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ORIGINAL ARTICLE

Effect of Er:YAG laser pretreatment on glass–ceramic surface in vitro

Kaixuan Yan[1] · Jianing Song[2] · Xin Liu[2] · Yanning Zhang[3] · Yafei Qiu[4] · Jianping Jiao[4] · Mingxuan Wu[2]

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Abstract

This study investigated the feasibility of using an Er:YAG laser to pretreat glass–ceramic surface and evaluate the effect of the treatment on the bonding strength and marginal adaptation between glass–ceramic and dentin. Glass–ceramic samples (CEREC Blocs) and third molars were cut into 6 mm × 6 mm × 2 mm plates. Thirty ceramic plates were randomly divided into 5 groups: group A (control), group B (pretreated with 9.6% hydrofluoric acid [HF]), group C (pretreated with the Er:YAG laser at 300 mJ and 15 Hz), group D (pretreated with the Er:YAG laser at 400 mJ and 15 Hz), and group E (pretreated with the Er:YAG laser at 500 mJ and 15 Hz). The surface morphologies of the samples in each group were studied under a scanning electron microscope, and the sample displaying optimal etching parameters was selected for subsequent experiments. Based on the surface treatments, 30 ceramic and dentin plates were randomly allocated into 3 groups: the control, laser, and acid-etching groups. After bonding a ceramic plate to a dentin plate, the microleakage and bonding strength were measured, and the pretreatment effects of the Er:YAG laser and 9.6% HF were compared. Group E exhibited an etching effect that was more pronounced and uniform than that in groups C and D. Microleakage and bonding strength analyses revealed that the laser and acid-etching groups differed significantly from the control group in dye penetration depth and shear strength ($P < 0.05$), although the laser and acid-etching groups did not differ from each other. Both 9.6% hydrofluoric acid and Er:YAG laser pretreatments can coarsen glass–ceramic surfaces, improve the marginal adaptation and bonding strength between the glass–ceramic and dentin, and decrease microleakage of the materials. The two treatments showed no apparent differences in pretreatment outcomes.

Keywords Er:YAG laser · Glass–ceramic · Hydrofluoric acid (HF) · Microleakage · Bonding strength

✉ Mingxuan Wu
15608758@qq.com

Kaixuan Yan
178696477@qq.com

Jianing Song
18330102750@163.com

Xin Liu
lxkouqiang@163.com

Yanning Zhang
119945939@qq.com

Yafei Qiu
422909650@qq.com

Jianping Jiao
jjp69@163.com

[1] Department of Oral Medicine, The Third Hospital of Hebei Medical University, Shijiazhuang 050051, People's Republic of China

[2] Department of Periodontology (II) & Department of Laser Medicine, Hebei Key Laboratory of Stomatology, Hebei Clinical Research Center for Oral Diseases, School and Hospital of Stomatology, Hebei Medical University, Shijiazhuang 050017, People's Republic of China

[3] Department of Oral Pathology, Hebei Key Laboratory of Stomatology, Hebei Clinical Research Center for Oral Diseases, School and Hospital of Stomatology, Hebei Medical University, Shijiazhuang 050017, People's Republic of China

[4] Department of Prosthodontics, Hebei Key Laboratory of Stomatology, Hebei Clinical Research Center for Oral Diseases, School and Hospital of Stomatology, Hebei Medical University, Shijiazhuang 050017, People's Republic of China

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