

Background

White spot lesions are the early signs of demineralization occurring under intact enamel which may or may not lead to the development of caries. Remineralization includes any repair to the crystal lattice in order to bring about a net mineral gain to the enamel subsurface lesion but it does not involve the precipitation of the solid phases onto the enamel surfaces. A new micro invasive treatment method suggested for the management of white spot lesions is the infiltration of a resin into the lesion. The aim of this invitro study is to compare and evaluate the caries preventive efficacy of a resin infiltrant (ICON), Casein phosphopeptide -Amorphous calcium phosphate (GC Tooth mousse) and Nano-hydroxapatite (Aclaim) on non cavitated enamel lesions.

Materials and methods

60 human maxillary incisors extracted for periodontal reasons were included in this study. The Sectioning was done at the middle third region of the crown for the 60 samples with approximate dimensions of (5x5x5mm). In order to create the artificial enamel lesions, the samples were demineralized by placing in a beaker containing the prepared demineralizing solution for 14 days. The Study samples were then divided into four groups which is Resin infiltrant (Group I), CPP-ACP (Group II), nano-HA (Group III) and control (Group IV) of 15 enamel samples in each group. The caries preventive efficacy of each group were evaluated using confocal laser scanning microscope and Vickers microhardness test for the depth of the penetration and surface microhardness after infiltrating the samples with resin infiltrant and remineralizing the

samples with CPP-ACP, nano-HA for a time period of 30days and also after acid challenge for a period of 14 days.

Statistical analysis

The Data were analyzed using Statistical Package for Social Sciences (SPSS) version 20.0. Measures of central tendency such as mean and measures of dispersion like Standard deviation were calculated for all the parameters tested. The Data collected were statistically analyzed using ANOVA and Post hoc bonferroni test was used for comparing intragroups and Tukey test was used to compare Intergroups.

Results

The mean values after demineralization of enamel samples in demineralizing solution is 245 μm for Group I(Resin infiltrant) , 246 μm for Group II (CPP-ACP), 250 μm for Group III (nano-HA) and 247 μm for Group IV (control). After remineralizing the enamel samples for a period of 30 days, the results are Group I (Resin infiltrant) 158 μm > Group II (CPP-ACP) 28.8 μm \geq Group III (nano-HA) 26.3 μm . After acid challenge for a period of 14 days the amount of material which was resistant to acid attack was Group I (Resin infiltrant) 114 μm (72%) > Group III (CPP-ACP) 16.4 μm (57%) \geq Group III (nano-HA)13.8 μm (50%) . The untreated control group showed increased progression of lesion and least resistance to acid challenge. The p value were 0.993 after demineralization, <0.001 after remineralization and after acid challenge for 14 days when comparison was done between all the four groups. After

Post hoc Tukey inter group comparison Group I showed statistically significant difference which was greater when compared to group II (CPP-ACP) and Group III (nano-HA) where there were no difference.

The mean microhardness after demineralization of enamel samples in Group I (Resin infiltrant) is 226VHN, Group II (CPP-ACP) 222VHN, Group III (nano-HA) (207 VHN, Group IV (Control) 215VHN. The pvalue were 0.143 which was not statistically significant. The mean microhardness value after Remineralization of enamel samples is Group I (Resin infiltrant) 316VHN >Group II (CPP-ACP) 282VHN \geq Group III (nano-HA) 267VHN > Group IV (Control) 218 VHN. The p value were <0.001 when comparing all the four groups. After Post hoc Tukey test there was statistically significant difference between Group I (Resin infiltrant) and other 3 groups. Group II (CPP-ACP) and Group III (nano-HA) showed no significant difference. The mean microhardness value after acid challenge of enamel samples for 14 days is Group I (Resin infiltrant) 292VHN > Group II (CPP-ACP) 254VHN \geq Group III (nano-HA) 237 VHN > Group IV (Control) 167 VHN. The p value was < 0.001 for groups. After Post hoc Tukey test there statistically significant difference between Group I (Resin infiltrant) and other 3 groups. Group II (CPP-ACP) and Group III (nano-HA) showed no significant difference.

Conclusion

Within the limitations of this invitro study it can be concluded that resin infiltrant showed higher caries inhibition potential than CPP-ACP and nano-HA. In addition, resin infiltrant showed superior acid resistance compared to CPP-ACP and nano-HA. It has a promising role in the management of early enamel carious lesion. It can be used as an alternative micro invasive approach.

Keywords

Resin infiltrant, casein phosphopeptide-amorphous calcium phosphate, nanohydroxyapatite, confocal laser scanning microscope, Vickers microhardness test