The effect of different remineralizing agents on caries-like lesions – a pilot study

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Introduction

The remineralization of white spot lesions allows for an early treatment of the dental carie with the benefits of being less invasive and more conservative of the dental tissue. These white spot lesions are sub-superficial and they represent the first morphological changes to the enamel, facing the cariogenic challenge, where the intra oral pH is found to be lower than the critical pH of hydroxyapatite, due to the conversion of the lactose and other carbon hydrates into lactic acid by cariogenic bacteria's. If the acid is removed, and if there is a high concentration of phosphate and calcium ions in the saliva, the hydroxyapatite is repaired (Bowen, 2002; Cummins, 2013; Larsen & Pearce, 2003; Oliveira, 2009). However, certain external factors, like fluor, calcium and phosphate ions combined, are capable of remineralization of the enamel (Cochrane *et al*., 2010; Menêses da Silva *et al*., 2012; Cummins, 2013; Li *et al*., 2014). If on one hand, CPP-ACP (Casein Phosphopeptide - Amorphous Calcium Phosphate) has a good adhesion to the bacterial plaque, it acts as a saliva buffer and as a calcium and phosphate repository, leading to an ion supersaturation, on the other hand the fluoridated varnish have a high adhesion to the dental surface and allow the maintenance of the fluor levels.

Therefore, the exploratory investigation resides in understand whether there is a difference in the human enamel microhardness when different remineralization agents are used after artificially inducing of dental carie.

Aim

To quantify the surface microhardness of enamel when using different remineralizing agents, after the induction of artificial dental caries.

Materials and Methods

16 human enamel specimens were randomly submited to a 50mL lactic acid buffer solution with a pH 5 for 6 days (Cardoso et al., 2014), at 37ºC (Jo *et al*., 2014; Magalhães *et al*., 2008; Oliveira *et al*., 2014) for White Spot Artificial Lesion induction (WSAL) – (phase 1). 8 of them, were referred to as control, and the remaining 8 were divided into 4 study groups (Stage 1 treatment). The study groups were: GA (n = 2) *positive control / distilled water*; GB (n=2) *GC Tooth Mousse, Recaldent*™ - CPP-ACP (Casein Phosphopeptide - Amorphous Calcium Phosphate); GC (n = 2) *Clinpro*™ *White Varnish* – 5% sodium fluoride varnish and calcium phosphate (NaF+FC); GD (n = 2) *Profluorid® Varnish* – 5% sodium fluoride varnish (NaF). After the remineralization agent application, all the groups were submitted to a new cicle of demineralization (phase 2). In this cicle, lactic acid was used for a 2h period (Queiroz *et al*., 2008) at 37ºC. After these 2h, every specimens were removed from the acid and washed with destilled water. Then, the specimens were placed in gobelets with artificial saliva at pH 7 for a 22h period at 37ºC (remineralization phase) (Cardoso *et al*., 2014; Queiroz *et al*., 2008), concluding the second phase. In each phase (phase 1 and 2), the Vickers microhardness (HV) was measured using the HSV-30® (Shimadzu) identator (figure 1 and 2). Exploratory and descriptive analysis of the data was performed by SPSS 21.0.

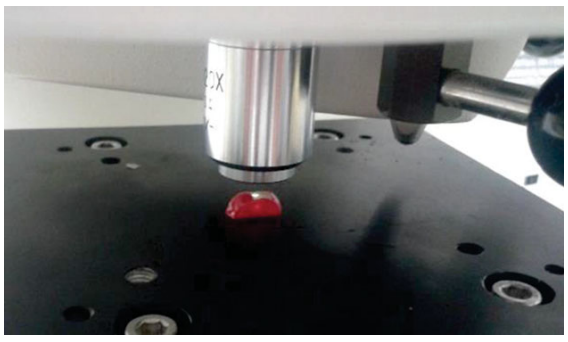

Figure 1. Specimen surface microhardness, by Vickers technique.

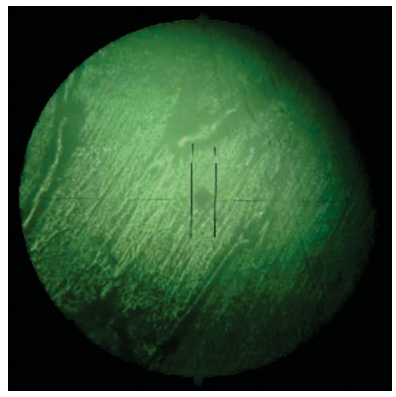

Figure 2. Observed image taken during Vickers surface microhardness test.

Results

WSAL (Phase 1) registered values of 93.99 HV. Step 1 (treatment), obtained values: GA - HV 56.70; GB - 290.00 HV; GC - 136 HV; GD - 224 HV. Phase 2 values: GA - 116.70 HV; GB - 266.80 HV; GC - 261.80 HV; GD - 158.80 HV.

Groups/Study fase	GA (n=2): positive control / distilled water	GB (n=2) GC Tooth Mousse,Recaldent™ - CPP-ACP (Casein Phosphopeptide - Amorphous Calcium Phosphate)	GC (n=2) Clinpro™ White Varnish - 5% Sodium Fluoride and Calcium fosfate varnish (NaF+FC);	GD (n=2) Profluorid® Varnish - 5% Sodium Fluoride (NaF).
Fase 1: WSAL	93,99 HV			
Fase 1: treatment	56,7 HV	290 HV	136 HV	224 HV
Fase 2	116,7 HV	266,8 HV	261,8 HV	158,8 HV

Table 1. Comparative table with surface microhardeness results obtined from each group and phase of the study.

Conclusion

GC Tooth Mousse, Recaldent™ , CPP-ACP (Casein Phosphopeptide - Amorphous Calcium Phosphate) expressed a tendency to increase the microhardness of the enamel surface, in comparison to the fluoride varnish.

Clinical Implications

Early white spot lesions remineralization allows a greater preservation of dental tissue and greater convenience for the patient.

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