to patients, and mineral islands on the lesion surface may be susceptible to further demineralization of the infiltrated areas at the base of the lesion.

Adhesives may be useful as proximal lesion sealants. However, the application of dental adhesives requires 2 visits, whereas resin infiltration requires just 1. A bonding agent used before resin infiltration or resin sealant has not increased resin penetration depth.

Ideally, resin infiltration materials should be low-viscosity monomers that can both infiltrate caries lesions at depth and form a thick film to resist degradation outside the lesion. Lower viscosity infiltrants may be better for deeper infiltration, but the viscosity of the monomer is inversely proportional to the oxygen inhibition of polymerizing monomers. New resin infiltrants should be tested with fillers that remain on the surface. This increases the resin's properties and allows residual resin to infiltrate the lesions' deeper layers. This synthesis appears to be perfect for infiltration.

Ntovas P, Rahiotis C: A clinical guideline for caries infiltration of proximal enamel lesions with resins. *Br Dent J* 225:299-304, 2018

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Remineralization induction

BACKGROUND

In dental remineralization, minerals are gathered from the surrounding environment into partially demineralized tooth structures to replace minerals that have been lost or create amorphous mineral precipitates in the intercrystal and interred spaces. This can be a natural process or one that is induced by various therapies. Fluoride-based treatments are well-known to induce remineralization and reduce dental caries. Some individuals cannot use fluoride products, however, and the effect of fluoride in reducing dental caries prevalence is plateauing at the population level. New approaches have been developed, most to augment existing fluoride therapies.

METHODS

The PubMed database was searched to identify published data and other sources. In addition, ClinicalTrials.gov and google.com were searched to obtain registered randomized controlled trials (RCTs). The evidence found in the search was analyzed and summarized to offer an up-to-date report on the evidence gathered for remineralization therapies. The primary new approaches identified involved compounds increasing mineral saturation, biofilm modifiers, herbal compounds, and self-assembling peptides.

RESULTS

Mineral Saturation Increasing Compounds

Fluoride

Fluoride (F) treatments remain the primary therapy for remineralizing caries lesions because of their clinical effectiveness in arresting caries lesions. The F is delivered via toothpastes, gels, mouth rinses, and varnishes. The effects are dose-related, with toothpastes with 5000-ppm F more efficacious for remineralizing root caries lesions than those with 1000- to 1500-ppm F. However, current evidence of a superior benefit for remineralizing enamel lesions for these higher-dose dentifrices remains elusive. Thus the higher concentrations of F should not be recommended indiscriminately for patients with active lesions. Other formulations have provided preventive effects on lesion formation but not necessarily an ability to remineralize lesions.

Some metals have been combined with F to enhance its antimicrobial effects. Among these are silver diamine F (SDF), silver nitrate, and stannous F. SDF therapy is highly effective for remineralizing coronal and root surface lesions. Silver nitrate has been suggested as an alternative in countries where SDF is unavailable. Stannous F has the potential to interfere with biofilm formation and alter demineralization/remineralization processes. Tin also offers acid resistance, but this could interfere with remineralization. Further evidence is required before these agents can be recommended.

Calcium and Phosphate-Based Systems

Casein phosphopeptide–amorphous calcium phosphate (CPP-ACP) is a stabilized system of calcium phosphate with significant remineralizing ability. However, studies have had short durations, conflicting results, and concentrated on fluorescence changes in lesions after orthodontics as an outcome, making them unacceptable as remineralization measures. F has also been added to CPP-ACP (CPP-ACPF) to increase its remineralization efficacy. However, there is insufficient evidence that adding F to CPP-ACP increases its efficacy. Functionalized β-tricalcium phosphate (fTCP) is designed to protect calcium from prematurely interacting with ionic F and can act as a low-dose delivery system. No recent data indicating its remineralizing ability are available, but clinical studies are ongoing.

Bioactive glass containing calcium sodium phosphosilicate (CSPS) and sodium trimetaphosphate (TMP) are also suggested as agents to induce remineralization. However, as with the other calcium phosphate–based systems, none of these agents have been

consistently superior to products with F, so they cannot be recommended as replacements for the regular use of F products.

Biofilm Modifiers

Arginine

The clinical trials of arginine show that it has a clear potential to significantly increase the performance of toothpaste with F alone. Final recommendations for the use of this agent await confirmation by high-quality, long-term studies lacking bias.

Triclosan

Triclosan offers antibacterial power that may alter biofilm acid production, leading to higher saturation and resulting in better remineralization. Adding triclosan to dentifrices may produce modest but statistically significant reductions of coronal and root caries in children and adults. Studies are underway to verify the usefulness of triclosan-loaded dendrimers.

Xylitol

Antimicrobial and potentially anticaries effects have been attributed to the naturally occurring sugar alcohol xylitol. Data on its ability to remineralize is sparse, however, Sugar-free chewing gum containing 36% xylitol and 32% sorbitol can remineralize enamel lesions, but there is insufficient evidence to fully evaluate these remineralization abilities.

Herbal Compounds

Depending on the specific compounds involved, herbal compounds may be able to affect mineral saturation and precipitation, act as antimicrobial agents, or stabilize collagen, which may function as a scaffold for mineral deposition. A synergistic effect between proanthocyanidins and calcium phosphate–based materials may affect the remineralization of artificial root caries in vitro, but in situ and in vivo studies are required for confirmation.

Self-Assembling Peptides

A biomimetic technology has been developed to promote faster remineralization. The introduction of monomeric low-viscosity peptide solutions into enamel lesions has been able to create scaffolds that can promote remineralization. Although some in vitro and laboratory data show this remineralization potential, the results of ongoing clinical trials are needed to confirm or refute the potential of this technology.

STRATEGIES OF NEW REMINERALIZING AGENTS

Significant progress has been made in the development of remineralizing strategies. Most prolong the mineral supersaturation periods by creating stable systems that supply bioavailable calcium, phosphate, and F directly to the lesion or the biofilm. It's challenging to develop a system that can deliver the right concentration of minerals at the right time and avoid unwanted surface precipitation. Some agents promote environmental changes around lesions or create scaffolds to which minerals can cling. Finally, a new iontophoresis technology can accelerate the flow of mineral ions into deeper areas of demineralized enamel. Although early results seem promising, more study of this method's remineralization potential is needed.

Clinical Significance

Studies are needed to assess the efficacy and effectiveness of newer therapies to induce remineralization. Various populations should be included in these investigations, along with lesions in different surfaces. Only with such studies can the remineralization of carious lesions move forward.

González-Cabezas C, Fernández CE: Recent advances in remineralization therapies for caries lesions. *Adv Dent Res* 29:55-59, 2018

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ORAL SURGERY

Autotransplantation

BACKGROUND

Dental autotransplantation can be described as the extraction of a tooth to be implanted in another site in the individual's oral cavity. With the widespread use of implants, this option is often overlooked but has some applicability, especially in pediatric patients. However, the principles of autotransplantation and guidelines for its use have not been defined, so an evidence-based approach was taken to define best practices for this technique.

METHODS

The databases of the Cochrane Library, PubMed, and CINAHL, along with trial registers, professional body publications, and