Retrospective Study of Survival Rates According to The Type of Dental Restoration of Proximal Caries in Primary Molars

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I. Introduction

- Restorative dental materials have advanced rapidly with improvement of physical properties to improve survival rates.
- Amalgam, composite resin, glass-ionomer cement, and preformed stainless steel crowns have been used widely for the restoration of dental caries in primary molars.
- Only few studies have examined their survival rates. This study results should help in the selection of class II restorations for primary molars.

II. Material & Methods

Subjects

Patients : Be treated at the Chosun University dental hospital in 2012
Caries lesion : proximal caries of primary molar
Number : 355 patients (739 teeth)
Ruled out
i) No revisit
ii) Couldn't read radiograph clearly
iii) Frankel scale 1 and 2
iv) Irreversible pulpitis
v) Pulp exposure, fistula, swelling of periodontal tissues, abnormal mobility of teeth

Examination method

1) Selection of research target

(1) Electronic Medical Record
- Age
- Type of filling material
- Maxillary / Mandibular
- 1st primary molar / 2nd primary molar
- Type of developed complications
- Follow-up periods

(2) Filling materials
- Composite resin (Filtek™ Z250, 3M ESPE, Minnesota, USA)
- Preformed crown (3M SP crown®, 3M ESPE, Minnesota, USA)
- GI cement(Ketac™ Molar, 3M ESPE, Minnesota, USA)
- Amalgam(CAVEX 68® Holland BV, Haarlem, Holland)
- Light cured GI cements(Fuji II LC® GC Co, Tokyo, Japan)

(3) Cavity Shape
- Only conventional cavity shaped teeth were included
  : Ruled out - round slot-type, slice type, tunnel preparation, and etc.

(4) Radiographic examination
  : Teeth which caries reach dentin were included

(5) Type of failure
- Secondary caries
- Fractures of filling material
- Fall out of filling material
- Abnormal absorption of root or radiographic lesion

2) Follow-up
: Electronic medical records and radiation pictures were evaluated (up to 24 months).

3) Data analysis
- SPSS (version 18.0.0 SPSS Cicago IL)
- Kaplan-Meier method
- Amalgam (n=19) and LC GI (n=5) were excluded (due to lack of sample).

III. Result

1) Survival rates of different restorative materials
- SSC had a very low rate of repair failure than LC resin or GIC.

Table 1. The numbers of failures and censored observations on different restorative dental materials

Treatment	Number of teeth	Failures		Censored	
		Number	%	Number	%
LC resin	121	26	21.5%	95	78.5%
SS crown	442	20	4.5%	422	95.5%
GIC	152	37	24.3%	115	75.7%

- The SSC survived for a period of 23 months in a follow-up study lasting 23 months.
- There was a statistically significant difference between SSC and other restorative materials.

Table 2. Estimated survival periods in relation to dental restorative materials

Treatment	Estimate (months)	Standard Error	95% Confidence interval	
			Lower Bound	Upper Bound
LC resin	21.973[a)]	0.530	20.935	23.011
SS crown	23.343[b)]	0.169	23.011	23.675
GIC	20.499[a)]	0.588	19.346	21.652

Kaplan-Meier method (a,b : same letter are not significantly different , $p < 0.01$)

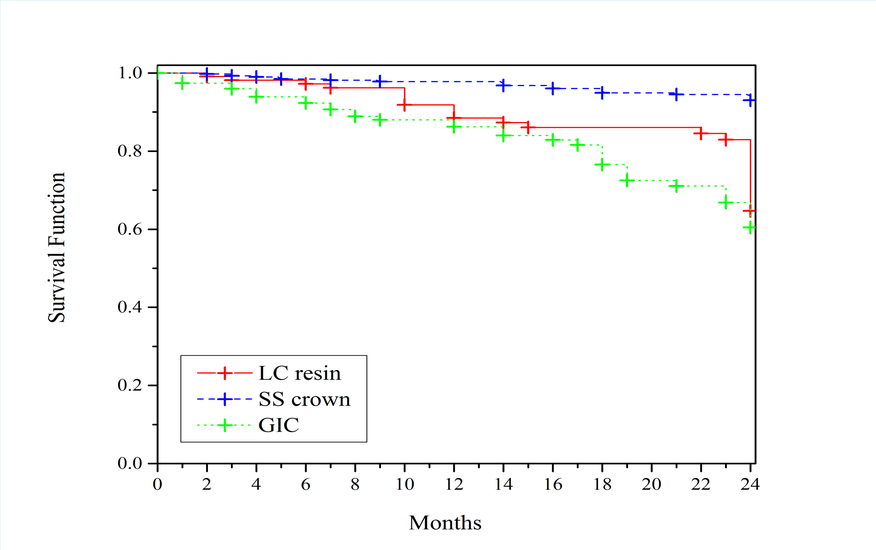

Fig. 1. Survival estimates of different restorative materials over time.

2) Survival rates of different patients age
- Cases of 7 years old patients Showed high failure rate compared to 3-4 years old group and 5-6 years old group.

Table 3. Numbers of failures and censored observations on patients' age

Age	Number of teeth	Failures		Censored	
		Number	%	Number	%
3-4 years	241	17	7.1%	224	92.9%
5-6 years	290	31	10.7%	259	89.3%
≥7 years	181	35	19.3%	146	80.7%

Table 4. Estimated survival periods in relation to the age of patients

Age	Estimate (months)	Standard Error	95% Confidence interval	
			Lower Bound	Upper Bound
3-4 years	23.426[a)]	0.214	23.007	23.845
5-6 years	22.614[a)]	0.292	22.042	23.186
≥7 years	21.155[b)]	0.499	20.177	22.133

Kaplan-Meier method (a,b : same letter are not significantly different , $p < 0.01$)

3) Correlation between materials and failure types
- For composite resins, the probability of developing secondary caries was higher.
- In the case of GIC, the occurrence of restoration fracture and fall out were higher than other materials.

Table 5. The failure type of Class II cavity restoration depending on the type of restorative materials

Restorative materials	Failures				Total
	Secondary caries	Restoration fracture	Restoration fall out	Abnormal root resorption or radiographic lesion	
LC resin	14***	2	8	1	25
SS crown	1	3	2	9	15
GIC	5	13***	16***	2	36
Total	20	18	26	12	76

Fisher's exact test (***$p < 0.001$)

Summary

In this study, the Stainless steel crown suffered a relatively low incidence of complications compared to other repair materials and showed relatively high survival rates. Based on this study, the Stainless steel crown was more appropriate than other materials for the transition into a correct permanent dentition. It is believed that if clinicians acknowledge the limits of the Stainless steel crown, and apply it to the teeth of the correct indications, there will be a high success rate.