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OsseoPulse™ Scientific and Clinical Dossier

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Published Research - Summaries

Accelerated Implant Stability After LED Photobiomodulation

Brawn P, Kwong-Hing A, Boeriu S and Clokie CM*, J Dent Res* 87(Spec Iss B):2021, 2008

Study: This article examines the effect of OsseoPulse™ treatment on implant stability, as assessed by resonance frequency analysis. 35 patients had 63 dental implants placed. 23 patients were treated with the OsseoPulse™ for 21 days. All implants were tested for primary stability with an Osstell Mentor™ at the time of implant placement, 14, 30, 60 and 90 days.

Conclusion: Patients treated with the OsseoPulse™ demonstrated significantly ($p<0.05$) improved dental implant stability at day 14, day 30 and day 60. There was a 58% reduction in time required to achieve sufficient stability to load implants compared to controls. These results may suggest that OsseoPulse™ treatments may allow for more rapid integration of dental implants and earlier loading.

Combined New Technologies to Improve Dental Implant Success -- Quantitative Ultrasound Evaluation of NIR-LED Photobiomodulation

Bouquot J, Brawn P, *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*, 2008; 106(3):e6

Background: Dental implants must be placed in healthy bone for successful osteointegration and stability. Low bone density (LBD) and ischemically damaged, desiccated bone both have a poor ability to remodel and are, therefore, contraindications for implants. Near-infrared light emitting diode (NIR-LED) therapy or photobiomodulation has been shown in cultured cells and animal models to stimulate bone healing and production.

Study: 68 patients received 12 weeks of OsseoPulse therapy to 294 sites of ischemic/low bone density. Bone density/hydration improved by 44%, and 42% of sites returned to completely normal bone.

Conclusion: OsseoPulse therapy seems to hold good potential for improving alveolar bone prior to implant placement.

Phototherapy promotes attachment and subsequent proliferation of human osteoblast-like cells

Khadra M, Kasem N, and Brawn P, *J Dent Res* 87(Spec Iss B):3308, 2008

Study: The aim of the study was to investigate the effect of OsseoPulse™ treatment on attachment and proliferation of human osteoblast-like cells cultured on titanium implant material. Cells derived from human mandibular bone were exposed to OsseoPulse™ and then seeded onto titanium discs. Non-exposed cultures served as controls. Cell proliferation was determined after staining by counting cells under a light microscope. Furthermore, MTT analyses were also performed to determine cellular attachment and proliferation.

Conclusion: In this cellular model the attachment and proliferation of human osteoblast-like cells cultured on titanium implant material was significantly enhanced ($p < 0.05$) after OsseoPulse™ treatment compared to controls.

Accelerated Implant Stability After LED Photobiomodulation Treatment

Brawn P, Kwong-Hing A, Aptekar A, *Clin Oral Implants Res* 2007; 86(2):cii

Study: 15 Nobel Biocare Replace Select™ implants were placed and the OsseoPulse™ device was utilized by the patient on a daily basis, at their home, for 21 days post operatively. Implants were tested for primarily stability with an Osstell Mentor™ over a period of 3 months.

The control untreated implants from Day 14 to 30 presented a typical marked loss of stability and did not reach the initial stability values at 90 days. The OsseoPulse™ treated group experienced a slight loss at 14 days and 30 days, but exceeded initial stability values at Day 60 and 90.

Conclusion: The accelerated implant stability of the OsseoPulse™ treated implants compared to the untreated controls may allow for faster healing and loading of implants that under conventional treatment regimes.

A histologic comparison of light emitting diode phototherapy-treated hydroxyapatite-grafted extraction sockets

Brawn P, Kwong-Hing A, *Implant Dent* 2007; 16(2):204-11

Case Study: After bilateral extraction of periodontally involved lower molars an investigational OsseoPulse™ was used daily for 21 days on the treated side after grafting both sockets with Hydroxyapatite (HA) Osteograf LD300. Bone regeneration of the OsseoPulse™ treated and nontreated socket graft was compared. Histologic evaluations showed enhanced bone formation and faster particle resorption associated with the OsseoPulse™ treated socket graft compared with the untreated socket.

Conclusion: In this bilateral case study the accelerated bone healing in the OsseoPulse™ treated HA socket graft may provide faster implant placement compared to untreated treated socket grafts.

Accelerated implant stability in indirect sinus lifts with bone grafts using LED phototherapy

Kwong-Hing A, Brawn P, *Proc FDI Sci* 2006

Case Study: 4 bilateral implants were placed in conjunction with indirect sinus lifts grafted with Bio-Oss™ particulate. The implants were tested for primary stability at initial placement and then weekly for 4 weeks, and then at month 2 and 3.

The OsseoPulse™ treated implants increased stability compared to untreated controls at all time periods and achieved stability sufficient to load by the 2nd week, while the untreated controls did not reach this level of stability until after the 3rd Month.

Conclusion: The accelerated implant stability of the OsseoPulse™ treated implants placed with simultaneous indirect sinus lift and bone may provide faster implant stability compared untreated implants. This may allow shorter treatment times before prosthetics can be initiated.

Supporting Research:

Phototherapy enhances bone regeneration in direct sinus lifts, Kwong-Hing and Brawn, poster at *BIOS 2007*

Effects of laser therapy on attachment, proliferation and differentiation of human osteoblast-like cells cultured on titanium implant material, Khadra et al, *Biomaterials 2005; 26: 3503-3509*

Low-Level laser therapy stimulates bone-implant interation:an experimental study in rabbits, Khadra et al, *Clin. Oral Impl. Res*., 2004

Other Supporting Literature:

Irradiation effect of low-energy laser on alveolar bone after tooth extraction. Takeda Y**:** Experimental study in rats. *Int J Oral Maxillofac Surg* 1988, 17:388-391.

The effects of the helium-neon laser on postsurgical discomfort: a pilot study. Clokie C, Bentley KC, Head TW: *J Can Dent Assoc* 1991, 57:584-586.

Enhancement of angiogenesis in regenerating gastrocnemius muscle of the toad (Bufo viridis) by low-energy laser irradiation. Bibikova A, Belkin V, Oron U: *Anat Embyrol (Berl)* 1994, 190: 597-602.

Effect of low-energy laser (He-Ne) irradiation on the process of bone repair in the rat tibia. Barushka O, Yaakobi T, Oron U:. *Bone* 1995, 16:47-55.

Promotion of bone repair in the cortical bone of the tibia in rats by low energy laser (He-Ne) irradiation. Yaakobi T, Maltz L, Oron U: *Calcif Tissue Int* 1996, 59:297-300.

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In vitro effects of low-level laser irradiation at 660 nm on peripheral blood lymphocytes. Stadler I, Evans R, Kolb B, Naim JO, et al**:** *Lasers Surg Med* 2000, 27:255-261.

Impact of low level laser irradiation on infarct size in the rat following myocardial infarction. Ad N, Oron U: *Int J Cardiol* 2001, 80:109-116.

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Improvement of macromolecular clearance via lymph flow in hamster gingiva by low-power carbon dioxide laser-irradiation. Shimotoyodome A, Okajima M, Kobayashi H, Tokismitsu I, et al: *Lasers Surg Med* 2001, 29:442-447

Effect of NASA light-emitting diode irradiation on wound healing. Whelan HT, Smits RL Jr, Buchman EV, Whelan NT, et al: *J Clin Laser Med Surg* 2001, 19:305-314.

Laser stimulation on bone defect healing: an in vitro study. Guzzardella GA, Fini M, Torricelli P, Giavaresi G, et al: *Lasers Med Surg* 2002, 17:216-230.

Low level 809-nm diode laser-induced in vitro stimulation of the proliferation of human gingival fibroblasts. Kreisler M, Christoffers AB, Al-Haj H, Willershausen B, et al: *Lasers Surg Med* 2002, 30:365-369.

Effect of low-power laser irradiation on cell growth and procollagen synthesis of cultured fibroblasts. Pereira AN, Eduardo Cde P, Matson E, Marques MM: *Lasers Surg Med* 2002, 31:263-267.

Computerized morphometric assessment of the effect of low-level laser therapy on bone repair: an experimental animal study. Silva Junior AN, Pinheiro AL, Oliveira MG, Weismann R, et al: *J Clin Laser Med Surg* 2002, 20:83-87.

Effect of low-power GaAlAs laser (660 nm) on bone structure and cell activity: an experimental animal study. Nicola RA, Jorgetti V, Rigau J, Pacheco MT, et al**:** *Lasers Med Sci* 2003, 18:89-94.

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