

Clinical and Microbiological Study of Laser-assisted Periodontal Therapy

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Introduction

The scientific and clinical discussion in the last few years has been focused on laser systems as an assisted method in periodontal therapy.

Purpose

The aim of this clinical and microbiological study was to investigate the influence of various laser wavelengths on the periodontal bacterial spectrum as well as changes in clinical parameters in patients with chronic periodontitis.

Materials and Methods

Four methods were used to treat the periodontitis. SRP (control group), SRP + diode laser (980 nm), SRP + Nd:YAG-laser (1064 nm) and SRP and photodynamic therapy (PDT, 670 nm). Ten patients with a total of 253 periodontal pockets were treated over a period of three months. A total of 325 microbiological samples were taken (figs.1,2) and evaluated (PCR) over the complete period of the study (before treatment, on the third and seventh day thereafter, after one and after three months). The bleeding index (BOP) was measured before treatment, after one and after three months period. For each patient a treatment method was assigned randomly by quadrants, so that in any one patient one quadrant was treated Nd:YAG laser-assisted, one quadrant diode laser-assisted, one quadrant PDT-assisted and one quadrant by SRP alone. Treatment was conducted with a power setting of 2 W, cw (fig. 3) and 75 mW in the case of PDT (figs. 4,5) for 20 seconds irradiation period.

Conclusion

This study shows that periodontal therapy assisted by PDT can offer an alternative method in the initial phase of periodontal therapy. In comparison to SRP alone and SRP assisted by high-intensity laser, PDT is able to control BOP and achieves the best results in bacterial reduction.



Fig. 1: Probing depth



Fig. 2: Microbiological test



Fig. 3: Laser irradiation with high-intensity laser after SRP (980 nm or 1064 nm)



Fig. 4: Photosensitizer application before irradiation (HELBO[®]Blue, HELBO, Grieskirchen, Austria)



Fig. 5: Laser irradiation with low-intensity laser after SRP, photosensitizing (670 nm)



Fig. 6: HELBO[®]Blue and HELBO[®]T-Controller (HELBO, Grieskirchen, Austria)

MK	3 days after				7 days after				1 month after				3 months after			
	Nd:YAG	Diode	PDT	K	Nd:YAG	Diode	PDT	K	Nd:YAG	Diode	PDT	K	Nd:YAG	Diode	PDT	K
A.A.	50.00	50.00	100.00	33.33	0.00	50.00	100.00	33.33	50.00	33.33	100.00	33.33	50.00	50.00	100.00	33.33
P.P.	50.00	82.5	80.00	83.33	62.5	25.00	30.00	33.33	50.00	75.00	50.00	41.67	50.00	50.00	100.00	41.67
PI.	66.67	100.00	100.00	70.00	83.33	100.00	100.00	90.00	50.00	50.00	100.00	60.00	50.00	100.00	100.00	60.00
B.I.	50.00	64.29	69.23	69.23	83.33	64.29	84.62	76.92	58.33	71.43	84.62	61.54	58.33	100.00	100.00	69.23
P.m.	53.85	64.71	85.71	56.25	78.92	76.47	85.71	56.25	23.08	58.82	64.29	75.00	23.08	70.59	82.86	62.5
F.N.	50.00	61.11	92.31	61.54	64.29	50.00	61.54	69.23	21.43	61.11	46.15	53.85	50.00	66.67	53.85	46.15
T.d.	66.67	71.43	85.71	100.00	66.66	64.29	64.29	88.89	44.44	85.71	85.71	55.56	55.56	64.29	82.86	66.67
Ø	55.31	67.72	87.57	64.11	62.43	61.44	83.74	63.99	42.47	62.20	80.11	54.42	48.14	71.65	91.37	54.22

Fig. 7: Average bacterial reduction of all bacteria (MK) after 3 and 7 days, 1 and 3 months after treatment with SRP (control group, K), SRP + Nd:YAG laser, SRP + diode laser, SRP + PDT

Results

Regarding bleeding on probing, the sites of the control group showed more bleeding compared to laser irradiated sites after three months (fig. 12). The average bacterial reduction of all bacteria investigated after treatment by SRP + PDT was the best: 87.57 % ($p < 0.001$) on the third day, 83.74 % ($p < 0.05$) on the seventh day, 80.11 % ($p < 0.05$) after one month and 91.37 % ($p < 0.05$) after three months period (figs. 8-11).

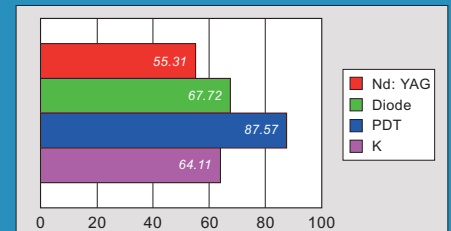


Fig. 8: Average bacterial reduction after 3 days in %

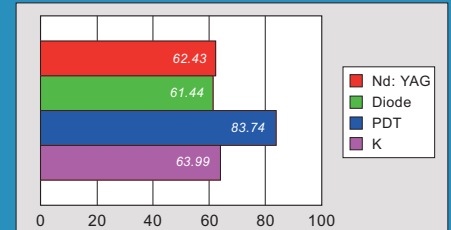


Fig. 9: Average bacterial reduction after 7 days in %

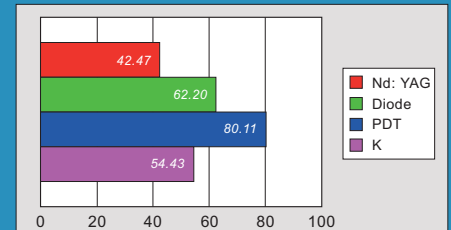


Fig. 10: Average bacterial reduction after 1 month in %

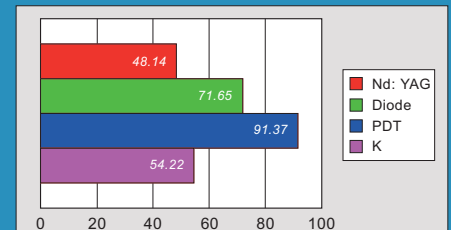


Fig. 11: Average bacterial reduction after 3 months in %

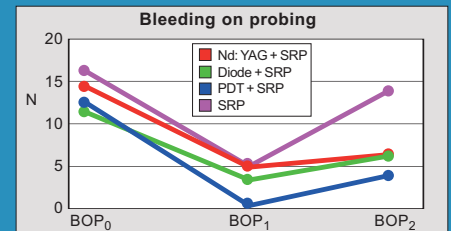


Fig. 12: BOP over the period of 1 month (BOP1) and over the period of 3 months (BOP2). Comparison of the four treatment groups