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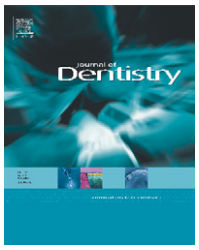

Comparison of dental health in sealed and non-sealed first permanent molars: 7 years follow-up in practice-based dentistry

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ABSTRACT

Objectives: The use of digital dental records enables the retrospective analysis of the effectiveness of the fissure sealants applied in everyday dental practice. We tested the hypothesis that sealant treatment of first permanent molars results in a diminished need for restorative treatment in sealant treated teeth compared to their non-sealed counterpairs tested in a ''practice-based research'' (PBR) protocol.

Methods: Kaplan–Meier survival analysis was used to estimate the survival of first permanent molars caries-free, either sealed or non-sealed, for children attending two health centers in Finland (Kemi and Vantaa).

Results: Non-sealed teeth were restored approximately 50% more frequently compared to their sealed counterparts in Vantaa. In Kemi, however the survival of non-sealed teeth was even greater compared to sealed teeth. This was thought to be due to successful targeting of selective sealant treatment to real high caries risk teeth in Kemi whereas in Vantaa the strategy was to seal all molars routinely.

Conclusions: The results suggest that the use of fissure sealant treatment routinely, without caries risk determination, is not the treatment of choice in preventing dental restorations but it effectively reduces caries rates in real-life conditions.

1. Introduction

Survival analysis needs independent data which is not possible to reach inside the oral cavity where the caries susceptibility of different tooth or teeth surfaces is different.[1] Therefore, we chose the subject-specific approach in our previous study[2] where the subjects were divided retrospectively into all sealed, non-sealed and partly sealed subpopulations basing on the sealant treatment status of their first permanent molars at 6–7 years of age. We concluded that sealing all four permanent first molars, rather than some of them, in high caries risk subjects remarkably prevents caries incidence. Leaving unsealed the first molars of caries resistant subjects enable to decrease unnecessary sealant treatment by focusing it especially to those benefiting it. This observation is in line with another recent study.[3]

The great number of articles of the effectiveness of fissure sealants (more than 190 in PubMed Library) is generally conducted on different age cohorts and the comparisons are

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performed between sealed and non-sealed teeth. In clinical trials the tooth-specific approach is dominating. Clinical trials are conducted using an evidence-based dentistry (EBD) fashion but when survival analysis is used, it needs statistically independent data for the comparisons between sealed and non-sealed teeth. The independence problem has been solved so that either each tooth is compared to its counterpart in another subject only[1] or can also be treated by modern statistical means.[4]

The studies basing on EBD have a limited value in general dental practice because no calibrated dentists are working in primary dental care. The standardized application of sealants and the calibrated examination of caries are therefore impossible to reach in practice. Today scientific approaches have also an ethical obstacle: control teeth or subjects could not be selected beforehand for the study because of the presumed effectiveness of sealants and the assumption that depriving a patient of a sealant might disadvantage them for the sake of a study. Thus, we may raise the question: is it really important to know if fissure sealing is effective when highly standardized application methods are conducted by skillful operators and the outcome analyzed by calibrated examiners? Does this show that caries prevention by sealants works in real-life conditions?

We developed a data-mining system for data collection from electronic dental records and used it in two health centers in Finland.[5] In this study the data were used for survival analysis of the effectiveness of sealant treatment and for timing of restorative procedures in sealed versus non-sealed teeth. Our null hypothesis was that sealing of first permanent molars results in less restorative treatment need in these teeth compared to their non-sealed counterparts, i.e. the same anatomical tooth in another subject. The aim is to bridge the gap between the earlier subject-specific[2] and the present tooth-specific approaches for making comparisons of the effectiveness of sealant treatments as versatile as possible.

2. Material and methods

This study is based on the same dataset of two health centers in Finland, Vantaa and Kemi, as described in detail earlier.[2] The Committee of Ethics of the University Hospital of Oulu granted the permission to conduct this study in both health centers.

In Finland children can get free municipal dental care up to 18 years of age. The most of the children (over 99%) attend for dental treatment to health centers where the systematic caries prevention program for children and adolescents consist of regular examinations. The interval of examinations on the early 1990s was 1 year in both health centers; thereafter it was based on a clinical determination of the individual caries risk of subjects, interval varying from 1 to 3 years. Almost 70% of the age cohort was examined once a year. Preventive care included diet counselling, education of children and their parents on the importance of good oral hygiene and recommendations to use fluoridated toothpaste.

Nevertheless, there were some principal differences between treatment lines in these two health centers. In Kemi the system was based on caries risk strategy: children were classified as high caries risk subjects at the age of 2 years once they were clinically evaluated and had signs of dental caries and high *Streptococcus mutans* level in saliva (or in dental plaque), which was determined by a chair side dip slide test (Dentocult SM, Orion Diagnostica, Espoo, Finland). Supervised xylitol chewing gum was delivered once a day in day care centers and thereafter at elementary schools. The recommendation was made to the parents to give xylitol chewing gum to their children after every meal. The application of sealants was performed by dentists and oral hygienists and the fissures of permanent molars of all high caries risk children were sealed and low-risk subjects were left unsealed. The decision to seal or not to seal the tooth was always made by dentist and it was based on individual caries risk of children.

In Vantaa the strategy of routine sealing of all first molars soon after their eruption without caries risk determination was followed. The sealing procedure was performed mainly by dental hygienists.

Application of resin-sealant (Delton, Light Curing Clear, Dentsply De Trey, Germany) was performed in both health centers.

The observations made during dental examinations by dentists were recorded in standard electronic patient records at the surface level of each tooth: sealant treatment, enamel/dentin caries and restorations. The dates and codes of this information and treatment procedures were complied into an intermediate file for analysis.

The age of subjects and the dates of examination, sealing procedures and restorative treatment were recorded with an accuracy of 1 day. The dates of caries onsets were interval censored to have occurred at the first examination following the diagnosed event. The criterion for restorative treatment due to caries was the decision of a dentist to restore the lesion, normally when caries had reached dentin. Enamel caries was followed or treated by non-operative preventive methods including the sealing of occlusal fissures. Restorations and sealant treatments were complied from the progress notes. Restorations placed due to crown fractures and resealing procedures were excluded from this analysis.

Right censoring was used for the teeth which were sound at the end of the follow-up.

Standard survival analysis techniques using SAS statistical software program were conducted to evaluate the survival probability of the first permanent molar from the birth of the subject to the first sealant treatment or restoration due to caries. Survival of first molars was defined as the time during which the tooth survived without any caries or restorative treatment. The incidence of sealant treatment during the follow-up period was drawn starting at 0% at the origin. Kaplan–Meier curves were drawn to represent survival times in sealed and non-sealed teeth. Comparisons were made between the tooth pairs using simple descriptive statistics (log-rank test). A p-value of less than 0.05 was taken to indicate statistical significance.

3. Results

Sealant placement on the first permanent molars started at about 6 years of age of the subject, soon after the tooth