

**Assessment of dental implant stability
during healing period and determination of
the factors that affect implant stability by
means of resonance frequency analysis**

(Clinical study)

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Abstract

Background: Implant stability is considered one of the most important factors affecting healing and successful osseointegration of dental implants. At implant placement, adequate primary stability is fundamental to allow undisturbed bone healing while thereafter, secondary stability which result from the osseointegration process, permits an optimal distribution of the functional loads through the bone-implant interface

Aims of the study: The objective of the present study was to measure the implant stability quotient (ISQ) values at intervals during the healing period (first 6 months after dental implant placement) as a predictive factor of osseointegration, and to determine the factors (age, gender, maxilla\ mandible, anterior\ posterior, diameter of implant, length of implant, bone density) that affect the implant stability.

Materials and methods: Thirty patients enrolled in the study (17 female, 13 male) with an age range (20-59) year's old. The patients received 44 Implantium® Dental Implants located as the following: 22 implants in the maxillary jaw, 22 implants in the mandibular jaw from them 17 implants in anterior segment and 27 in the posterior segment. The bone density in each implant recipient site was determined using interactive CT scan and classified according to the Misch bone density classification (29 implants placed in (D3), 15 implants in (D4)). Resonance frequency analysis (RFA) was used for direct measurement of implant stability on the day of implant placement and 8, 16 and 24 weeks after implant placement.

Results: The mean of average ISQ at surgery was 73.2. The lowest mean of average ISQ was at the 8th week (69.5), and then the mean increased at the 16th week (73.5) to reach a value slightly higher than the primary stability at the 24th week (76.8). Mandibular implants showed significantly higher ISQ values than

maxillary implants. Implants placed in the posterior segment of the jaw had significantly higher ISQ values than implants in the anterior segment. A significant, positive linear correlation was observed between the implant diameter and the implant stability ($r=0.343$ $p<0.001$), however no significant correlation was observed between the implant length and the implant stability. No statistically significant difference was found regarding gender, age and bone density.

Conclusions: Resonance frequency analysis was non-invasive diagnostic tool for detecting changes in implant stability during the healing period. The factors that affect implant stability were implant diameter and implant location (maxilla\ mandible, anterior\ posterior). Gender, age and bone density had no effect on implant stability.