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Resonance frequency analysis of dental implants after laser therapy

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Background: The importance of primary stability in implant placement for long-term success is well known in the literature. The resonance frequency analysis technique has extensively been used in experimental and clinical research for the last 10 years, for assessing primary stability. The benefits of low-level laser therapy in bone tissue are already consolidated in the literature, however, little is known about its benefits on improvement of stability of dental implants.

Aim: The aim of this random double blind clinical study was to investigate whether stability of titanium implants can be enhanced by low-level laser therapy during the osseointegration process when measured by means of resonance frequency analysis.

Methods: Thirty implants ($n = 30$) were placed in the posterior region of partially edentulous mandible of eight adult patients, after following several inclusion criteria and were distributed bilaterally in agreement with the prosthetic requirement. The implants on the experimental side were randomly submitted to low-level laser therapy (830 nm, 86 mW, 92.1 J/cm^2, 2.57 J, 3 s/point, at 20 points), and on the control side the laser irradiation was only simulated. The first irradiation was performed in the immediate postoperative period, and it was repeated every 48 h in the first 14 days. The initial implant stability quotient of the implants was measured by means of resonance frequency analyzer (Osstell®). New implant stability quotient measurements were made after 10 days, 3, 6, 9 and 12 weeks. ANOVA for repeated measurements and Bonferroni test were used to assess statistically significant differences.

Results: The initial implant stability quotient values ranged from 65 to 84, with a mean of 76. The irradiated side showed significant drop in stability from the 10th day until the sixth week only ($P = 0.028$), and presenting a gradual increase from the sixth to the 12th week. In the control side, the mean implant stability quotient increased up to the third week, decreased in the sixth week, and then began to grow again. The highest stability values were observed in the 10th day in the irradiated group, and the lowest in the sixth week in both groups. No statistical differences were detected among the ISQ means in the two groups for each of the six times observation.

Conclusions and clinical implications: No evidence was found of any effect of low-level laser therapy on implants' stability when measured by resonance frequency analysis. Because high primary stability and good bone quality are of major relevancy for a rigid bone–implant interface, additional low-level laser therapy under these conditions may have little impact macroscopically. Further researches under different bone conditions are necessary for a better understanding of the occurrences at bone/implant interface.

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Flapless surgery using CT-based mucosa supported templates: 2–year results

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Background: Surgical templates produced from CT-scan data, using virtual 3D planning systems, are increasingly used in implant dentistry. In accordance with radioprotection recommendations, preoperative CT examinations should be reserved for fully edentulous jaws or for large edentulous spaces. Conventional imaging techniques before implant surgery allow high implant success rates in fully edentulous patients with a favorable residual bone crest, or after a bone graft; CT-scan-based surgical templates are not necessary in these cases.

Aim: The aim of this study is to evaluate if a surgical guide based on the CT-implant planning allows implant insertion in edentulous patients with limited bone volume.

Methods: From May 2006 to August 2007, 47 implants Replace Straight (Nobelbiocare®, Goteborg, Sweden) were inserted in the completely edentulous upper jaw of seven patients (five female and two male patients, mean age 47 years). The implants were inserted following the Nobelguide® procedure using a flapless technique and a mucosa supported CT-derived surgical template. In immediately loaded cases, the prosthesis was manufactured following the Nobelguide® process.

Results: After implant insertion, partial relief of the screw was palpated through the buccal mucosa in 9/47 (19%) implants indicating a perforation of the buccal cortical plate. Immediate loading of the implant-supported prosthesis delivered at the time of implant placement was performed in three patients (20/47 implants, 42.6% implants). There were 7/47 (14.9%) early failures during osseointegration: two (4.3%) implants were mobile and were removed immediately at the end of surgery and 5 (10.6%) during the first weeks, including four that had been immediately loaded. There was one (2.1%) implant failure after osseointegration. Thus during the follow-up period 8/47 (17%) implants were lost giving a 2-year survival rate of 83%.

Conclusions and clinical implications: This 2-year clinical evaluation shows the limits of flapless implant placement using CT-based mucosa-supported surgical templates in patients with limited bone volume. Although preoperative evaluation of implants sites in difficult anatomical situations seemed facilitated