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RISK-ADAPTED REMINERALIZING AND ANTI-EROSIVE PREVENTION OF DENTAL EROSION IN PATIENTS WITH GASTROESOPHAGEAL REFLUX DISEASE: A LITERATURE REVIEW

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Relevance. Gastroesophageal reflux disease (GERD) is an important intrinsic risk factor for erosive tooth wear (ETW). Repeated contact of dental hard tissues with gastric contents may lead to progressive mineral loss, while the severity and rate of tissue damage are additionally influenced by salivary protection, dietary habits, oral hygiene behavior, medication use, and other individual factors. Meta-analytic evidence demonstrates that dental erosion occurs substantially more frequently in patients with GERD than in control populations [1].

Prevention is particularly important because erosive loss of dental hard tissues is irreversible. Contemporary recommendations emphasize early recognition of erosive changes, identification and control of etiological factors, reduction of acid exposure, and implementation of preventive measures before extensive restorative treatment becomes necessary [2,3].

However, patients with GERD do not have an identical level of dental risk. Differences in reflux severity, baseline erosive damage, salivary characteristics, diet, behavioral factors, and exposure to additional acids suggest that a uniform preventive protocol may be less appropriate than an individualized approach. Therefore, risk-adapted remineralizing and anti-erosive prevention represents a relevant direction for both clinical dentistry and prospective research.

Keywords: c

Aim. To analyze current evidence on remineralizing and anti-erosive preventive strategies for dental erosion and to evaluate the scientific rationale for their risk-adapted use in patients with GERD.

Materials and Methods. A narrative literature review was performed. Systematic reviews, meta-analyses, consensus statements, clinical guidelines, and relevant clinical or experimental studies addressing GERD-associated dental erosion, anti-erosive dentifrices, fluoride compounds, calcium-containing agents, BEWE, and preventive management of erosive tooth wear were analyzed. Priority was given to recent high-level evidence, while earlier consensus and methodological publications were retained when they provided fundamental principles for diagnosis, risk assessment, or prevention. The review focused on the potential relationship between the intensity of preventive measures and the individual risk of erosion progression.

Results and Discussion. The first stage in the prevention of GERD-associated dental erosion is reduction of intrinsic acid exposure. Dental preventive measures cannot fully compensate for recurrent exposure to gastric acid when the underlying gastrointestinal disorder is inadequately controlled. Therefore, interdisciplinary cooperation between dentists and gastroenterologists is important, particularly in patients with frequent regurgitation, nocturnal reflux, or progressive erosive lesions [10].

From the dental perspective, prevention should combine reduction of additional acidic exposures, modification of oral hygiene behavior, support of salivary protection, and use of agents capable of increasing the resistance of enamel and dentin to subsequent acid challenges [2,3].

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Fluoride-containing products represent one of the most extensively studied groups of anti-erosive agents. However, their effectiveness depends considerably on the chemical formulation. A systematic review and meta-analysis by Zanatta et al. demonstrated that fluoride-containing products can reduce enamel loss, although the magnitude of protection varies among different compounds. Stannous-containing fluoride systems showed greater anti-erosive potential than conventional sodium fluoride formulations under several experimental conditions [4].

Trentin et al. reported that stannous fluoride-containing dentifrices may provide greater protection against erosive tooth wear than conventional sodium fluoride formulations. However, the superiority of SnF2-containing products was demonstrated mainly in laboratory studies, and the authors emphasized the limited amount of clinical evidence [5]. Therefore, these findings should not be interpreted as definitive proof of superior long-term clinical efficacy in patients with GERD.

A network meta-analysis published by da Silva et al. in 2022 further showed that polyvalent fluoride compounds, particularly stannous-containing formulations and titanium tetrafluoride, provided greater protection against erosion and erosion-abrasion than non-fluoridated controls and several monovalent fluoride formulations [6]. Nevertheless, much of this evidence originates from in vitro and in situ models.

Recent evidence synthesis also supports a formulation-specific approach. A 2026 umbrella review found that stannous-based and multi-ion fluoride dentifrices demonstrated the most consistent anti-erosive effects, whereas conventional monovalent fluoride formulations generally showed more modest protection [8]. At the same time, the authors noted that the available evidence is still dominated by laboratory and short-term experimental studies.

Calcium-based approaches may also contribute to the protection of dental hard tissues. A systematic review and meta-analysis showed that calcium supplementation of acidic beverages may reduce enamel loss, whereas the evidence concerning milk and CPP-ACP-containing products was heterogeneous [7]. Importantly, these findings were not specific to patients with GERD and therefore should not be interpreted as direct evidence of clinical efficacy in GERD-associated dental erosion.

Thus, "remineralizing prevention" should not be considered a single intervention. Fluoride compounds, calcium-containing agents, salivary protective mechanisms, and behavioral measures act through different mechanisms and are supported by different levels of evidence. For this reason, preventive strategy should be selected according to both the patient's clinical risk profile and the strength of evidence supporting a particular intervention.

Risk-Adapted Preventive Approach. BEWE provides a standardized assessment of the current severity of erosive tooth wear [11]. However, existing tissue loss should not be considered equivalent to future progression risk. Contemporary recommendations emphasize that reflux, vomiting, diet, medication use, salivary function, and other etiological factors should be assessed together with the clinical severity of lesions [2].

A conceptual risk-adapted framework may therefore include different levels of preventive intensity. Patients with relatively low risk may benefit from correction of acidic dietary habits, appropriate oral hygiene recommendations, routine fluoride use, and periodic clinical monitoring. Patients with a higher estimated risk may require more frequent BEWE and photographic monitoring, evaluation of salivary protective factors, and more intensive anti-erosive or remineralizing measures. Patients with progressive lesions, marked reflux exposure, impaired salivary protection, or multiple additional risk factors may require closer interdisciplinary management and intensified professional prevention.

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This framework should be interpreted as a conceptual model rather than a validated GERD-specific clinical algorithm. At present, exact thresholds defining low, moderate, and high progression risk in GERD-associated dental erosion have not been prospectively validated.

Scientific Perspective. The main scientific gap is not simply whether fluoride- or calcium-containing products can reduce erosive mineral loss. A more clinically important question is which preventive strategy should be applied to which patient and according to what objectively determined level of progression risk. At present, evidence supports several anti-erosive interventions, but prospective studies evaluating a GERD-specific, risk-stratified preventive algorithm are lacking. Future research should therefore combine baseline BEWE, standardized photography, GERD severity, salivary pH, buffering capacity, salivary flow, dietary exposure, medications, and behavioral factors.

Longitudinal follow-up could allow identification of independent predictors of erosion progression and development of an integrated risk model. Preventive intensity could then be matched to objectively estimated risk rather than applied uniformly to all patients.

Conclusion. GERD-associated dental erosion requires not only early diagnosis but also individualized preventive management. Current evidence indicates that the anti-erosive effectiveness of preventive agents varies according to their composition. Stannous-containing and multi-ion fluoride formulations generally demonstrate stronger anti-erosive effects than conventional monovalent fluoride products under experimental conditions [4-6,8].

Calcium-based interventions may provide additional protection, although available evidence is heterogeneous and is not specifically derived from GERD populations [7].

A risk-adapted approach integrating baseline BEWE, GERD characteristics, salivary protective factors, and local or behavioral exposures appears scientifically justified. However, a prospectively validated GERD-specific algorithm for differentiated remineralizing and anti-erosive prevention has not yet been established. Development and validation of such an approach represent an important direction for future clinical research.

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