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Laser Aided Ceramic Bracket Debonding vs Conventional Debonding Pliers (An *in vitro* Study)

A Thesis

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Abstract

Over the years, different debonding procedures have been used for ceramic brackets from enamel surface with few complications. The usage of laser in debonding reduces these complications such as enamel tears, bracket failure, and pain encountered during the debonding of ceramic brackets such as Er:YAG laser.

The current study was accomplished to assess the effect of debonding of ceramic bracket using Er:YAG laser procedure on shear bond strength. And comparing the shear bond strength of laser-aided ceramic bracket debonding method and the conventional method using three types of debonding pliers on enamel surface [Straight bracket removing pliers, Bracket removing pliers (occlusal pad type), and Ice debonding pliers].

Sixty ceramic brackets were bonded on tooth surface of sixty extracted first premolars, which were divided randomly into six groups. Three assigned as a control non-lased group using Straight bracket removing pliers, Bracket removing pliers (occlusal pad type), and Ice debonding pliers without laser application, each group with one type of pliers. The other three groups was assigned as experimental lased groups which was debonded after laser application. Er:YAG laser irradiate the experimental lased groups at power of 5W for 10 second with swiping motion and 50% air-water cooling. The laser was applied at energy of 250mJ, 20Hz frequency, and pulse duration 100 μ s.

Shear bond strengths and adhesive remnant index scores were calculated and a highly significant difference of Shear Bond Strength values between control non-lased groups and the experimental lased groups was observed ($p < 0.000$). The non-lased ice debonding pliers group had the highest mean value of shear bond strength of all groups while the lased bracket removing pliers (occlusal pad type) group scored the lowest. While no significant difference in Adhesive Remnant Index scores was observed between the control non-lased groups and

the experimental lased groups, except between lased and non-lased ice debonding pliers groups.

Application of Er:YAG laser thermally softened adhesive resin structure, lowered the bonding resistance of ceramic brackets and shear bond strength, and therefore enabled their debonding. So it could be concluded that Er:YAG laser is effective in ceramic bracket debonding without bracket fracture or enamel surface cracks or damage, and it is recommended to use Er:YAG laser in ceramic bracket debonding.