

# IS PROFESSIONAL TOPICAL FLUORIDE APPLICATION EFFECTIVE IN THE TREATMENT OF INCIPIENT DENTAL CARIES LESIONS IN PERMANENT TEETH? A SYSTEMATIC REVIEW

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## 1. INTRODUÇÃO

Dental caries is considered a major public health problem affecting individuals worldwide (KASSEBAUM et al., 2017). Carious lesions become clinically visible as white spot lesions (WSLs) when enough mineral amount is lost. This initial phase is clinically relevant in the carious process since it is the stage that the lesion can be arrested or even reversed by modifying causal factors or through preventive measures (PITTS et al., 2017). There are some preventive strategies and minimally invasive approaches for the treatment of WSLs available in the literature. One refers to the professional topical fluoride application, which is widely used, not just for prevention, but also for the treatment of incipient carious lesions, through delivery systems that provide fluoride in elevated concentrations to exposed tooth surfaces for a local effect (MARINHO et al., 2015).

The scientific evidence about the effect of topical fluoride products on the prevention of dental caries has been well documented and extensively reviewed, demonstrating the benefits of fluoride agents for caries inhibiting effect. Nevertheless, the evidence about the use of fluorides as a treatment approach for dental caries on permanent dentition is not clear. There are some results published in the literature regarding its remineralizing ability, however, most of them were obtained through in vitro and in situ studies. Although few randomized controlled clinical trials (RCTs) have evaluated the effectiveness of professional topical fluoride application on the treatment of incipient carious lesions in permanent dentition, their results are contrasting. Additionally, a systematic review and meta-analysis aimed to review the evidence about the effectiveness of topical fluorides for treating carious lesions, however, both permanent and deciduous dentition were included in the same analysis (LENZI et al., 2015).

Given the lack of consensus about topical fluoride application for treatment of incipient carious lesions in permanent dentition, this study aimed to perform a systematic review of the literature to investigate the effectiveness of professional topical fluoride application as therapeutic intent of incipient carious lesions in permanent teeth.

## 2. METODOLOGIA

We conducted a systematic review according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis statement (PRISMA). Search strategy was performed based on MeSH terms related to our review question, following the PICO model: (a) P: adults and/or children with permanent teeth; (b) I:



professional topical fluoride application in the treatment of incipient carious lesion; (c) C: tooth brushing (usual home care control), placebo or no intervention; (d) O: reversal of incipient enamel dental caries without cavitation.

All studies included were clinical trials comparing the effectiveness of professional topical fluoride application on treatment of incipient enamel carious lesions in permanent dentition. In vitro and in situ studies, abstracts, observational studies, protocols, studies without abstracts and systematic reviews were excluded. Topical fluoride agent (varnish and gel) applied for the reversal treatment of incipient enamel carious lesions was considered as intervention. For the study to be included, it should have received one of the following treatments as control group: placebo, usual home care (tooth brushing) or just followed up without any intervention. The outcome measure in this review was the reversal of incipient carious lesions which was measured by changes on the lesion's surface on follow-up assessments. Incipient carious lesions were considered as lesions without cavitation restricted to the enamel surface, assessed through objective measures and criteria, such as clinical examination, quantitative light-induced fluorescence (QLF) measurements, laser fluorescence and photographic assessment.

No restrictions on language or publication date were applied on electronic databases search. The electronic search was performed in PubMed, Web of Science, Scopus, BVS, Embase and Cochrane until May 2020. We also searched the grey literature on Google Scholar to identify additional eligible references. The references were managed on EndNote X7 software (Thomson Reuters, New York, NY, USA). Two authors screened titles and abstracts from electronic search independently to identify potentially eligible studies. A third review author moderates any disagreement between other authors. Full texts of articles were read by the same two reviewers, to determine whether they met the inclusion criteria for this review. A spreadsheet (Microsoft Corporation, Redmond, WA, USA) was created for data extraction including the following data: first authors' name, year of publication, country, aim of the study, sample characteristics, study design, type of intervention and comparison, outcomes reported, follow-up assessments and statistical analysis (statistical method and effect measures used, adjustments performed and confounding factors). The same two reviewers extracted the data independently from each study. The third review author moderated any discrepancy.

Two reviewers performed the risk of bias assessment of all included studies independently using the Cochrane recommended tool for assessing the risk of bias in RCTs (RoB 2). Any disagreements were solved by discussion or by the involvement of the third author. This tool has a fixed set of domains that aims to obtain relevant information for assessing risk of bias. Issues in each domain can be judged as "low" or "high" risk of bias or also as "some concerns".

Only descriptive analysis was performed considering results of each study, as considerable variability in methods used to evaluate the professional topical fluoride application on the reversal of incipient enamel carious lesions was found among the included studies. Thus, a meta-analysis was not possible due to the heterogeneity of the results.

### 3. RESULTADOS E DISCUSSÃO

A total of 3,860 articles were selected after electronic searching databases and grey literature to identify additional eligible references. After duplicates removal, 1,908 articles were screened by titles and abstracts and 20 were



selected for full-text reading. Among those, 9 RCTs were included in the systematic review which enrolled a total of 636 participants.

Two RCTs evaluated the outcome through only clinical examination. One addressed the effect of 1.23% APF gel compared to placebo gel on the arrestment of lesions with the DMFS criteria and the other investigated the cariostatic efficacy of 1% neutral NaF gel compared to placebo gel applying the Marthaler criteria. Although studies have evaluated different types of fluoride gel, both have shown no additional benefit from either in treating incipient carious lesions. The studies that evaluated caries lesions through photographic assessment used two different criteria. One study that investigated the effect of 2% neutral NaF gel compared to no treatment, used the WSL area (mm<sup>2</sup>) and mineral content as photographic assessment criteria. The other used an objective measurement to evaluate the effect of 5% NaF varnish in comparison to usual home care oral hygiene. The first concluded that the application of 2% neutral NaF gel 3 times over 10 days was effective in reducing the area and increasing the mineral content of permanent teeth WSLs in children. Conversely, 5% NaF varnish does not appear to be more effective than normal home care for improving the appearance of WSL over 8 weeks.

Laser-induced fluorescence measured with DIAGNOdent pen was used in 3 studies. One study that addressed 5% NaF varnish in comparison to usual home care hygiene also applied a clinical parameter to assess the outcome. This study revealed that the use of varnish associated with twice-daily use of 1000 ppmF toothpaste had no additional beneficial effect in remineralization of post-orthodontic WSLs. Additionally, laser-induced fluorescence was used to assess the effect of 1.23% APF gel compared to a placebo paste and 5% NaF varnish in comparison to a saline solution. These studies revealed that the remineralization effect may be improved with 1.23% APF fluoride gel application and that 5% NaF varnish application is effective in reversing WSLs after orthodontic debonding. In addition, two studies assessed the outcome through quantitative light-induced fluorescence (QLF) measurements. The effect of 5% NaF varnish application compared to a fluoride-free deliquescent toothpaste may induce remineralization after orthodontic therapy. Similarly, 1.5% ammonium fluoride varnish repeated applications compared to professional tooth-cleaning had a favorable effect on the remineralization of WSL.

Five RCTs concluded that topical fluoride application may be effective in reversing incipient enamel carious lesions in permanent teeth, with three of them investigating fluoride varnish use. Hence, fluoride varnish seems to be effective in caries therapy, corroborating with the findings of LENZI et al. (2015). However, these results should be interpreted with caution since different types of control groups were used in the included studies, which may explain the different findings between the articles. Regarding the results of included studies that demonstrated no additional benefits of topical fluoride use, it can be seen that they had applied some source of fluoride to the comparison group, such as tooth brushing with fluoridated dentifrice. Furthermore, other studies in the literature demonstrated that tooth brushing with fluoridated dentifrices can lead to the arrestment of WSLs (PAES LEME et al., 2004). In fact, as has been shown by previous studies, usual home care oral hygiene plays an important role in caries therapy and is sufficient to arrest incipient carious lesions without cavitation, avoiding fluoride overtreatment and reinforcing the relevance of tooth brushing with fluoride dentifrice for caries treatment (BONOW et al., 2013; SINGH et al., 2016).

It is also important to highlight that the main limitation of this systematic review was the considerable heterogeneity found among the included studies, which did not enable to perform a meta-analysis and to draw major conclusions.

#### 4. CONCLUSÕES

This systematic review suggests, based on results of the included studies, that usual home care oral hygiene with fluoride toothpaste may be sufficient to treat incipient carious lesions in permanent dentition, without the need for professional topical fluoride application. However, few clinical studies are addressing the effectiveness of professional topical fluoride application on the treatment of incipient dental carious lesions in permanent dentition. Therefore, more RCTs with higher methodological rigor and standardization on protocols and outcomes are required and should be developed with appropriate analysis to reduce bias and to allow a meta-analysis.

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