

Title: The Use of Lasers in Enhancing the Bond Strength of Orthodontic Brackets

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Abstract: Background: The use of lasers in orthodontics has garnered interest for its potential to enhance the bond strength between orthodontic brackets and tooth surfaces, a crucial factor for successful orthodontic treatment. This study aims to investigate the effect of laser irradiation on the bond strength of orthodontic brackets in a sample of 30 patients.

Materials and Methods: Thirty patients undergoing orthodontic treatment were divided into two groups. In Group A, brackets were bonded using conventional methods, while in Group B, brackets were bonded after laser irradiation. A diode laser operating at 810 nm was used, with an energy setting of 2.5 W for 20 s. After bonding, a universal testing machine measured the bond strength in megapascals (MPa). The adhesive remnant index (ARI) was also recorded to determine the mode of bond failure. Statistical analyses were conducted to compare the results between the groups.

Results: The mean bond strength in Group B (laser irradiation) was significantly higher ($P < 0.05$) than in Group A (conventional bonding). Group B exhibited a mean bond strength of 9.72 MPa, whereas Group A showed a mean bond strength of 7.41 MPa. The ARI scores indicated that Group B had more adhesive remaining on the tooth surface, suggesting a stronger bond.

Conclusion: Laser irradiation prior to orthodontic bracket bonding resulted in significantly enhanced bond strength compared to conventional bonding methods. The increased bond strength and greater adhesive remnant on the tooth surface indicate that laser irradiation improves the adhesion between brackets and tooth enamel. Integrating lasers into orthodontic procedures has the potential to elevate treatment outcomes by ensuring durable bracket adhesion.

Keywords: Adhesive remnant, bond strength, bracket bonding

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