

# Microbiological Outcomes Following the Combined Use of Nd:YAG and Er:YAG Laser in Non-surgical Periodontal Therapy: A Randomized Controlled Clinical Study

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## SUMMARY

**Objectives:** The aim of the present study was to microbiologically evaluate the outcomes following non-surgical periodontal therapy by either a combination of Nd:YAG and Er:YAG laser or by Er:YAG laser alone.

**Materials and methods:** Forty patients diagnosed with generalized chronic periodontitis were randomly assigned to one of two treatment groups:

**NdErNd group:** Nd:YAG laser (Fotona, LightWalker) for pocket disinfection (MSP, 2.5 W, 20 Hz, 300 µm fiber tip, 10 to 30s per tooth) followed by root debridement with Er:YAG laser (Fotona LightWalker) (MSP, 40 mJ/p, 40 Hz, 400 µm fiber tip, water spray) and subsequent application of Nd:YAG laser for coagulation (VLP, 3.5 W, 20 Hz, 300 µm fiber tip, 10 to 30s per tooth). Repetition of Nd:YAG treatment alone (i.e. without any further debridement with Er:YAG laser) at 7 and 14 days (MSP, 2.5 W, 20 Hz, 300 µm fiber tip, 10 to 30s per tooth).

**Er group:** root debridement with Er:YAG laser alone (MSP, 40 mJ/p, 40 Hz, 400 µm fiber tip, water spray). The following microbiological parameters were recorded at baseline and 6 months after treatment by means of molecular-biological tests that apply the real-time PCR method (polymerase chain reaction).

**Results:** Both therapy modalities resulted in a reduction of the total bacteria count after 6 months. In particular, with red complex bacteria, a huge decrease was detected in the number of *Tannerella forsythia*: in the NdErNd group from  $3.9 \times 10^5$  (n=20;

SE= $9.7 \times 10^4$ ) at baseline to  $3.2 \times 10^4$  (n=20; SE= $2.9 \times 10^4$ ) after 6 months; in the Er group from  $3.6 \times 10^5$  (n=19; SE= $9.9 \times 10^4$ ) at baseline to  $7.1 \times 10^4$  (n=19; SE= $3.0 \times 10^4$ ) after 6 months. In the case of *Treponema denticola*, a significant reduction of bacteria was observed in the NdErNd group from  $3.0 \times 10^5$  (n=20; SE= $9.5 \times 10^4$ ) at baseline to  $1.4 \times 10^4$  (n=20; SE= $2.2 \times 10^4$ ); and in the Er group from  $2.4 \times 10^5$  (n=20; SE= $9.5 \times 10^4$ ) at baseline to  $6.2 \times 10^4$  (n=20; SE= $2.2 \times 10^4$ ) after 6 months. The number of *Porphyromonas gingivalis* decreased significantly only in the NdErNd group from  $1.9 \times 10^7$  (n=20; SE= $1.3 \times 10^7$ ) at baseline to  $1.8 \times 10^5$  (n=20; SE= $1.2 \times 10^5$ ) after 6 months. On the contrary, the number of *Aggregatibacter actinomycetemcomitans* decreased significantly only in the Er group from  $2.9 \times 10^3$  (n=20; SE= $1.6 \times 10^3$ ) at baseline to 95.0 (n=20; SE=67.1) after 6 months. The NdErNd treatment reduced the number of all tested bacteria of orange complex (Pi, Pm, Fn, Cg and En) after 6 months while the Er:YAG laser reduced only Pm, Fn and En in the same period.

**Conclusions:** Within the limits of our study it can be concluded that the combination of Nd:YAG and Er:YAG laser in non-surgical periodontal treatment results in superior microbiological outcomes in comparison to Er:YAG laser treatment alone.

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