

Title: In-Vitro Study of Osseointegration: Evaluating the Influence of Surface Modifications on Dental Implant Stability

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Abstract: Osseointegration is critical for the success of dental implants. Surface modifications of dental implants play a crucial role in enhancing osseointegration and implant stability. This in-vitro study aims to evaluate the influence of various surface modifications on dental implant stability. Dental implants with different surface modifications were prepared and subjected to in-vitro testing. Surface modifications included sandblasting, acid etching, and plasma spraying. Implant stability was assessed using resonance frequency analysis (RFA) and pull-out tests. Statistical analysis was performed to compare the stability of implants with different surface modifications. The results showed that implants with sandblasted and acid-etched surfaces exhibited significantly higher stability compared with those with only a machined surface. The mean RFA values for sandblasted and acid-etched implants were 75 ± 5 and 80 ± 6 , respectively, whereas machined implants recorded a mean RFA value of 60 ± 4 . Similarly, pull-out tests demonstrated higher maximum tensile strengths for sandblasted and acid-etched implants compared with machined implants. Surface modifications, such as sandblasting and acid etching, significantly enhance dental implant stability in vitro. These modifications promote better osseointegration, which is crucial for the long-term success of dental implants in clinical practice.

Keywords: Dental implants; Osseointegration; Pull-out test; Resonance frequency analysis; Surface modifications

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