

Comparison of Er,Cr:YSGG Laser and Hand Instrumentation on the Attachment of Periodontal Ligament Fibroblasts to Periodontally Diseased Root Surfaces: An In Vitro Study

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Background: This study investigates the effects of erbium, chromium: yttrium-scandium-gallium-garnet (Er,Cr:YSGG) laser irradiation and hand instrumentation on the attachment of periodontal ligament (PDL) fibroblasts to periodontally involved root surfaces.

Methods: Twenty-four single-rooted periodontally involved human teeth (test groups), and six healthy premolar teeth extracted for orthodontic reasons (control group) were included in this study. A total of 45 root slices were obtained from all selected teeth and assigned to the following five groups: 1) untreated healthy group (+control); 2) untreated periodontally diseased group (-control); 3) hand instrumentation group (scaled Gracey); 4) laser I, Er,Cr:YSGG laser irradiation setting-I (short pulse); and 5) laser II, Er,Cr:YSGG laser irradiation setting-II (long pulse). All of the root slices were autoclaved in phosphate buffered saline and slices were placed onto cell culture inserts. PDL fibroblasts were placed at the density of 80,000 cells on the root plate (5 · 6 mm) and incubated for 48 hours and transferred to 24-well plates. The attachment PDL fibroblasts on the root plates were observed using confocal microscopy (at 12 hours and on days 3 and 7) and scanning electron microscopy (at 12 hours and day 3). 3-(4,5-dimethyl-thiazol-2-yl)-2,5-diphenyl-tetrazolium bromide assay was performed on day 5 for PDL fibroblast survival.

Results: 3-(4,5-dimethyl-thiazol-2-yl)-2,5-diphenyl-tetrazolium bromide assay shows that whereas laser-treated specimens showed a significantly higher cell density, the Gracey-treated group showed a lower cell density compared to the positive control group ($P < 0.05$). Based on confocal microscopy, apparent reduction was observed in the attachment of PDL cells to the periodontally diseased root surfaces. In the laser and Gracey groups, cells looked well-oriented to the root surfaces. Laser-treated groups provided suitable environment for cell adhesion and growth. Laser I treatment was more favorable for the attachment of PDL compared to scaled Gracey, laser II, and even healthy root surfaces.

Conclusion: The results of the study indicate that short-pulse laser setup (laser I) looks more promising regarding the attachment, spreading, and orientation of PDL cells. *J Periodontol* 2010;81:1216-1225.

KEY WORDS

Cell biology; fibroblasts; lasers.

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