

R-21. The Effect of single Low-Power CO₂ Laser irradiation on human PDL fibroblast Proliferation & Differentiation

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Background

Low-power lasers are widely used as tissue stimulator, to improve wound repair and anti-inflammatory and analgesic effects. Tajima et al.(2003) reported that low-power CO₂ laser accelerates new bone formation within the marrow cavity subjacent to the laser treatment site.

Materials and Methods

The experimental groups were applied to laser at a power of 0.5W with 50Hz under continuous mode. In the case of MTT experiment 6 groups were divided according to different distances-1cm, 2cm, 3cm and different irradiating time-1second, 3second. In the case of ALP activity experiment, the groups were divided into 4 groups by distances-2cm, 3cm and time-1second, 3second. The control group was not applied to laser. MTT and ALP activity test were performed to observe the growth of PDL cells and cell differentiation to osteoblastic or cementoblastic cell.

Results

1. On the 5th day after laser irradiation, statistically significant increase of cells were found. At the baseline of laser irradiation there was no significant difference of cell increase among groups. On the 3rd day, 2cm, 1sec group showed statistically significant increase of cells compared to other groups. On the 5th day after laser irradiation, also no significant differences were found among groups.
2. Statistically significant increase of ALP activity was seen on the 3rd, 5th, 7th, and 10th day after laser irradiation compared to the baseline. The control and 3cm, 3sec group showed statistically significant decrease of ALP activity between the 3rd and 5th day and no significant increase till the 10th day. On the other hand 2cm, 3sec and 3cm, 1sec groups showed statistically significant

decrease of ALP activity between the 3rd and 5th day, and significant decrease of ALP activity till the 10th day.

Especially 2cm,1sec group showed increase of ALP activity not statistically significant from the 3rd day to 10th day.

On the 3rd day after laser irradiation 3cm, 1sec and 3cm, 3sec group showed statistically significant high score of ALP activity compared to other groups.

On the 5th day after laser irradiation, statistically significant high score of ALP activity was found experimental groups compared to control group and no statistical difference of ALP activity was found among experimental groups.

On the 7th and 10th day 3cm, 1sec, 3cm, 3sec and 2cm, 1sec group showed significant high score of ALP activity compared to 2cm, 3sec and control group. And the ALP activity score increases as it goes from 3cm, 1sec, 3cm, 3sec to 2cm, 1sec group and there was no significant difference between 3cm, 3sec and 2cm, 1sec group

Conclusion

There was no cell proliferation effect of low-power CO₂ laser in this experimental condition where total energy and power density were changed. Less energy with low power density and more energy with high power density had more effects to cell differentiation. 2cm, 1sec irradiation was found to be the most effective condition for PDL cell differentiation in this study and 3cm, 3sec was found to be efficient.

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