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Effect of ultraviolet photofunctionalization on implant stability and osseointegration: a randomized controlled trial of UVA and UVC on SLA-coated titanium implant

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Abstract

Objectives: To evaluate the effect of ultraviolet A (UVA) and ultraviolet C (UVC) irradiation on sandblasted, large-grit, acid-etched (SLA) coated titanium implants by measuring their impact on implant stability and osseointegration in the surrounding bone. **Methods:** This interventional experimental study was conducted jointly by CMH Lahore Medical College and Universiti Sains Malaysia from July 2017 to December 2018, with ethical approval obtained from both institutions. Sixty-six SLA-coated titanium implants (10 mm length, 4.5 mm width) were placed in partially edentulous patients aged >20 years, randomized into three groups: Group A (control, untreated

implants), Group B (implants irradiated with UVA), and Group C (implants irradiated with UVC). Implant stability quotient (ISQ) and osseointegration speed index (OSI) were measured using the Osteon Mentor device at baseline (day 0), the 8th week, and after 26 weeks of functional loading. Statistical analysis included linear regression and t-tests. Results: Baseline ISQ levels were 62.1, 65.2, and 69.3 for Groups A, B, and C, respectively. At the 8th week, ISQ levels increased significantly to 77.0, 81.5, and 82.5. Group B (UVA) demonstrated the highest OSI (8.5 ± 3.3), with significant ISQ improvement compared to the control group ($p=0.009$). UVC irradiation (Group C) showed no statistically significant difference in ISQ compared to the control group ($p=0.191$). Patients with lower baseline ISQ showed greater improvement across all groups. Conclusion: Photofunctionalization with UVA significantly enhanced implant stability and osseointegration, suggesting its potential for improving clinical outcomes in dental implantology. Further research is needed to explore the long-term effects of UVC irradiation. © 2024, Khyber Medical University. All rights reserved.

Author keywords

implant stability quotient; Osseointegration speed index; Photofunctionalization; Resonance Frequency Analysis; Ultraviolet A irradiation; Ultraviolet C irradiation

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Abstract

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