

The Influence of the Operator and Assistant Experience on the Survival of Proximal ART Restorations

A Kaplan-Meier Survival Analysis

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29TH INTERNATIONAL SOCIETY FOR CLINICAL BIostatISTICS

27, August 2009

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Materials

A Two-year Clinical Trial

- To investigate the survival rate of proximal ART restorations in the primary molars
- In Matungulu and Kangundo rural divisions, Machakos district, Kenya.
- About 804 children; a baseline mean-age of 7.4 ± 0.9
- Period 2006-2007
- Ethical approval for the study was granted by the University of Nairobi and Kenyatta National Hospital Research and Ethical Committees.

- Random numbers were used to allocate each child to an operator, assistant, glass ionomer material and isolation method.
- Seven operators (3 experienced and 4 inexperienced) and eight assistants (4 experienced and 4 inexperienced) randomly paired daily, made the restorations.
- The operators and the assistants underwent a one-week WHO approved ART theory and practical training in their respective roles in the study
- Rubber dam and cotton rolls were used randomly to isolate the teeth for restoration.
- Fuji IX, Ketac Molar Easymix (KME) and Ketac Molar Aplicap (KMA) glass ionomer cements were randomly used to restore the cavities.

- They were all trained and calibrated prior to evaluating the restorations, soon after placement (within 2 hours), after one week, one month, six months, one year, one and a half years and two years.
- The clinical data on the quality of the sealants were collected using various codes.
 - Sealants with codes 0, 1 were considered successful, 2 as failures and 3, 4, 5 were censored.
 - Fillings with codes 0, 1, 2, 6 were considered successful, 3 as failures and 4, 5, 7 were censored.
- Response variable:
 - 1 Time to failure of the dental fillings
 - 2 Time to failure of the dental sealants

Kaplan-Meier Survival Analysis

- Survival probabilities, i.e. time to caries onset, were estimated by the Kaplan-Meier method, also known as the product-limit estimate of the survival function.
- Survival probabilities for sealants and fillings survival for experienced and inexperienced operators were compared by means of the Wilcoxon and log-rank tests. survival data are usually censored ([2]).
- A key characteristic that distinguishes survival analysis from other areas in statistics is that survival data are usually censored

- Censoring occurs when incomplete information is available about survival time for some individuals. Thus, survival analysis has an advantage over conventional statistical methods, as it includes censored observations in the analysis of the data.
- The strength of the Kaplan-Meier method over conventional methods of analysis is that it accounts for censored observations and includes them in the data analysis.
- Classical methods would generally only include those children who had complete observation; Survival analysis makes it possible to use information from children who had at least one examinations.

- We assumed that censoring was noninformative, i.e. subjects who were censored had the same underlying survival curve after censoring as subjects who were not censored
- The analyses were performed using SAS version 8.2 statistical package. Statistical significance was set at $P < 0.05$ (5%).
- Cox proportional hazards ratio (HR) were calculated for the survival time by experience, isolation method and material used.

Results

Survival of Fillings

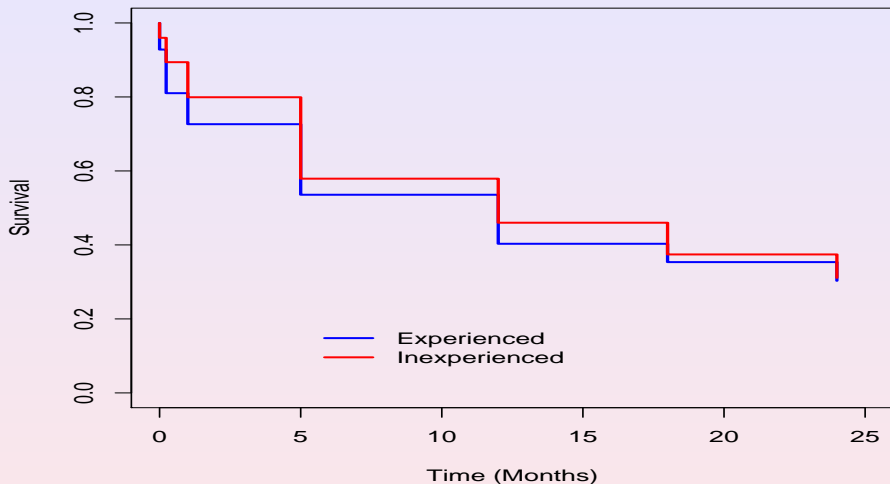
Months from Baseline	%Survival	95% LCL	95% UCL
0.00	89.4	94.4	96.0
0.23	68.7	85.2	87.7
1.00	56.9	76.3	79.3
5.00	34.3	55.7	59.3
12.00	28.9	43.2	46.8
18.00	16.4	36.5	40.3
24.00	10.9	30.8	34.7

Survival of Sealants

Months from Baseline	%Survival	95% LCL	95% UCL
0.00	89.4	87.3	91.6
0.23	68.7	65.6	72.0
1.00	56.9	53.5	60.5
5.00	34.3	31.1	37.8
12.00	28.9	25.8	32.3
18.00	16.4	13.8	19.5
24.00	10.9	8.5	14.0

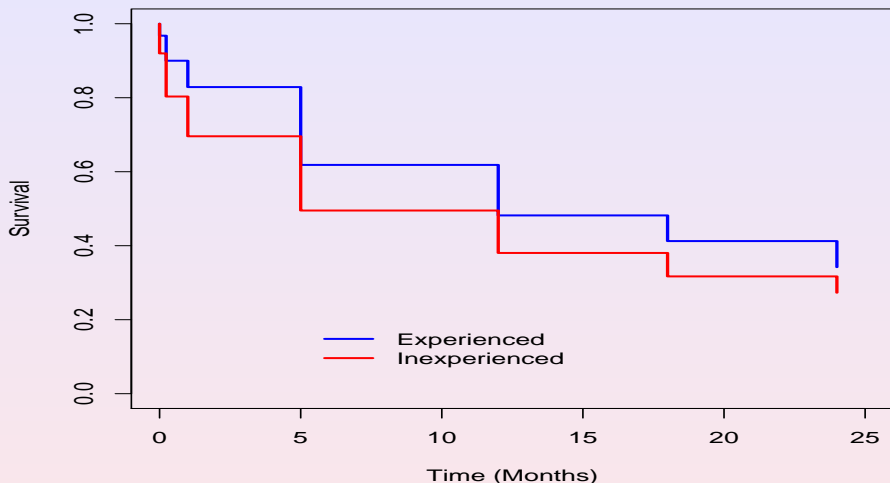
- After the two-year follow-up period, the seven operators showed amongst themselves significant statistical difference in the survival rate for the restorations they made
- Log-rank Chi-square 43.95, 6df, $p < 0.0001$ for sealants and;
- Log-rank Chi-square 63.79, 6df, $p < 0.0001$ for fillings.

Fillings survival by operator experience



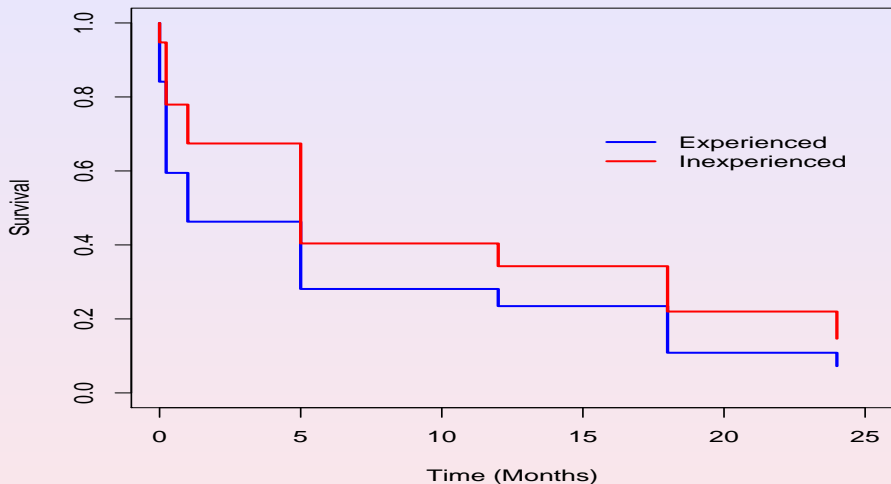
The difference in the survival rate between the two groups of operators was not statistically significant (Log-rank chi-square 2.04, 1 df, $p=0.15$)

Fillings survival by assistance experience



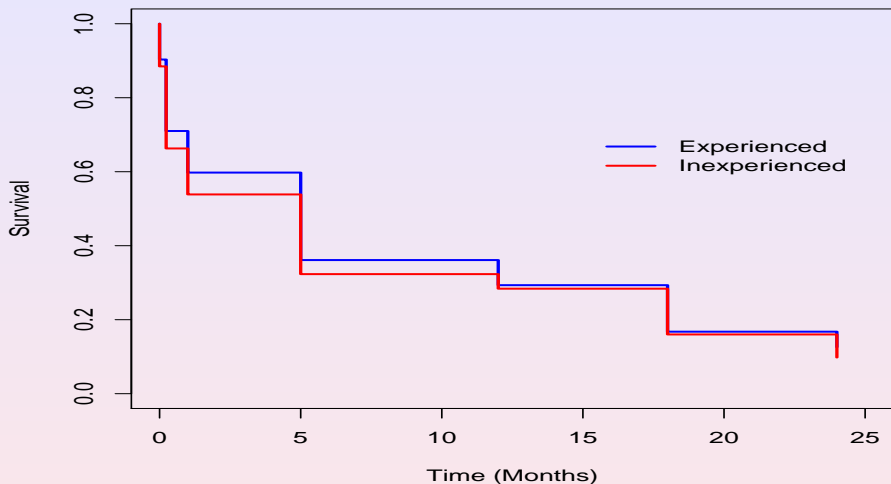
The difference in the survival rate between the two groups of assistants was statistically significant for fillings (Log-rank Chi-square 12.41, 1 df, $p=0.0004$).

Sealants survival by operator experience



The difference in the survival rate between the two groups of operators was statistically significant (Log-rank chi-square 31.3, 6 df, $p=0.0001$).

Sealants survival by assistance experience



The difference in the survival rate between the two groups of assistants was not statistically significant for sealants (Log-rank Chi-square 1.40, 1 df, $p=0.24$).

Cox PH for Fillings Survival

Variable	Hazard Ratio	P-value
Experienced Operator	1.088	0.4014
Experienced Assistant	0.708	0.0007
Isolation(Rubberdam)	0.800	0.0251
Isolation(Cottonrolls)	0	-
Material (Fuji IX)	0.960	0.7399
Material (Ketac molar Easymix)	1.274	0.0502
Material (Ketac Molar Aplicap)	0	-

Cox PH for Sealants Survival

Variable	Hazard	
	Ratio	P-value
Experienced Operator	1.688	< .0001
Experienced Assistant	0.971	0.7592
Isolation(Rubberdam)	0.995	0.9553
Isolation(Cottonrolls)	0	-
Material (Fuji IX)	1.059	0.6235
Material (Ketac molar Easymix)	1.219	0.0884
Material (Ketac Molar Aplicap)	0	-

Conclusion and Further Research

- After two years of follow-up, the proportion of satisfactory results for the survival rate of the restorations dropped.
- The experience of both the operator and the assistant appear crucial for best survival rate of the proximal dental restorations.
- The best outcome for fillings (but not the sealants) was with the "experienced" operators and assistant paired together. And that the experience of the assistant appears to be crucial when paired with any operator.
- **Further research:** fitting a bivariate survival distribution of both the fillings and sealants



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