusp-to-cusp relationship, prior to either a mesial shift occurring early or late [5]

In cases where dental space diminishes progressively, leaving insufficient room for permanent teeth to emerge, a space regainer appliance can be employed to recover the necessary space [6][7]. The recovery of space in the mandibular arch can be accomplished through molar distalization, utilizing a fixed space regainer appliance [8]. This appliance is a fixed unit so it requires consideration of the age group, cooperation level, and ability to tolerate the device [9]

This clinical case study emphasizes the importance of intervention in recovering the space loss within the mandibular arch, which resulted from the premature exfoliation of the second deciduous molar.

Method

A. Case Report

A ten-year-old boy visited our private clinic for general dental check up. Clinical examination revealed premature exfoliation 85. The patient's anamnesis indicated that the tooth had been removed due to extensive carious lesions [10].

The arch space analysis identified a 5 mm discrepancy in space availability..

An orthopantomogram revealed the submergence of tooth 45 and a mesial inclination of tooth 46 (figure 1).

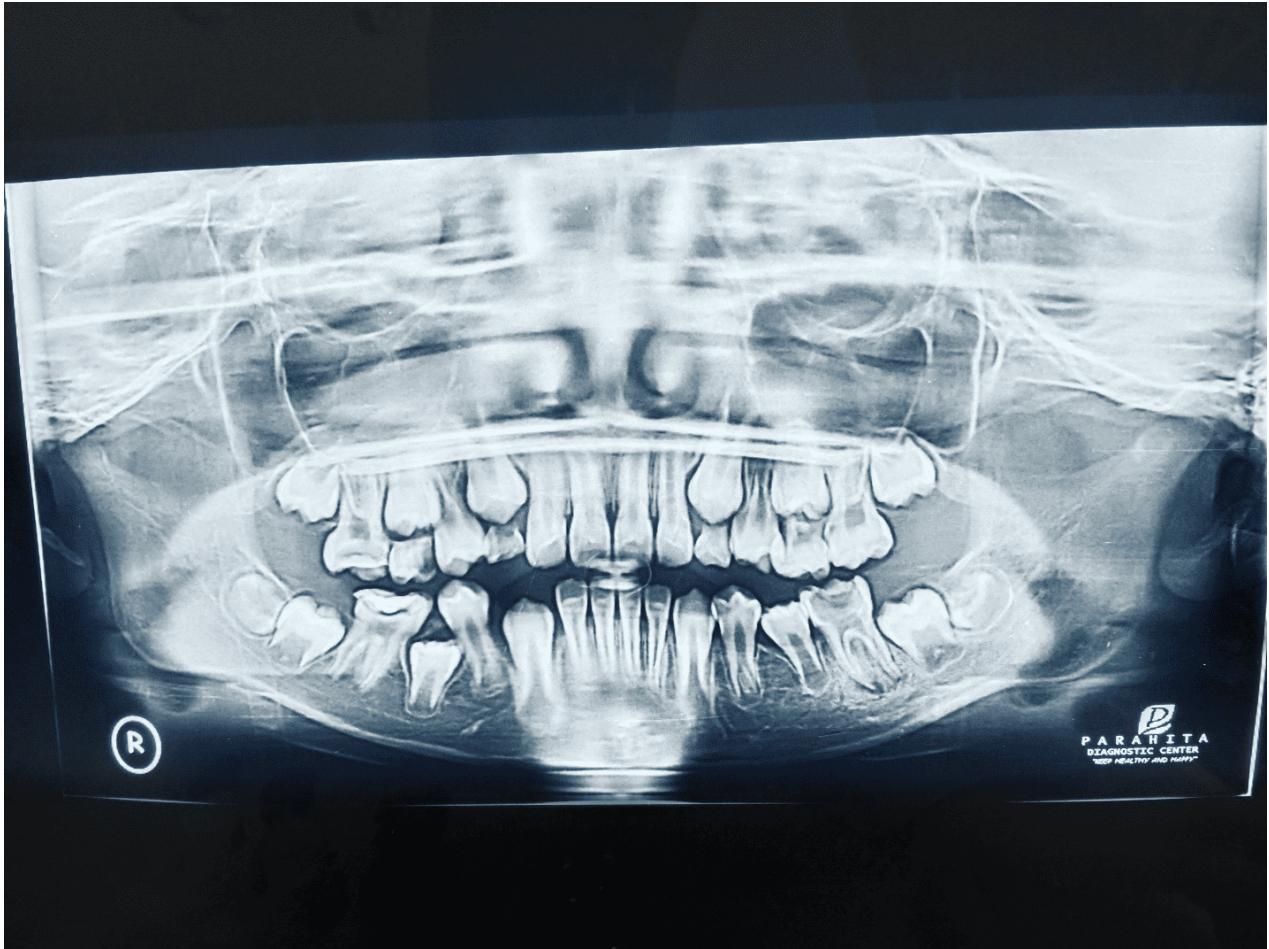


Figure 1. Pre-Operative Orthopantomogram

A Gerber space regainer was designed to retrieve the space necessary for the eruption of the permanent second premolar. An explanation about the space loss and its potential consequences were informed to patient and his parents, as well as the importance of early intervention to prevent further loss of arch length [11].

Result and Discussion

A. Result

The permanent first molar was banded with buccal and lingual molar tubes band; a wire and open coil spring was used. The appliance was cemented using Type I glass-ionomer cement (for luting) onto the tooth, with the springs held in compression to half of their original length (figure 2). After 3 months, the space regained after was 5 mm (figure 3) and after 6 months was 7 mm (figure 4). The complete space between permanent first molar and permanent first premolar was approximately 8 mm. The space regainer was taken out once the permanent second premolar made contact with permanent first premolar (figure 5, figure 6).



Figure 2. *Cementation of Gerber Space Regainer*



Figure 3. *Follow-Up of Appliance After 3 Months*



Figure 4. *Follow-Up of Appliance After 6 Months*



Figure 5. *Postoperative Periapical Radiograph of 85 Region*



Figure 6. *Post Removal of Appliance*

B. Discussion

When primary molars are lost prematurely, it can lead to a decrease in arch length due to the mesial shifting of the permanent first molar. Children aged 7 to 10 years are considered the optimal candidates to restore lost arch length, as the roots of the permanent first molar are not fully developed, making no difficulties for distalization of the permanent molar [12][13]

Maintaining space after the early extraction of primary teeth is crucial for guiding the development of proper occlusion. Space maintenance can be achieved through space maintainer or space regainer. Space regainer, is employed when there is an irregularity in the dimensional changes of the arches. This approach aims to recover the space lost due to early exfoliation [14]

A fixed appliances, such as Gerber space regainer, can be a simple alternative for regaining space, as recommended by the American Academy of Pediatric Dentistry (AAPD) reference manual [15][16]. The open coil should be compressed, which can be susceptible to debonding due to factors such as occlusal contacts, diet, or habits. To enhance stability, the system requires additional wire extending mesially or distally, serving as a track for the two units to slide on. [17]

In the present case, a Gerber space regainer was designed to recover the lost space within the shortest possible time frame and was easy to fabricate. A total of 8 mm of space was regained over a period of 7 months. The distal movement of the molars appears to be more effective before the eruption of the lower second molars [18]. Moving the permanent first molar towards the distal was accomplished without difficulty in the present case due to the incomplete root formation, and no tipping of the tooth was observed [19]

Managing space issues during the mixed dentition is crucial. Understanding the development of both the mixed and deciduous dentitions aids in determining the appropriate timing and methods for correcting malocclusions resulting from the early loss of deciduous teeth..

Conclusion

Gerber appliances are effective for retrieving space lost in the mandibular arch due to the displacement of the second permanent premolar. This space regainer is not only effective and easy to fabricate but also demonstrated good patient compliance. Further research using nonlinear analysis could provide additional insights into the efficacy and optimization of Gerber space regainers.

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