Low-Level Er:YAG Laser Irradiation Can Enhance Proliferation of Osteoblasts
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Background: The high-level Er:YAG laser has been increasingly used in periodontal therapy. However, the low-level effects (photo-bio-modulation) of Er:YAG laser have not been clarified in detail. The aim of this study was to investigate the potential photo-bio-modulation effects of the low-level Er:YAG laser on proliferation of osteoblasts.

Materials and methods: Osteoblastic cell line MC3T3-E1 cells were cultured and serum starved for 24 hours prior to Er:YAG laser irradiation. Irradiation was performed at 2.6 mJ/cm²/pulse in the absence and the presence of culture medium for different time durations (30 sec–4 min). After 24 and 72 hours, cell proliferation and cytotoxicity were examined using MTT and LDH cytotoxicity assay kits. In some experiments, cells were preincubated with MAPK inhibitors (U0126, SP600125, SB203580) prior to the laser irradiation.

Results: MTT assay showed higher cell proliferation rate at 24 and 72 hours after irradiation compared with non-irradiated control both in the presence and absence of culture medium. The significantly highest enhancement of cell proliferation rate was observed at 3 min of irradiation with medium and 1 min of irradiation without medium. LDH activity was not changed in any conditions tested. All three MAPK inhibitors diminished laser-enhanced cell proliferation of MC3T3-E1 cells.

Conclusion: The low-level Er:YAG laser increases proliferation of cultured osteoblast cells possibly through MAPK pathways. These findings may contribute to faster bone tissue healing following Er:YAG laser irradiation.