

Management of premature loss of primary maxillary first molar using crown and loop space maintainer in a 6-year-old patient: A case report

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Abstract

Premature loss of a primary molar due to extensive caries can reduce the available arch space for its permanent successor and predispose the child to future malocclusion. A fixed space maintainer is therefore indicated to preserve the space until the permanent tooth erupts. This report describes the management of an 8-year-old boy who presented with a deep carious lesion in the maxillary right first primary molar (tooth 54), with clinical and radiographic findings of pulp necrosis and furcation involvement together with root resorption of more than half the root length. Space analysis using the Moyers prediction method revealed an arch length deficiency of 2.4 mm in the maxilla, indicating the need for space maintenance. Tooth 54 was extracted under local infiltration anaesthesia, and a fixed crown and loop space maintainer was fabricated using a stainless steel crown cemented on tooth 55 with a soldered loop extending to the mesial surface of tooth 53. Treatment was completed over three visits: extraction and impression, crown try-in with impression for loop fabrication, and final cementation. At insertion, the appliance was stable, well retained, and did not interfere with occlusion. This case demonstrates that a crown and loop space maintainer is an effective, well-tolerated appliance for preserving arch space following premature loss of a primary molar in a paediatric patient.

Keywords: Crown And Loop; Space Maintainer; Premature Loss; Primary Tooth; Pediatric Dentistry

1. Introduction

Premature loss of primary teeth due to extensive caries or trauma is a condition frequently encountered in children. Early loss of a primary tooth, particularly a molar, can cause the adjacent teeth to drift into the resulting space, thereby narrowing the space available for eruption of the succeeding permanent tooth. This condition can ultimately lead to malocclusion in the form of dental crowding, rotation, or impaction of the permanent tooth [1].

A space maintainer is an appliance used to preserve and maintain space for the eruption of the succeeding permanent tooth following premature loss of a primary tooth [1]. Based on their mode of use, space maintainers can be classified into removable and fixed types. One fixed space maintainer commonly used in cases of primary molar loss with extensive destruction of the abutment tooth crown is the crown and loop appliance, a combination of a metal crown (stainless steel crown) cemented on the abutment tooth with a wire loop soldered to the crown that contacts the tooth on the opposite side of the extraction space [1,2].

Compared with the band and loop appliance, the crown and loop type is preferred when the abutment tooth has extensive crown destruction or has undergone pulp therapy, as the crown provides better retention and protection of the tooth crown [2]. This case report aims to describe the management of a fixed crown and loop space maintainer in a child with premature loss of the maxillary primary first molar.

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2. Case Report

2.1. Patient Identity and History

An 8-year-old boy presented with his parents complaining of a large cavity in his upper right posterior tooth. According to the parents, the tooth had previously been swollen but was no longer painful at the time of their visit at dentist. The patient had no history of systemic disease and no known drug or food allergies.

2.2. Clinical and Supporting Examination

Extraoral examination revealed no abnormalities. Intraoral examination showed medium-depth caries in several posterior primary teeth and deep caries in tooth 54 with a history of swelling (Figure 1). Tooth 54 showed no response to the vitality test, and there was no pain on percussion or palpation testing. Periapical radiographic examination showed a radiolucency extending to the furcation area of tooth 54 with root resorption of more than half the root length (Figure 2), leading to a diagnosis of pulp necrosis with furcation involvement in tooth 54. Based on these clinical and radiographic findings, tooth 54 was deemed non-restorable and extraction was planned.



Figure 1 Initial intraoral photograph showing carious lesions in several posterior primary teeth



Figure 2 Periapical radiograph of tooth 54 showing radiolucency extending to the furcation area with root resorption

2.3. Space Analysis

Because permanent tooth bud of first premolar (tooth 14) had not yet reached its eruption time and had not yet penetrated the alveolar bone, extraction of tooth 54 needed to be accompanied by placement of a space maintainer to prevent space loss. Space analysis was performed using the Moyers prediction method on maxillary and mandibular study models. In the maxilla, the available space was 83 mm, whereas the space required according to the Moyers prediction was 85.4 mm, giving a space deficiency of 2.4 mm. In the mandible, the available space was 70 mm compared

with a required 74 mm, giving a deficiency of 4 mm. These findings confirmed the need for a space maintainer in the region of tooth 54 to preserve the eruption space for tooth 14.

2.4. Treatment Plan and Stages

The treatment plan included communication, information, and education for the parents, dental health education (DHE), extraction of tooth 54 under infiltration anaesthesia, and placement of a fixed crown and loop space maintainer with the crown on tooth 55 and the loop contacting the mesial surface of tooth 53. Treatment was carried out over three visits, as follows.

First visit: extraction of tooth 54 was performed under infiltration anaesthesia, followed by alginate impressions of the maxillary and mandibular arches for fabrication of study and working models.



Figure 3 Maxillary working model with a stainless steel crown on tooth 55



Figure 4 Intraoral condition at try-in and after insertion of the crown and loop space maintainer

Second visit: tooth 55 was prepared for placement of a stainless steel crown (SSC), followed by try-in of the crown. Once a crown of appropriate size and adaptation was obtained, a final impression was taken with the crown inserted intraorally, which was then sent to the laboratory for fabrication of the loop to be soldered to the crown (Figure 3).

Third visit: the completed crown and loop space maintainer returned from the laboratory was tried in, followed by permanent cementation using dental cement (Figure 4). After insertion, the occlusion was checked to ensure there were

no premature contacts, and the parents were given instructions on maintaining oral hygiene and caring for the appliance.

3. Discussion

Premature loss of a primary tooth, occurring before physiological root resorption is complete, can disrupt both the vertical and horizontal occlusal relationships of the primary and permanent dental arches, ultimately leading to malocclusion. Preventing space loss following premature loss of a primary tooth is therefore an important measure [1].

Several factors need to be considered when selecting the type of space maintainer to be used, including the timing of primary tooth loss, the patient's chronological age, the thickness of bone covering the succeeding permanent tooth germ, and the sequence of tooth eruption [3,5]. In this case, the space maintainer was placed immediately after extraction to prevent adjacent teeth from drifting into the extraction space.

A crown and loop appliance was chosen in this case because the abutment tooth (tooth 55) was also at risk of crown structure damage, so using a crown provided better retention and protection than a band in a band and loop design [2,6]. In addition, the crown and loop appliance is relatively straightforward and does not require lengthy chairside time compared with several other fixed space maintainer designs [1].

After placement of the space maintainer, the patient and parents needed to be instructed to maintain oral hygiene by brushing at least twice daily, avoiding sticky and hard foods, and attending regular follow-up visits to check the stability of the appliance and monitor eruption of the succeeding permanent tooth [1,7]. At follow-up, the space maintainer in this case showed good retention with no signs of soft tissue irritation or occlusal disturbance.

4. Conclusion

The fixed crown and loop space maintainer is an effective treatment option for preserving the eruption space of the succeeding permanent tooth following premature loss of a primary first molar. Using a crown as the retainer provides better retention and protection of the abutment tooth crown, allowing the appliance to function optimally until the succeeding permanent tooth erupts. The success of this treatment was also supported by the patient's and parents' compliance in maintaining oral hygiene and attending regular dental follow-up visits.

Compliance with ethical standards

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Disclosure of Conflict of interest

The authors declare that there is no conflict of interest in the writing of this case report.

Statement of ethical approval

This case report describes a single instance of routine clinical management in one patient and did not involve any experimental study on animals or humans.

Statement of informed consent

Written informed consent was obtained from the patient's parent/guardian for publication of this case, along with the accompanying clinical data and images.

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