Arresting early childhood caries using silver and fluoride products - A randomized trial

Judy Lam

Section 2B

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Summary of the article

Sherry Shiqian Gao, Kitty Jieyi Chen, Duangporn Duangthip, et al. carried out a randomized trial on a group of three-year-old children with active cavitated carious lesions, to test the effectiveness of semi-annual applications of silver and fluoride products in arresting early childhood caries. This study took place at the Faculty of Dentistry, The University of Hong Kong, Hong Kong, China and it was published in the *Journal of Dentistry* in December 2020 (https://pubmed.ncbi.nlm.nih.gov/33166594/).

1,070 children were recruited from 29 local kindergartens, and 535 children were assigned to each group; Group A received semi-annual applications of 25% AgNO3 solution followed by 5% NaF varnish on carious lesions and Group B received semi-annual applications of 38% silver diamine fluoride solution followed by a placebo varnish. Children who were recruited were generally healthy, had parental consent, and had at least one untreated active denting carious lesion. This trial was designed to investigate whether one treatment is at least as effective as the existing treatment, creating an ethical conflict, because this enabled the control group to receive effective treatment.

The authors concluded that 25% AgNO3 solution followed by 5% NaF varnish is as effective as 28% SDF solution in arresting early childhood caries. Both treatment protocols are simple, inexpensive, and non-invasive, making them favorable for managing and arresting ECC in young children.

Article Information

The article, *Arresting early childhood caries using silver and fluoride products - A randomized trial*, was written by Sherry Shiqian Gao, Kitty Jieyi Chen, Duangporn Duangthip, et al. This article was published in December 2020 in the *Journal of Dentistry,* https://www.sciencedirect.com/science/article/pii/S0300571220302694. The abstract can be found in *Pubmed*, https://pubmed.ncbi.nlm.nih.gov/33166594/. The authors mentioned that the participants' caries risk, snack intake, and location of these carious lesions can affect the results of caries arrest.

Study Analysis:

Type of Study

This type of study is a randomized control trial, specifically a parallel trial design. The participants in the parallel trial design are randomly allocated to different treatment groups, each receiving a different treatment. In this case, group A received the semi-annual applications of 25% AgNO3 solution followed by 5% NaF varnish on carious lesions and group B received the semi-annual applications of 38% silver diamine fluoride solution followed by a placebo varnish. This study was conducted at the Faculty of Dentistry, The University of Hong Kong, Hong Kong, China, and the trial protocol was published in 2015.

Study Purpose

The authors conducted this study to assess the efficacy of two different dental treatments, silver diamine fluoride (SDF) solution, and fluoride varnish, to arrest early childhood caries (ECC) in primary teeth. This study compared the clinical value of these two treatments across a 12-month period, evaluating the side effects and acceptability of these interventions among young children. The authors also investigated the risk factors associated with early childhood caries and its progression.

Existing evidence suggests that SDF and fluoride varnish could be effective at arresting ECC in primary teeth. However, the research comparing the efficacy of these two treatments over a long period of time is limited. This study is able to provide important information on the clinical effectiveness of SDF and fluoride varnish in arresting ECC over a 12-month period. Additionally, this study also evaluates the risk factors and progression associated with ECC among young children. With these findings, dental providers can use this to develop or come up with the best possible preventative treatment for ECC.

Experimental Design

The authors conducted a randomized controlled trial with 5,167 3-year-old children. The participants were selected based on their health status, parental consent, and had at least one untreated active denting carious lesion, reducing the sample size to 1,070 participants. The 1,070 participants were classified into two strata based on the number of decayed, missing, and filled tooth surfaces (dmfs): strata 1 included children with 1-3 dmfs and strata 2 included children with more than 3 dmfs. Then, children in each stratum would be placed into the intervention

groups using computer-generated random numbers with a block size of 8. The numbers were generated by an independent statistician and an independent assistant carried out the randomized distribution procedure. The trained dentist, participants, and their guardians were all blinded to the distribution procedure. This study had two intervention groups: group A received the semi-annual applications of 25% AgNO3 solution followed by 5% NaF varnish on carious lesions and Group B, which was the active control group, received the semi-annual applications of 38% silver diamine fluoride solution followed by a placebo varnish. The two groups were observed for a period of 12 months; baseline, 6 months, and 12 months after treatment. Some measures the researchers evaluated were through dental examinations performed by a trained dentist at the baseline and all follow-ups; the International Caries Detection and Assessment System (ICDAS) to evaluate the severity of caries lesions, number of new carious lesions developed during the trial, changes in plaque and gingival indices using the Silness and Loe plaque and gingival index, and adverse effects of treatment recorded by the researches.

The researchers conducted a thorough statistical analysis of their findings. To ensure the accuracy of the data, they utilized various methods such as independent t-tests, chi-square tests, and logistic regression analysis using generalized estimating equations (GEE). They also employed the intention to treat (ITT) approach and the last observation carried forward (LOCF) method to handle missing data. The team calculated the mean number of arrested decayed surfaces (ds) and compared Group A with Group B by utilizing the lower limit of the 95% confidence interval (CI) for the difference in the mean number of arrested ds. All tests were set at a level of statistical significance of 0.05. The researchers used some level of calibration to ensure consistency and reliability of the exams and diagnosis of carious lesions, like Cohen's Kappa value for duplicated examinations.

Results

At the baseline of this trial, 1,070 participants were recruited, 535 participants in each group. The researchers added that there was a dropout rate after 30 months, which was 16% in Group A and 19% in Group B respectively, with a p-value of 0.263; this is mainly due to rejection, leaving the study, or being uncooperative. The means dmfs scores for Group A and Group B were 5.87±6.26 and 5.96±6.11 respectively, with a p-value of 0.828. At the 30-month

follow-up, the mean arrested decayed surfaces (ds) scores for Group A and Group B were 3.65±3.62 and 3.56±3.69 respectively, with a p-value of 0.694. The ratio of arresting caries to newly developed dmfs was significantly negative, 0.835, $p < 0.001$, while the ratio of surfaces of the tooth to caries activity was significantly positive, $p < 0.001$. There were no significant differences between Group A and Group B for caries arrest rates, number of new carious lesions, and changes in plaque and gingival indices. Carious lesions were more likely to be arrested on the anterior teeth and buccal surfaces of the teeth. Children who had a daily intake of snacks had a lower caries arrest rate, $p = 0.003$. The Kaplan-Meier survival analysis showed that the time for caries to arrest was shorter in Group A than in Group B.

Conclusion

Based on the findings and results, the authors concluded that the semi-annual application of 25% AgNO3 followed by 5% NaF varnish is as effective as the semi-application of 38% SDF solution in arresting ECC. This trial highlights that caries arrests are based on the participants' caries risk, snack intake, and location of the lesion; these factors contribute to determining the best intervention to manage ECC. The authors' findings contribute to the knowledge of this trial, by using straightforward, non-invasive, and economical treatment to treat ECC in young children.

There was a discrepancy where the authors didn't provide clear requirements for further studies but did identify the limitations of this trial. The low estimation of caries arrest efficacy may have been caused by the input of missing data in the six-month interval between examinations and the use of the last observation carried forward (LOCF) method.

Overall, silver and fluoride products are favorable in managing ECC in young children, due to their effectiveness, availability, and affordability; especially in certain circumstances where major dental treatments are not an option for some people.

Your Impression

I think this study is important in the dental hygiene field because ECC is a serious health concern among young children, especially those who have trouble accessing the right care. ECC can cause negative health consequences like a toothache or tooth loss. For that reason, finding a preventative treatment that is effective, available, and affordable in treating ECC is significant.

Using research like this article, encourages dental providers, like dental hygienists, to educate parents about the importance of detecting carious lesions early on and promote the use of silver and fluoride on these lesions to arrest caries activity. Silver and fluoride varnish is also great for low-income communities who have limited access to care, as they are not intrusive and affordable in preventing the progression of caries among young children.

After learning from this article, there was some information that I wish the authors would elaborate more on: did the participants keep good oral hygiene at home? How were they brushing? What kind of dentifrice do they use? What type of snacks did the participants' intake? I also want to know if this trial study can be done with children in different countries who have different cultural, economic, and social backgrounds and if there are other studies that look into silver and fluoride varnish on carious lesions in adults.