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Effect of laser therapy on attachment, proliferation and differentiation of human osteoblast-like cells cultured on titanium implant material.

Khadra M, **Lyngstadaas SP**, **Haanaes HR**, **Mustafa K**.

Department of Oral Surgery and Oral Medicine, Faculty of Dentistry, University of Oslo, P.O.Box 1109 Blindern, N-0317 Oslo, Norway. maawan@odont.uio.no

The aim of this in vitro study was to investigate the effect of low-level laser therapy (LLLT) on the attachment, proliferation, differentiation and production of transforming growth factor-ss(1) (TGF-beta(1)) by human osteoblast-like cells (HOB). Cells derived from human mandibular bone were exposed to GaAlAs diode laser at dosages of 1.5 or 3 J/cm(2) and then seeded onto titanium discs. Non-irradiated cultures served as controls. After 1, 3 and 24h, cells were stained and the attached cells were counted under a light microscope. In order to investigate the effect of LLLT on cell proliferation after 48, 72 and 96 h, cells were cultured on titanium specimens for 24h and then exposed to laser irradiation for three consecutive days. Specific alkaline phosphatase activity and the ability of the cells to synthesize osteocalcin after 10 days were investigated using p-nitrophenylphosphate as a substrate and the ELSA-OST-NAT immunoradiometric kit, respectively. Cellular production of TGF-beta(1) was measured by an enzyme-linked immunosorbent assay (ELISA), using commercially available kits. LLLT significantly enhanced cellular attachment ($P<0.05$). Greater cell proliferation in the irradiated groups was observed first after 96 h. Osteocalcin synthesis and TGF-beta(1) production were significantly greater ($P<0.05$) on the samples exposed to 3 J/cm(2). However, alkaline phosphatase activity did not differ significantly among the three groups. These results showed that in response to LLLT, HOB cultured on titanium implant material had a tendency towards increased cellular attachment, proliferation, differentiation and production of TGF-beta(1), indicating that in vitro LLLT can modulate the activity of cells and tissues surrounding implant material.

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