

Linking Research to Clinical Practice

Interventions for Alleviation of Dentin Hypersensitivity

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The purpose of Linking Research to Clinical Practice is to present evidence based information to clinical dental hygienists so that they can make informed decisions regarding patient treatment and recommendations. Each issue will feature a different topic area of importance to clinical dental hygienists with A BOTTOM LINE to translate the research findings into clinical application.

Da Rosa WL, Lund RG, Piva E, da Silva AF. The effectiveness of current dentin desensitizing agents used to treat dentin hypersensitivity: a systematic review. *Quintessence Int.* 2013;44(7):535-546.

Objective: Dentin desensitizing agents are used in the treatment of dentin hypersensitivity, which is defined as a painful response in the exposed dentin to stimuli that are thermal, evaporative, tactile, osmotic, or chemical. A systematic review was conducted to analyze the clinical effectiveness of current desensitizers with at least 3 months of follow-up.

Methods: Eight electronic databases were searched: Medline (PubMed), Embase, Lilacs, Ibecs, Web of Science, Scopus, Scielo and The Cochrane Library. Only those clinical trials published from 2000 to 2012 were included.

Results: A total of 3,029 relevant records were identified. After title and abstract examination, 2,645 articles were excluded. A data extraction form was designed and completed by reviewers from the selected studies for a retrospective comparison. From the 99 studies retrieved for detailed review, only 17 had an evaluation time of at least 3 months follow-up and fulfilled the selection criteria.

Conclusion: Cervitec Plus, SE Bond & Protect Liner F, laser, and iontophoresis have shown satisfactory posttreatment results between 3 and 6 months. However, additional clinical trials are warranted to better compare the different types of treatments and their effectiveness in the longer term.

Commentary

Dentin hypersensitivity, clinically depicted as an exaggerated response to stimulation to exposed dentin, is a common concern encountered by dental hygienists. Prevalence estimates vary widely; however, a recent general dental practice-based study of 787 patients attending 37 offices in the northwest U.S. concluded that 1 in 8 patients had dentin hypersensitivity.¹ The condition was more prevalent in younger individuals, age 18 to 44, females and those who had recession or used tooth whitening agents. Perhaps surprisingly, tooth sensitivity was not related to obvious signs of occlusal trauma, noncarious cervical lesions or aggressive toothbrushing. About half of these patients had tried at-home treatments, with 72% reporting short-term relief (less than 6 weeks) or no relief from pain. Only about 1 of 5 patients reported having in-office treatment for dentin hypersensitivity, with 38% of those reporting no pain for 6 months or more. The most common in-office treatments participants had received were fluoride (47.6%), dentin adhesives (9.5%), glutaraldehyde-containing varnish (9.5%) and restorative treatments (9.5%).

Dental hygienists have the responsibility to determine potential sources of tooth sensitivity or pain and to provide treatment or recommend interventions that address the patient's concern about tooth sensitivity or pain. Assessment should include an evaluation of the patient's history, the response to stimulation using tactile, cold, and air, how the hypersensitivity affects the individual's oral health-related quality of life, and the exclusion of other dental and periodontal conditions that might be causing the patient's discomfort.¹ An

awareness of research findings indicating the most effective treatments is essential to assisting the many patients who are seeking relief of the discomfort caused by dentin hypersensitivity.

This study assessed the effects of selected in-office desensitizing treatments with 3 and 6 month follow-up to determine whether long-term relief was achieved. Patients often report an immediate, yet temporary, relief of symptoms that return quickly after treatment and require multiple applications of a desensitizing agent or device. The study was a well-designed systematic review, one of the highest levels of evidence, performed by established standards for such reviews.² A systematic review is a study designed to answer a research question by comprehensively collecting and evaluating published studies. All of the studies that meet pre-established criteria for the highest level of evidence are systematically identified, appraised and summarized according to a precise methodology. For research questions about therapies or preventive strategies, a systematic review or meta-analysis of randomized clinical trials is considered the highest level of evidence. This study included clinical trials without the requirement that randomization was used in the study design; therefore, the investigators did not select only the highest quality of research study. This decision may have been made due to the low number of studies available for inclusion in the review. The study included only in vivo studies (studies of dentin sensitivity in human beings) and excluded in vitro (laboratory) studies. Thus, the methodology was strong, and the focus on long-term effectiveness was desirable.

Of 3,029 studies identified in the initial literature review and screening, only 99 published studies potentially met the criteria for quality required for inclusion. Of those, only 17 evaluated the results of the dentin hypersensitivity treatment at least three months posttreatment. Practitioners should be aware that studies or articles that represent lower levels of evidence are frequently published and seek the highest level of evidence available when making decisions about patient care. This systematic review included studies of the most commonly used in-office treatments for dentin hypersensitivity. Of the 17 studies included, 9 evaluated lasers (NdYag, GaAlAs or Er,Cr:YSGG), 6 assessed a glutaraldehyde-containing varnish (Gluma, Heraeus Dental), 3 evaluated a chlorhexidine and thymol-containing varnish (Cervitec Plus, Ivoclar Vivadent), a 3% potassium oxalate gel (Oxa-Gel, Art-Dent) and/or an adhesive bonding agent (SE Bond and Protect Liner F) and 2 assessed the efficacy of 2% sodium fluoride (NaF) iontophoresis therapy.

Although fluoride varnishes are commonly used for desensitization, the best evidence supports their use for caries prevention in children and adolescents rather than as desensitizing agents. Fluoride varnishes are approved, however, by the FDA for use as a tooth desensitizer.

Findings of this systematic review indicated that there is a need for additional long-term clinical trials to evaluate the effectiveness of in-office desensitizing agents, particularly because these studies used a variety of protocols, making comparison difficult. Some evidence was found to support the efficacy of Cervitec Plus, SE Bond & Protect Liner F, lasers and 2% NaF iontophoresis treatments with effects lasting between 3 months and 6 months.

Talioti E, Hill R, Gillam DG. The Efficacy of Selected Desensitizing OTC Products: A Systematic Review. *ISRN Dent.* 2014;2014:865761.

Objectives: The aim of the present study was to review the published literature in order to identify relevant studies for inclusion and to determine whether there was any evidence on the clinical effectiveness of selected desensitizing toothpastes, calcium sodium phosphosilicate, amorphous calcium phosphate, nanohydroxyapatite and casein phosphopeptide-amorphous calcium phosphate (tooth mousse) on reducing dentine hypersensitivity.

Methods: Following a review of 593 papers identified from searching both electronic databases (PubMed) and hand searching of relevant written journals, only 5 papers were accepted for inclusion.

Results: Analysis of the included studies (3 calcium sodium phosphosilicate and 2 amorphous calcium phosphate) would suggest that there may be some benefit for patients using these products for reducing dentine hypersensitivity. No direct comparative studies were available to assess all these products under the same conditions neither were there any comparative randomised controlled studies that compared at least 2 of these products in determining their effectiveness in treating dentine hypersensitivity.

Conclusions: Due to the small number of included studies, there are limited clinical data to support any claims of clinical efficacy of these OTC products. Further studies are therefore required to determine the efficacy of these products in well-controlled randomized clinical trial studies with a larger sample size.

Commentary

This systematic review was well-designed to meet the criteria established to ensure the transparent and complete reporting of systematic reviews and meta-analyses.² The focus of this review was the effectiveness of over-the-counter (OTC) desensitizing products rather than in-office treatments for dentin hypersensitivity. These authors cited references that previously identified the prevalence of dentin hypersensitivity as high as 74% and indicated that earlier estimates may have underestimated the prevalence or reflected under diagnosis of the condition. A large scale, practice-based study discussed earlier in this article identified the prevalence of dentin hypersensitivity as 12.8%.¹ Although 40% of all subjects in that study reported pain or sensitivity upon presentation, the prevalence of dentin hypersensitivity was found to be lower after clinical examination and diagnosis. Diagnosis is often based on elimination of other potential causes, rather than by the patient's self-report. Difficulties in successfully treating dentin hypersensitivity may be related to inadequate assessment of other causes such as cracked tooth syndrome, incorrect placement of dentin adhesives, fractured restorations, pulpal response to caries/restorations, chipped teeth causing exposed dentin. Differences in reported prevalence underscores the importance of a comprehensive assessment of each patient's reported pain or sensitivity and identification of the etiology prior to selecting an in-office or at-home intervention for dentin hypersensitivity.

This systematic review, designed to assess the efficacy of selected OTC desensitizing products for at-home use, included only double-blinded, randomized clinical trials with placebo controls, the highest quality of clinical studies available. The duration of studies included was at least 6 weeks; therefore, it was not designed to assess long-term effects. Studies included followed the Holland et al. guidelines established in 1997 to enable investigators to compare studies with similar methodologies for evaluating a desensitizing agent. Only studies evaluating the effect of toothpastes containing calcium sodium phosphosilicate (Novamin®), amorphous calcium phosphate, nanohydroxyapatite and casein phosphopeptide-amorphous calcium phosphate (tooth mousse) were included. Despite the fact that some stannous fluoride (SnF₂) dentifrices have the American Dental Association (ADA) Seal of Acceptance for safety and efficacy as desensitizing products, SnF₂ toothpastes were not evaluated in this systematic review. Another systematic review recently found some evidence to support the effectiveness of arginine-containing desensitizing toothpastes; however, of 18 studies included, 16 assessed short-term relief (immediate to 8 weeks).³ Additional studies are needed to determine long-term effectiveness

and arginine-containing toothpastes are not readily available in the U.S.

A literature search and screening resulted in 593 studies that were potentially relevant to this review. Of those, 57 were determined to be relevant and appraised for inclusion based on the eligibility criteria. After careful review by 2 investigators, only 5 randomized clinical trials could be included: 3 calcium sodium phosphosilicate, 2 amorphous calcium phosphate, 0 nanohydroxyapatite and 0 casein phosphopeptide-amorphous calcium phosphate/tooth mousse papers. The requirement for placebo controls was restrictive; however, it did ensure inclusion of the highest quality of studies available.

The small number of studies eligible for this systematic review limited the ability to draw definitive conclusions. CSPA and ACP desensitizing toothpastes may have some effect on alleviating dentin hypersensitivity, although further study is required. No conclusions can be drawn about HAP or CPP-ACP desensitizing products because none of the related clinical trials met criteria for inclusion. There is a lack of high-quality evidence comparing various OTC desensitizing agents and a need for additional RCTs meeting the Holland et al. guidelines to determine effectiveness of these products. This lack of evidence or inadequate assessment prior to diagnosis might explain the finding indicating that nearly 3 of 4 patients who had tried at-home desensitizing interventions reported only short-term or no relief of pain.¹

The Bottom Line

These studies addressed the effectiveness of OTC and in-office interventions for dentin hypersensitivity, a common condition. The findings and conclusions of both studies indicate a need for additional well-designed randomized clinical trials evaluating the effectiveness of these products and therapies. Studies comparing different products also would strengthen the evidence available for clinician's to make the best decisions for their patients. Based on the findings of one or both of these studies, the following conclusions are drawn:

- Before selecting any in-office treatment or recommending an OTC product for patients who report tooth pain, a comprehensive assessment, including an interview to determine the patient's history, a careful clinical examination, identification of etiological factors, and elimination of other possible causes, is indicated.
- 72% of patients report only short-term relief or no relief from pain following use of OTC desensitizing products, and 38% of patients who have had in-office treatments report being pain free

for 6 months or more. While in-office treatments appear to have better outcomes than OTC toothpastes, neither intervention has long-term benefits for the majority of patients. Poor outcomes may be related to inadequate examination and diagnosis.

- The in-office treatments with the best evidence supporting satisfactory posttreatment results between 3 and 6 months include Cervitec Plus, SE Bond & Protect Liner F, laser, and NaF iontophoresis; however, further study of these interventions and others is indicated.
- Although commonly used, fluoride varnishes were not included in this review. Evidence supports fluoride varnishes for prevention of caries in high risk children and adolescents rather than as a desensitizing treatment, although the FDA approves use of fluoride varnish for desensitization.
- When recommending products for at-home use, dental hygienists should review the active ingredients and be aware that there is a paucity of evidence supporting long-term effectiveness of most OTC desensitizing toothpastes. Although some SnF₂ dentifrices have the ADA Seal of Acceptance as safe and effective desensitizing products, they were not evaluated in this systematic review. Of the selected OTC products reviewed, desensitizing toothpastes containing calcium sodium phosphosilicate and amorphous calcium phosphate may have some effect on alleviating dentin hypersensitivity. Further study is required.
- There is a lack of strong evidence, based on this systematic review, to support recommendations for nanohydroxyapatite or casein phosphopeptide-amorphous calcium phosphate desensitizing products because none of the related clinical trials met criteria for inclusion.
- Dental hygienists need to continue to monitor research results related to desensitizing interventions giving particular attention to results of randomized clinical trials with placebo controls, sound measures of tooth sensitivity, and results lasting at least 3 months posttreatment.

Summary

Dental hygienists have the opportunity to provide a comprehensive assessment of dentin hypersensitivity, a common concern of patients. Once other potential causes are eliminated, an

intervention may be considered. In-office treatments that have some evidence supporting their long-term effectiveness include Cervitec Plus, SE Bond & Protect Liner F, laser, and NaF iontophoresis; however, no treatments work for all individuals experiencing pain. OTC desensitizing products lack strong evidence to support their use, although some stannous fluoride dentifrices have the ADA Seal of Acceptance for safety and efficacy. Other toothpastes that may alleviate symptoms are those with CSPA and ACP, although further study is needed. Dental hygienists need to be aware of active ingredients in the desensitizing interventions they use and recommend and continue to read related research regarding these interventions in order to make evidence-based recommendations for their patients.

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