Clinical Outcomes for Early Childhood Caries: Influence of Aggressive Dental Surgery

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ABSTRACT

Purpose: The objective of this study was to assess the relationship between the number of stainless steel crowns (SSCs) placed, number of surfaces at risk (SAR) post dental surgery, and the risk for relapse in patients treated for Early Childhood Caries (ECC).

Methods: The study population consisted of 57 children treated for ECC under general anesthesia, ranging in age from 2.3 to 7.3 years old at the time of entry. Dental surgery utilized an aggressive approach: teeth that had necrotic pulps or were nonrestorable were extracted; decayed primary mandibular incisors that could not be treated by stripping were extracted; primary maxillary incisors with 3 or more carious surfaces were extracted; single-surface lesions of primary molars that did not compromise cusp integrity were restored with intracoronal amalgam restorations; primary maxillary incisors and canines with smooth-surface lesions affecting 2 or less surfaces were treated with intracoronal composites; primary molars and canines requiring vital pulp therapy were restored with SSCs; primary molars with caries lesions affecting 2 or more surfaces (including smooth-surface, white-spot lesions) were restored with SSCs; primary canines with caries affecting 3 or more surfaces were restored with stainless steel crowns; topical fluoride was applied after all restorative therapy was completed. The cohort was examined for new caries lesions 6 months post dental surgery. Relapse was defined as the presence of new smooth-surface caries lesions as defined by Radike.[9] Comparisons between relapse (R) and nonrelapse (NR) groups, with respect to the number of SSCs placed and the number of SAR, were performed using *t* tests and Wilcoxon tests. A 0.05 level of significance was employed in all statistical tests.

Results: Twenty-one of the 57 (37%) patients relapsed. No statistically significant difference for the number of SSCs placed or SAR existed between the R group (SSCs: mean=4.57, median=4±2.18; SAR: mean=39.76, median=40±13.62) and NR group (SSCs: mean=5.44, median=5.5±2.62; SAR: mean=39.98, median=39.5±15.19).

Conclusions: The risk for relapse in children treated for ECC is not associated with the number of SSCs placed or SAR; aggressive dental surgery for ECC does not result in acceptable clinical outcomes. (*J Dent Child.* 2004;71:114-117)

KEYWORDS: CLINICAL OUTCOMES FOR EARLY CHILDHOOD CARIES, CROWNS, SURFACES AT RISK

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Early Childhood Caries (ECC) continues to be a public health problem of global proportions.[1] Impoverished babies and young preschool children, regardless of race, ethnicity, or culture, are at highest risk.[1] Treatment of ECC usually necessitates general anesthesia because of the level of cooperative behavior of babies and young preschool children. Treatment is usually restricted to restoration or extraction of carious teeth coupled with recommendations to extinguish decay-promoting feeding behaviors. Such an approach does little to bring the disease under control. Dental surgery has minimal

long-term impact on oral *mutans streptococci* reservoirs,[2,3] and counseling parents about caries-promoting feeding behaviors has had minimal success.[4] Not surprisingly, reports of clinical outcomes for children treated for ECC under general anesthesia indicate that current treatment strategies are associated with high relapse rates.[5-8]

Treatment of relapse is costly and associated with the potential for significant morbidity (eg, general anesthesia, sedation, physical restraint). Use of sedation and physical restraint are common modalities utilized for behavior management in babies and young preschool children who require limited restorative dentistry. These approaches may have an effect on the developing psyche of a young child and adverse effects on future health care behaviors. Treatment strategies that improve clinical outcomes are needed. Accordingly, it is reasonable to speculate that aggressive dental surgery would result in fewer surfaces at risk for new decay and, therefore, may improve clinical outcomes.

On this basis, this report assessed clinical outcomes for patients treated for ECC, utilizing an aggressive dental surgery approach.

METHODS

STUDY POPULATION

The study population consisted of 79 children consecutively admitted to the Ambulatory Surgical Center of the Strong Memorial Hospital at the University of Rochester Medical Center (URMC) in Rochester, NY, for treatment of ECC utilizing general anesthesia. This study cohort consisted of 42 males and 37 females ranging in age from 2.3 to 7.3 years (mean age=4.2 years) at their time of entry into the study. Study population ethnicity was as follows: 2 Native Americans; 2 Asians; 22 African Americans (not of Hispanic origin); 4 Hispanics; 27 Whites; 22 of mixed race.

All subjects were recipients of New York State Medicaid or Child Health Plus, indicating that they were from families of lower socioeconomic status. All subjects harbored a complete primary dentition at the study's inception and only primary teeth at the 6-month follow-up visit. The criteria for establishing a diagnosis of ECC were cavitated carious lesions affecting at least 2 of the 4 maxillary primary incisors and 2 of the 4 buccal segments. Hence, all subjects had a caries pattern consistent with a diagnosis of ECC.

Dental surgery utilized an aggressive approach:

1. Teeth that had necrotic pulps or that were nonrestorable were extracted.
2. Decayed primary mandibular incisors that could not be treated by stripping were extracted.
3. Primary maxillary incisors with 3 or more carious surfaces were extracted.
4. Single-surface lesions of primary molars that did not compromise cusp integrity were restored with intracoronal amalgam restorations.
5. Primary maxillary incisors and canines with smooth-surface lesions affecting 2 or less surfaces were treated with intracoronal composites.
6. Primary molars and canines requiring vital pulp therapy were restored with stainless steel crowns (SSCs).
7. Primary molars with caries lesions affecting 2 or more surfaces (including smooth-surface, white-spot lesions) were restored with SSCs.
8. Primary canines with caries affecting 3 or more surfaces were restored with SSCs.

A prophylaxis and topical fluoride application were performed after all restorative procedures were completed. The parent(s) or caregiver(s) of all patients received preoperative dietary counseling regarding decay-promoting feeding behaviors and oral hygiene instruction. The study protocol was approved by the Research Subjects Review Board of the URMC.

RELAPSE EVALUATION

The study population was evaluated for new caries lesions 6 months following dental surgery. Caries status was evaluated by 2 clinical examiners at the 6-month follow-up visit. One examiner was trained and calibrated by one of the authors who has extensive experience in caries clinical trials. The second examiner was trained and calibrated by the first examiner. Each of these 2 calibration sessions included the examination of 15 subjects. In both cases, there was 100% agreement with respect to scoring of individual tooth sites by the examiners (κ=1). No opportunity was provided for performing repeated evaluations on the same subject by the same examiner, and, thus, no quantitative assessment of intraexaminer reliability was calculated.

Relapse was defined as the presence of 1 or more new smooth-surface caries lesion(s) affecting any primary tooth or teeth. Recurrent caries at the margin(s) of a restoration was excluded as a criterion for declaring relapse. A surface was declared as having smooth-surface caries per the criteria of Radike,[9] with the exception that white spot lesions were not penetrated with an explorer. The study coordinator scheduled the subjects via telephone for the 6-month follow-up visit and gave a $30 volunteer fee to enhance compliance with follow-up.

STAINLESS STEEL CROWNS (SSCs)

The number of SSCs placed per patient was scored for the relapse (R) and nonrelapse (NR) groups. The mean, median, and standard deviation of SSCs placed was determined for both the R and NR groups.

SURFACES AT RISK (SAR)

The number of SAR for new caries lesions post dental surgery was determined per patient for the R and NR groups. Surfaces that harbored an intracoronal restoration were not considered at-risk surfaces. The SAR determination was made on the following scoring system: primary molars had 5 potential surfaces at risk (occlusal, mesial, distal, buccal, and lingual); primary incisors and primary canines had 4 potential surfaces at risk (mesial, distal, facial, and palatal). The mean, median, and standard deviation of SAR were determined for the R and NR groups.

Table 1. Summary of Stainless Steel Crowns (SSCs) Placed and Surfaces at Risk (SAR) at 6 Months*

	6-month relapse status					
	Relapse			Nonrelapse		
Variables	N	Mean (±SD)	Median	N	Mean (±SD)	Median
SSCs	21	4.57±2.18	4	36	5.44±2.62	5.5
SAR	21	39.76±13.62	40	36	39.58±15.19	39.5*

*Comparisons (t tests; Wilcoxon tests) across relapse status were not significant (P>.05).

STATISTICAL ANALYSES

Comparisons between the R and NR groups regarding the number of SSCs placed and number of SAR were performed using *t* tests and Wilcoxon tests. A 0.05 level of significance was employed in all statistical tests.

RESULTS

Fifty-seven of the 79 patients (72%) returned for the 6-month follow-up exam. Review of the operative reports of these 57 patients indicated that 292 SSCs, 101 amalgam restorations, and 32 composite restorations were placed in these patients. In addition, 222 teeth were extracted and no primary incisor crowns were placed. At the 6-month follow-up evaluation, 1 SSC had come off and 2 occlusal amalgam restorations had failed due to recurrent decay at the margins.

Twenty-one of the returning 57 (37%) patients met the study's criteria for relapse. No statistically significant difference for the number of SSCs placed or SAR existed between the R group (SSCs: mean=4.57±2.18, median=4; SAR: mean=39.76±13.62, median=40) and the NR group (SSCs: mean=5.44±2.62, median=5.5; SAR: mean=39.98±15.19, median=39.5). The results are summarized in Table 1.

DISCUSSION

The observed relapse rate in this prospective study was 37%. An earlier report from this study's group[5], which assessed relapse through retrospective chart review, found that 52% of this study cohort had new smooth-surface caries lesions within 4 to 6 months post dental surgery. Similarly, Eidelman and colleagues[6] in a retrospective chart review, reported that 57% of their study cohort who were treated under general anesthesia or sedation required treatment for new caries lesions within 6 to 24 months following dental surgery.

Another retrospective study[7] of 42 children with ECC treated under general anesthesia at the Franciscan Children's Hospital and Rehabilitation Center in Boston reported that 45% relapsed by the end of 12 months post dental surgery. Sheehy and coworkers,[8] utilizing a telephone survey, found that 23% of children treated for ECC under general anesthesia required restorations or extractions following initial dental surgery. Given the potential morbidity (eg, the adverse effects of general anesthesia, sedation, physical restraint) associated with the treatment of relapse, these reports indicate that the current standard of care for ECC results in less-than-optimal clinical outcomes.

The R and NR groups both had the same caries pattern at the study's inception. In addition, data reported elsewhere[2] indicated that the difference in the preoperative median mutans streptococci (MS) level in saliva for the R and NR groups was not statistically significant. Accordingly, this information indicates that both R and NR groups were characterized by similar caries risk at the study's inception. As dental surgery has minimal impact on oral reservoirs of MS in the ECC setting,[2,3] it seemed that patients with more SAR for new decay post dental surgery would also be at increased risk for relapse. Utilizing the same logic, it was predicted that patients who had more SSCs placed would have fewer SAR for caries development and, therefore, would be at decreased risk for relapse.

Contrary to the anticipated outcomes, there was no significant relationship between SAR and relapse or the number of SSCs placed and relapse. The implication of this finding is that, even with an aggressive dental surgery approach, the risk for relapse remains high (37%). On this basis, it becomes clear that dental surgery in and of itself results in less-than-optimal clinical outcomes for children treated for ECC. Improvements in clinical outcomes are likely to be realized when treatment strategies address the infectious nature of this disease. In particular, treatment protocols that target the prime microbial culprit associated with ECC (MS) appear promising.

In this regard, a recent pilot study[10] demonstrated that a single topical application of 10% povidone iodine to the dentition of children treated for ECC resulted in statistically significant suppression of oral MS levels for up to 3 months post dental surgery. Accordingly, antimicrobial treatment that targets MS in combination with aggressive preventive protocols may be a likely venue to improve clinical outcomes.

CONCLUSIONS

Based on this study's results, the following conclusions can be made:

1. Clinical outcomes for treatment of ECC are not optimal.
2. Aggressive dental surgery for ECC does not result in acceptable clinical outcomes.

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