

Identifying Predictors for a Caries Free Permanent Second Molar in Second Molar Substitution cases

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Background

- At our pediatric dental clinic, we see many children coming in with gross decay on permanent first molar (PFM)
- Most times, we attempt to save PFMs with root canal treatment and stainless-steel crown, but sometimes extraction is necessary or preferred by parents

Permanent First Molar:

1. Earliest first permanent tooth

Exposed longest to caries risk factors (ex. Poor oral hygiene & cariogenic diet)¹

2. Experiences highest incidence of caries²⁻⁴

Due to lack of knowledge and early interventions, PFM is most heavily restored & most extracted tooth due to caries⁴⁻⁷

3. Susceptible to molar hypomineralization (MH)

More prone to caries and structural breakdown, requiring complex restorative tx for very young patients⁸⁻¹⁰

4. Higher chance of restorative failure

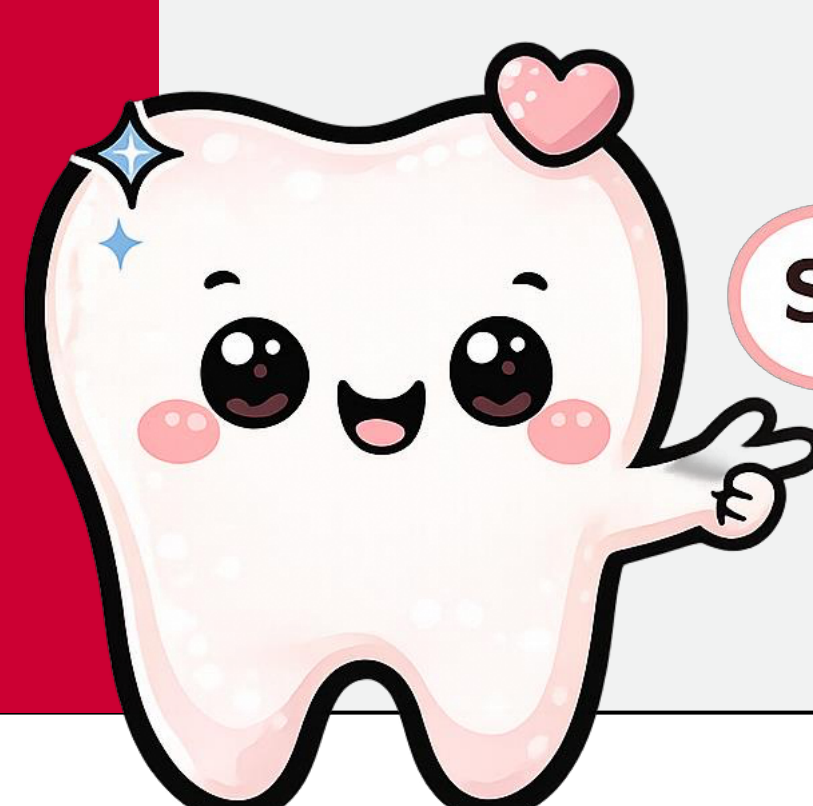
Repeat restorative tx leads to increased economic burden & behavior management problems → greater need for tx under sedation or GA^{11,12}

- Currently, there are numerous studies regarding evaluating success of Second molar substitution in orthodontic aspect by assessing spontaneous space closure between permanent second premolar and permanent second molar (PSM) without any orthodontic treatment.
- HOWEVER, very limited studies have been done in evaluating success in presence of caries and/or infection on PSM after extraction of PFM and assessing if early extraction of grossly carious PFM results in healthier PSM that requires less invasive and less traumatic dental treatment.

Aim

- This study aimed to identify predictors of caries-free PSMs following early PFM extraction by examining patient's age at extraction, PSM Demirjian stage, follow-up frequency, fluoride application, oral hygiene instruction and dietary counseling given.

References



Scan here



Methods

Design: Retrospective chart review (axiUm)

Sample: 1241 records

Inclusion: Patients with extracted PFMs with adequate radiographs + documented PSM follow-up

Outcome (Success):

→ Caries-free PSM (sealant codes: D1351/D1353)

Failure:

→ Restorative/SDF/endodontic/extraction codes

Key Variables:

- Age at extraction - Early (<8 years) / Ideal (8-10 years) / Late (>10 years)
- Demirjian stage of PSM - Early (A-D) / Ideal (E) / Late (F-H)

Follow-up frequency –

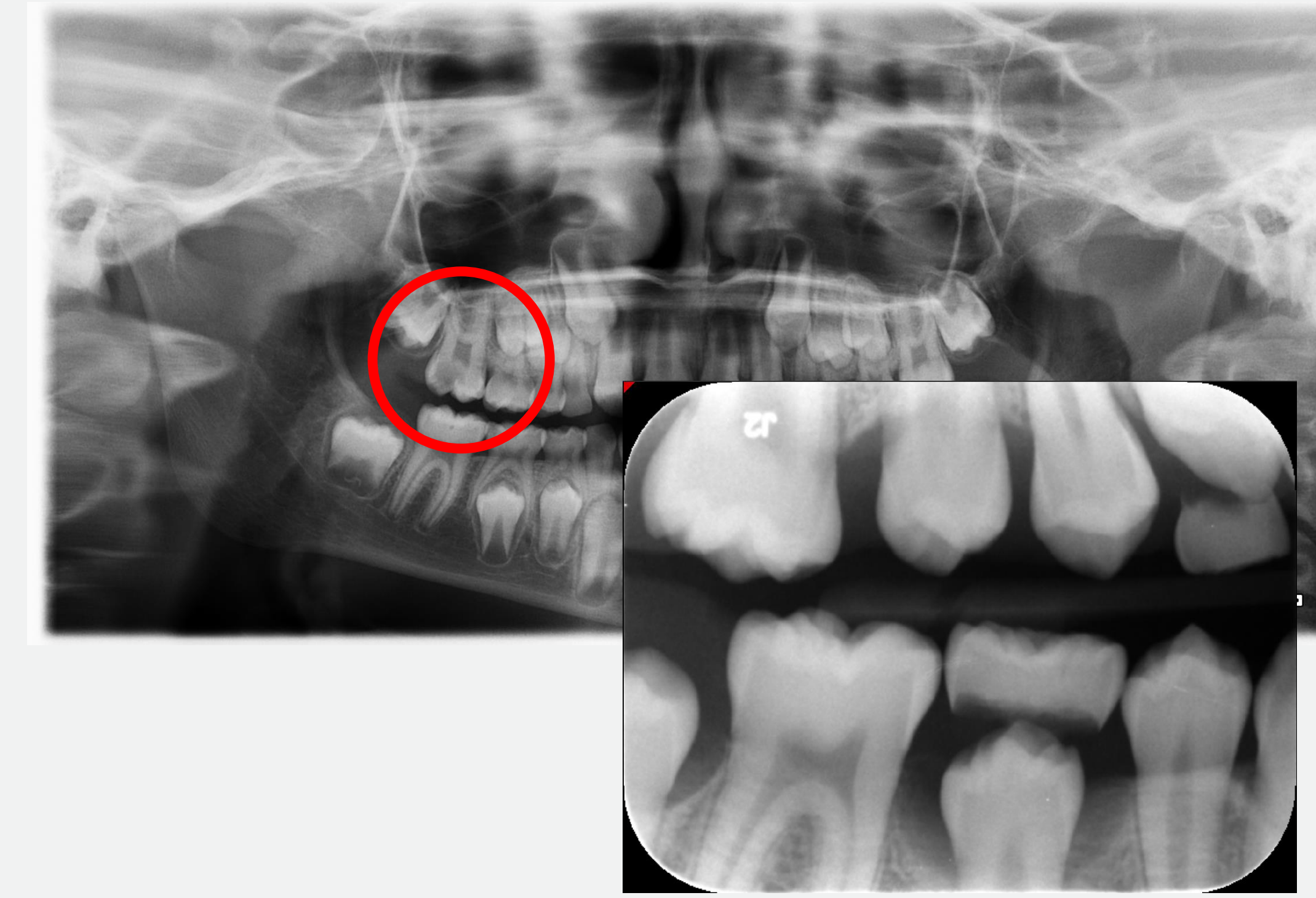
- Optimal (≥2 visits ≤3 months apart) vs Poor (<2 visits or >3-month intervals)

Preventive measures: per axiUm

- Fluoride (D1206)
- OHI
- Dietary counseling

Analysis:

- Bivariate analysis
- Binary logistic regression (Odds Ratios)



Results

Final cohort: 165 PSMs (114 patients)

Statistically significant predictors of success:

- Optimal follow-up (OR = 2.3; 95% CI: 1.2–4.5; p = 0.013)
- Fluoride application (OR = 2.4; 95% CI: 1.1–5.1; p = 0.028)

NOT significant variables:

- Age at extraction
- Demirjian stage of PSM
- OHI
- Dietary counseling

Variables	Groups	N (%)	Success N (%)	Failure N (%)	p-value
Chronological Age	Early	4 (2.4%)	1 (25%)	3 (75%)	0.598
	Ideal	65 (39.4%)	30 (46.2%)	35 (53.8%)	
	Late	96 (58.2%)	38 (39.6%)	58 (60.4%)	
PSM Demirjian Stage	Early	5 (3%)	0 (0%)	5 (100%)	0.175
	Ideal	28 (17%)	12 (42.9%)	16 (57.1%)	
	Late	132 (80%)	57 (43.2%)	75 (56.8%)	
Follow-up frequency	Poor	107 (64.8%)	37 (34.6%)	70 (65.4%)	0.010
	Optimal	58 (35.2%)	32 (55.2%)	26 (44.8%)	
Oral Hygiene Instruction	No	56 (33.9%)	24 (42.9%)	32 (57.1%)	0.846
	Yes	109 (66.1%)	45 (41.3%)	64 (58.7%)	
Fluoride application	No	44 (26.7%)	12 (27.3%)	32 (72.7%)	0.022
	Yes	121 (73.3%)	57 (47.1%)	64 (52.9%)	
Dietary counseling	No	108 (65.5%)	49 (45.4%)	59 (54.6%)	0.203
	Yes	57 (34.5%)	20 (35.1%)	37 (64.9%)	

Discussion

- Success was strongly associated with recall compliance and preventive interventions (esp. fluoride)
- Sealant placement alone may not ensure long-term caries-free outcomes as some patients later developed caries on previously sealant placed PSMs
- ⚠ Limitations: retrospective design, follow-up variability, potential MIH confounding

Conclusion

- Optimal post-extraction follow-up frequency and fluoride application** were associated with significantly increased odds of caries-free outcomes in substituting PSMs following PFM extraction, potentially outweighing developmental timing factors traditionally emphasized in orthodontic-focused studies.
- Stricter recall protocols** following PFM extraction should be considered to mitigate caries progression and support favorable long-term outcomes of substituting PSMs.

Acknowledgements

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