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Commentary

# Dental Implants with Reduced Graphene Oxide Surfaces and their Osseointegration Concepts

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## ABOUT THE STUDY

The main goal of dental implants is to minimize the recovery time following implant surgery. The most powerful elements that accelerate healing are initial osseointegration and subsequent preservation. Osseointegration, which is a critical element in improving the long-term clinical effectiveness of dental implants, is described as an intimate contact between living bone and implant surface without the intervention of fibrous connective tissues. The given surface of the dental implant, among other things, is crucial in the early stages of osseointegration, which directly affects the subsequent development of bone growth in patients. Pure titanium (Ti) and its alloys with exceptional mechanical strength, chemical resistance, and biocompatibility are currently the most extensively used materials for dental and orthopaedic implants.

Unfortunately, because these materials are physiologically inert, they cannot connect directly to bone or actively promote the production of new bone. A longer time between surgery and implant loading is necessary for partial integration of pure Ti implants with the bone cells and tissues, which ultimately increases the risk of implant failure. The effectiveness of osseointegration on the implanted Ti interfaces has thus been improved by the development of numerous sophisticated methodologies and methods for surface modification.

Recent technological advancements have concentrated on altering implant surface characteristics, which are crucial for osseointegration during bone repair. For instance, it has been proposed that surface treatment procedures including Ti plasma spraying, grit blasting, acid etching, anodizing, and coating with inorganic calcium phosphate can improve the augmentation of the surrounding bone and promote healing rates with greater osseointegration. Due to its effective contribution to clinical performance, the Sandblasted, Large-grit, and Acid-etched (SLA) treatment has been routinely utilised as a standard approach to change the surfaces of Ti dental implants. However, due to the poorer osseointegration of Ti dental implants produced *via* biological inactivation, obstacles still exist in enhancing the surface characteristics to support tooth tissue regeneration.

For the effective assessment of implantation in bone defect locations using biomimetic molecular alterations, such as collagen, the Arg-Gly-Asp (RGD) peptide, and growth factors like bone morphogenetic proteins, numerous approaches have been proposed (BMPs). The processes to coat the implant with biomolecules were not straightforward, and the utilities in the process required many distinct baths, despite the fact that effective integration was clearly proven. Because of this, efforts to change the implant surface using new technology are still being made in this area of study.

The objective of the current work is to assess the bone tissue regeneration capacity of various Ti surfaces that have undergone SLA treatment and have been created using biocompatible rGO (coated) and BMP (immobilized or treated). According to reports, rougher-surfaced Ti implants increase the surface area between the implant and the bone, increase friction, boost osseointegration, and eventually increase their early stability. In comparison to early mechanically treated surfaces, SLA is the typical technology that offers outstanding implant fixation and a greater success rate. However, it has been noted as a clinical difficulty as there are currently no effective methods for promoting dental tissue regeneration. In the current study, we created titanium implants with rGO coatings (R-ST) and examined the impact of various surface treatments on osseointegration.

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