

ABSTRACT/BACKGROUND

Premature loss of a primary molar can occur due to a multitude of reasons, including caries, infection, and trauma. When this occurs and restoration of the affected primary tooth is not possible, the AAPD recognizes space maintenance as a "Best Practice" to prevent loss of arch length, width, and perimeter after extraction. However, reports suggest that with proper intercuspation of first permanent molars, space loss from premature loss of a primary molar is minimal and a space maintainer in that area may not be needed. The clinical management for such cases has been controversial across pediatric dental providers, with factors such as timing, behavior, and age all playing large roles in making treatment planning complex. This systematic review is aimed at reviewing the current scientific literature to evaluate the need for a unilateral space maintainer after premature loss of a primary molar in the mixed dentition stage. For sake of completion, studies that looked at loss of first primary molars and/or second primary molars were included. Bilateral space maintenance, such as lower lingual holding arches or Nance appliances, is not investigated in this review due to its relative effectiveness across clinical cases. A systematic review is needed to help guide clinicians' decision making and provide clarity for management in the currently ambiguous scenario of the premature loss of a primary molar in the mixed dentition stage.

Primary Molar Loss and Resulting Space Outcomes: a Systematic Review Kaitlin Carlson, DMD; Meredith Clark, DDS; Richard Nguyen, DDS; Brenda Bohaty DDS, MSD, PhD; Amy Burleson, DDS; Robin Onikul, DDS; Neena Patel, DDS; Jenna Sparks, DDS Children's Mercy Hospital and UMKC School of Dentistry, Kansas City Missouri.

METHODS

Eligibility Criteria. Inclusion criteria for studies included in this review were randomized control trials, longitudinal studies, retrospective studies, cross sectional studies and systematic reviews following the PICO strategy as described below:

P (population): Patients who have lost a primary Molar prematurely

- I (intervention): Unilateral space maintenance
- **C** (comparison): No space maintainer
- **O** (outcome): Space loss

SYNTHESIS OF RESULTS

Twelve studies ^{2,3, 5,6, 7, 8, 9, 10, 11, 12} were included in this systematic review. One study ³ compared the use of a space maintainer to no space maintainer. This study reported there was space loss present in both the control and experimental groups, with the control group showing more space loss when the permanent molars were not intercuspated. Nine studies 2, 5, 6, 7, 8, 9, 10, 11, 12 used a split mouth model to compare unilateral post-extraction space loss to the contra-lateral side which had no extraction. In these 9 studies, there was no space maintenance intervention performed. In 2 of these studies, a space maintainer was recommended within the first 3 weeks ² or 3 months ¹⁰ after the extraction was performed. In 1 study¹², space maintenance was recommended in the maxilla after premature loss of a 2nd primary molar due to the loss of the leeway space. In 6 studies ^{5,6,7,8,9,11}, the space loss measured was not clinically significant enough to warrant use of a space maintainer. Two studies ^{6, 8} mentioned space loss was due to the drift of the primary canine towards the extraction site. Two studies ^{7,9} saw an increase in arch dimension over time indicating space maintenance was not necessary. Two of the studies ^{5, 11} report that depending on growth patterns and/or molar relationships, a space maintainer could be considered. Two studies included were systematic reviews ^{4,14} One study ⁴ reported that space loss was present in the first 3 months, recommending a space maintainer for the majority of cases where there was premature loss of a mandibular 2nd primary molar due to mesial displacement of the 1st permanent molar. The other systematic review ¹⁴ reported that there was space loss, but it may not be clinically significant. However, in cases with incisor/lip protrusion or severe arch length deficiencies, this could impact the need for a space maintainer.

DISCUSSION

Space maintenance is a large component of comprehensive care in pediatric dentistry particularly in the mixed dentition stage. There is conflicting evidence about how to best manage the premature loss of a primary molar. The objective of this systematic review was to help guide clinician's decision making in space maintenance after premature loss of a primary molar in the mixed dentition stage. Seven of the studies concluded there was space loss but not clinically significant enough to warrant the use of a space maintainer. Three studies recommended the use of a space maintainer depending on timing, growth pattern, and what primary molar was lost. A limitation of this analysis was a lack of randomized control trials, length of study, and inconsistency across experimental variables. It is recommended that additional research be performed in order to make more specific recommendations for best space maintenance practices.

Park, lung, Cim, 2009 ¹¹	Seoul, South Korea	Extraction side vs. Non-extra ction side	5-10 years old	13 children	Longitudin al Study	No significant results for space loss, Inconsistent findings for inclination or angulation changes on extraction side	"The premature loss of a maxillary primary first molar, in cases with class I molar relationship, has limited influence on the space in permanent dentition."
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CONCLUSION

Based on the results of this systematic review and meta-analysis, the following conclusions can be made:

1. There is evidence to support the use of a maintainer in certain scenarios, space specifically after the premature loss of a maxillary 2nd primary molar, when there is severe arch length deficiency, and when there is severe incisor/lip protrusion.

2. There is evidence against the use of a space maintainer if these aforementioned clinical scenarios were not present.

3. There is evidence to support that timing is a crucial factor in deciding if a space maintainer will be beneficial.

4. There is evidence to support that space loss depends on molar relationships, growth patterns, and anterior crowding that could cause distal drift of the primary canines.

5. Additional research is needed for continuing guidance on best practices for space maintenance following premature loss of a primary molar in the mixed dentition stage.

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