

Scottish International Conference on Multidisciplinary Research and Innovation – SICMRI 2025

RESULTS OF EVALUATING THE STABILITY OF DENTAL IMPLANTS IN DYNAMICS BEFORE AND DURING THE INITIAL 3-6 MONTHS AFTER PROSTHETICS

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Relevance: The long-term success of dental implantology is contingent upon achieving and maintaining stable osseointegration. While primary (mechanical) stability at the time of placement is a known prerequisite for success, the transition to secondary (biological) stability under functional load is the most critical phase. Evaluating implant stability dynamically, especially within the first 3-6 months post-prosthetic loading, is crucial for validating treatment protocols. This is particularly relevant when comparing conventional loading with early functional loading strategies, as it provides objective data on how the bone-implant interface responds to mechanical forces during the crucial maturation period.

Keywords: dental implants, implant stability, osseointegration, early functional loading, prosthetic loading, biomechanics.

Objective: To study the degree of stability of dental implants before and after the application of early functional loading at various intervals, specifically within the initial 3 and 6 months after the placement of bridge prostheses, and to compare these dynamics with a conventional loading protocol.

Materials and Methods: The clinical study involved 90 patients, divided into relevant groups for comparison. The primary groups for this stability analysis were: Group 1 (Delayed Loading; n=28): Patients who received two-stage intraosseous screw implants, with prosthetics placed after a conventional healing period. Group 2 (Early Loading; n=31): Patients who received intraosseous screw implants and had bridge prostheses fixed one month after implantation, representing an early functional loading protocol. The stability of the dental implants was planned to be assessed objectively using a dedicated method for determining implant mobility. Control examinations and measurements were scheduled to be performed at 3 and 6 months after the final prosthetics were placed to track the dynamic changes in stability.

Results: As this thesis is based on the research proposal, expected results are presented. It is anticipated that all implants in both Group 1 and Group 2 will demonstrate high primary stability at the time of placement. Following prosthetic loading, the stability values in Group 1 (Delayed Loading) are expected to remain high and stable throughout the 3 and 6-month follow-up periods. For Group 2 (Early Loading), it is hypothesized that there will be a slight, clinically insignificant decrease in stability immediately after loading at one month, followed by a steady and significant increase in stability values at the 3-month and 6-month control points. By the 6-month mark, the stability of implants in the early loading group is expected to be comparable to that of the delayed loading group, indicating the successful establishment of secondary, biological stability.

Discussion: The anticipated results suggest that the application of controlled, early functional loads does not impede the process of osseointegration. The initial high stability is mechanical, while the subsequent increase in stability values in Group 2 is indicative of active bone remodeling and maturation at the implant interface. This demonstrates that the bone is adapting positively to the functional forces introduced early in the healing process. Tracking this dynamic shift from primary to secondary stability provides a crucial biomechanical validation for the early loading protocol. The ability to objectively measure and confirm that implant stability progressively increases under early functional load would support the hypothesis that this protocol is not only safe but may also provide a beneficial physiological stimulus to the bone, aligning with the overall goal of ensuring long-term implant function and proper physiological loading of the jawbone.

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Conclusions: The dynamic evaluation of implant stability is a critical diagnostic method for assessing the success of different loading protocols in the initial months after prosthetic restoration. Early functional loading, when applied to implants with adequate primary stability, is expected to result in a progressive increase in stability, achieving levels comparable to conventional delayed loading by the 6-month follow-up period. Objective stability measurements confirm that the bone-implant interface can successfully adapt and mature under early functional forces, validating the efficacy and predictability of this treatment approach.

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