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SMITH SMITHRITHEE: INVESTIGATION OF THE ENAMEL-SEALANT INTERFACE AFTER Er:YAG LASER TREATMENT: AN IN VITRO SEM STUDY. THESIS ADVISORS: NOPPAKUN VONGSAVAN, Ph.D., SOMSAK CHUKPAIWONG, D.D.S., TASSANEE TENGRUNGSAN, D.D.S., KATKAO VONGSAVAN, D.D.S. 102 P ISBN 974-663-637-1

Er:YAG laser was introduced as a new method for dental hard tissue applications for both tooth preparation and tooth surface alteration. At wavelength of 2,940 nm it efficiently ablates dental hard tissue without thermal damage to the dental pulp. Besides the wavelength of the laser radiation, one of the most important factors influencing characteristics of the irradiated enamel surfaces was the laser energy. This study consisted of two in vitro experiments, the first experiment was to find the optimal laser energy irradiated on buccal surface of 6 extracted human premolar teeth using laser energy at 60, 100, 140, and 180 mJ/pulse, 2 Hz with fine water spray, respectively. At all energy levels the irradiated surfaces showed the honeycomb appearance or type I etching pattern. Surface morphology and clinical practicality indicated suitable laser energy for the alteration of enamel surface were 100 and 140 mJ/pulse. The second experiment was to investigate the enamel-sealant interface after laser treatment on the pit and fissure area. Twenty-four extracted human premolar teeth, two teeth from each patient were used. One tooth from each patient was placed in the control group (12 teeth) which were divided into two subgroups, 1 and 3. One tooth from each patient was then placed in the experimental group (12 teeth) which were also divided into two subgroups, 2 and 4. The teeth received one of the following treatments 1) subgroup 1, acid etching with phosphoric acid 38 % as control for subgroup 2, 2) subgroup 2, laser irradiated at 140 mJ/pulse, 3) subgroup 3, acid etching like subgroup 1 as control for subgroup 4, and 4) subgroup 4, laser irradiated followed by acid etching. After surface conditioning, sealing material was placed on the pit and fissure area then light activated. Then all teeth were demineralized in 10% HCl acid leaving remaining sealing materials intact. The enamel-sealant interface of the sealing materials were investigated under SEM. The results showed that in subgroup 1 and 3, numerous resin tags were found; in subgroup 2 and 4, a lot of interconnecting partitions were observed and disappeared in the area adjacent to the bottom of the pit and fissure. No resin tags were found on the inclined plane area in subgroup 2 and 4, but they could be observed in the junction between the interconnecting partitions and the bottom of the pit and fissure in group 4. All treatments could not completely clean pit and fissure areas.