



Journal of Prosthodontics Dentistry
An Official Publication of Bureau for Health & Education Status Upliftment
(Constitutionally Entitled as Health-Education, Bureau)

Assessing the Efficacy of Photofunctionalization on Implant Osseointegration and Marginal Bone Changes: A Systematic Review

Dr. Aasif Tadvī, Dr. Jyoti Nadgere, Dr. Janani Iyer, Dr. Saumil Sampat, Dr. Prachiti Terni &
Dr. Bhoomi Parmar

Email Id: serviceheb@gmail.com

ABSTRACT

Background: One technique for modifying titanium implant surfaces using UV light irradiation is known as "Photofunctionalization" which restores the bioactivity of aged surfaces of Ti implants with coronated surfaces containing hydrocarbons. PF makes its surface more hydrophilic and high in energy, which is proposed to promote early osseointegration and microgravity between the implant and bone. Although potential clinical data synthesis is available and showing promise, the evidence to date is still not strong.

Objective: To systematically assess and summarize the clinical evidence supporting the ability of the photofunctionalization technique to positively influence dental implant osseointegration and to result in changes to the implant sites' marginal bone in humans.

Materials and Methods: The systematic review was carried out consistent with the PRISMA 2020 guidelines. Boolean operator searches were conducted in electronic databases – PubMed/MEDLINE, EBSCOhost, Cochrane Library and Google Scholar. The review has been registered in PROSPERO (ID: CRD420251054890). Only randomized and prospective clinical studies of adult human patients with titanium implants treated with UV photofunctionalization were eligible for inclusion. The Cochrane Risk of Bias 2.0 (RoB-2) tool was used to evaluate the methodological quality.

Results: There were eight studies included in this study, including 761 implants in 637 patients. Six of eight studies reported statistically significant higher values for implant stability quotient (ISQ) and/or lower implant removal torque (IRT) or osseointegration speed index (OSI) for photofunctionalized implants than control, respectively. Five studies reported marginal bone loss, three of which found no statistical difference between groups and one, by Sandhu et al., which found that the crestal bone loss was significantly less in the PF group, at -0.27 mm compared to -0.57 mm for the control group. Four of these studies were considered to be low risk, three were rated to have some concerns, and one was considered to have high risk from the RoB-2 analysis.

Conclusion: Clinically relevant enhancement of early implant stabilization and osseointegration under different anatomical implantations sites and bone quality conditions was achieved for bismuth ions when evaluated using photofunctionalization. The effect on short-term marginal bone loss is not yet known. Additional, multi-center, randomized, and controlled trials with standardized UV protocols and in larger numbers are needed for confirmation of continued clinical advantage.

Keywords: *Photofunctionalization; Dental Implants; Osseointegration; Marginal Bone Loss; Implant Stability Quotient; Ultraviolet Treatment; Resonance Frequency Analysis; Systematic Review*

Access this Article Online	Quick Response Code: 
Website: http://heb-nic.in/jopd	
Received on 18/05/2026	
Accepted on 23/05/2026 © HEB All rights reserved	