Prevention of dental erosions by rinsing with a calcium solution
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Introduction
Approximately 50% of anorexia nervosa patients practice vomiting/bulimia (Roberts and Tylenda, 1989). While vomiting, gastric juice gets in contact with dental hard tissues causing erosive tooth wear.
Prevalence of erosive tooth wear is up to 98% for patients with eating disorders (Emodi-Perlman et al., 2008). For anorectic patients, a prevalence of 33% was observed (Milosevic and Slade, 1989). In general, irrespective of the type of disorder, these patients have an up to 8.5-times higher risk for developing dental erosions with severe loss of dental hard tissue impairing quality of life drastically (Johansson et al., 2012).
Taking into consideration the finding that solutions being saturated or even supersaturated with tooth minerals (e.g. calcium) showed no erosive effect, it was speculated that erosive softening of dental hard tissues will be reduced, when a higher content of tooth minerals (especially calcium) is present in the oral cavity during the erosive attack.

Objective
To evaluate if rinsing with a mineral containing solution prior to an erosive attack reduces the softening of enamel.

Methods
Twelve volunteers (six female and six male, mean age 33 years) performed in total five runs (series) of the following experiment:
Four enamel samples were worn in an intraoral appliance for 30 min. Afterwards, volunteers rinsed (1 min) their mouths with nothing (series 1, control), elmex erosion protection mouth-rinse (series 2), milk (Haltbare Vollmilch 3,5% Fett; series 3), solution prepared from a calcium effervescent tablet (Calcium Sandoz 500 mg, Sandoz Pharmaceuticals AG, Rotkreuz, Switzerland) dissolved in 100 ml (series 4) or 200 ml (series 5) of water. Afterwards, volunteers rinsed their mouth with Sprite

Zero to simulate an erosive attack. Finally, the microhardness of the enamel samples was measured and hardness loss calculated.
For statistical analysis, the mean Δmicrohardness (mean of final microhardness – microhardness before the experiment of the respective samples in the respective series) were calculated. Mean Δmicrohardness was calculated to evaluate the softening prevention potential of the respective products. The lower the mean Δmicrohardness was, the less the samples were softened and the better the respective product can hamper the erosion induced softening.
For statistical analysis, a mixed-linear model was fitted with Δmicrohardness as target variable, series as explanatory variable, initial hardness as co-variable (to adjust for difference in the initial hardness) and volunteer as random effect. After checking the model assumption, marginal means were calculated on the model and the series were compared pairwise (p-value was Tukey adjusted for multiple comparisons)

Results

The softening (marginal mean; lower confidence level/upper confidence level) of the enamel samples (loss of microhardness) due to the erosive attack was not significant different in the series 1 (no rinsing; control; 50.3; 60.8/40.6), 3 (rinse with milk; 50.7; 60.8/40.6), 4 (rinse with calcium effervescent tablet dissolved in 100 ml of water; 38.7; 48.8/28.6) and 5 (rinse with calcium effervescent tablet dissolved in 200 ml of water; 40.7; 50.8/30.6) ($p > 0.05$, respectively).
Only for series 2 (rinse with elmex erosion protection mouth-rinse) a significant lower softening (25.4; 35.6/15.3) of the enamel due to the erosive attack compared with the softening in the control series (1; no rinsing) could be observed ($p < 0.05$).
No significant difference in the softening in the series 2 (rinse with elmex erosion protection mouth-rinse) and 4 (rinse with calcium effervescent tablet dissolved in 100 ml of water) was observed ($p > 0.05$, respectively).

Conclusion

Within the limitation of the present study it can be concluded that rinsing with elmex erosion protection mouth-rinse before an erosive attack can reduce the erosion induced softening of enamel significantly. However, the rinsing with the above mentioned solution can not totally prohibit the erosive softening.
As in series 4 (rinsing with calcium effervescent tablet dissolved in 100 ml of water) quite promising results were observed, further studies are needed to verify if a higher concentration of calcium (e.g. 1000 mg calcium effervescent tablet dissolved in 100 ml of water) might be able to significantly reduce the erosion induced enamel softening.

References

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