

# Treatment of Peri-implantitis: Clinical Comparison Between Conventional Mechanical Debridement Versus Er,Cr:YSGG Laser Treatment

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## INTRODUCTION

Peri-implantitis is a plaque-associated pathological condition around dental implants, characterized by inflammation in the peri-implant mucosa and subsequent progressive loss of supporting bone<sup>1</sup>. Currently there is no “gold standard” of treatment for peri-implantitis<sup>2,3</sup> and laser therapy may provide some benefits over other treatment options. While there is a variety of lasers and protocols, all share the ability to irradiate bacterial deposits on implant surfaces<sup>4</sup> and clinically reduce pocket depths and inflammation. One of the proposed benefits of erbium lasers is the utilization of water to prevent thermal side effects<sup>5</sup>. Additionally, systematic reviews on the use of laser therapy and other therapies in both non-surgical<sup>6</sup> and surgical settings<sup>7</sup> show inconclusive evidence that any one technique is superior to others. **The aim of this study is to evaluate the efficacy of using an Er,Cr:YSGG laser as a monotherapy compared to mechanical debridement alone for the non-surgical management of peri-implantitis.**

## METHODS

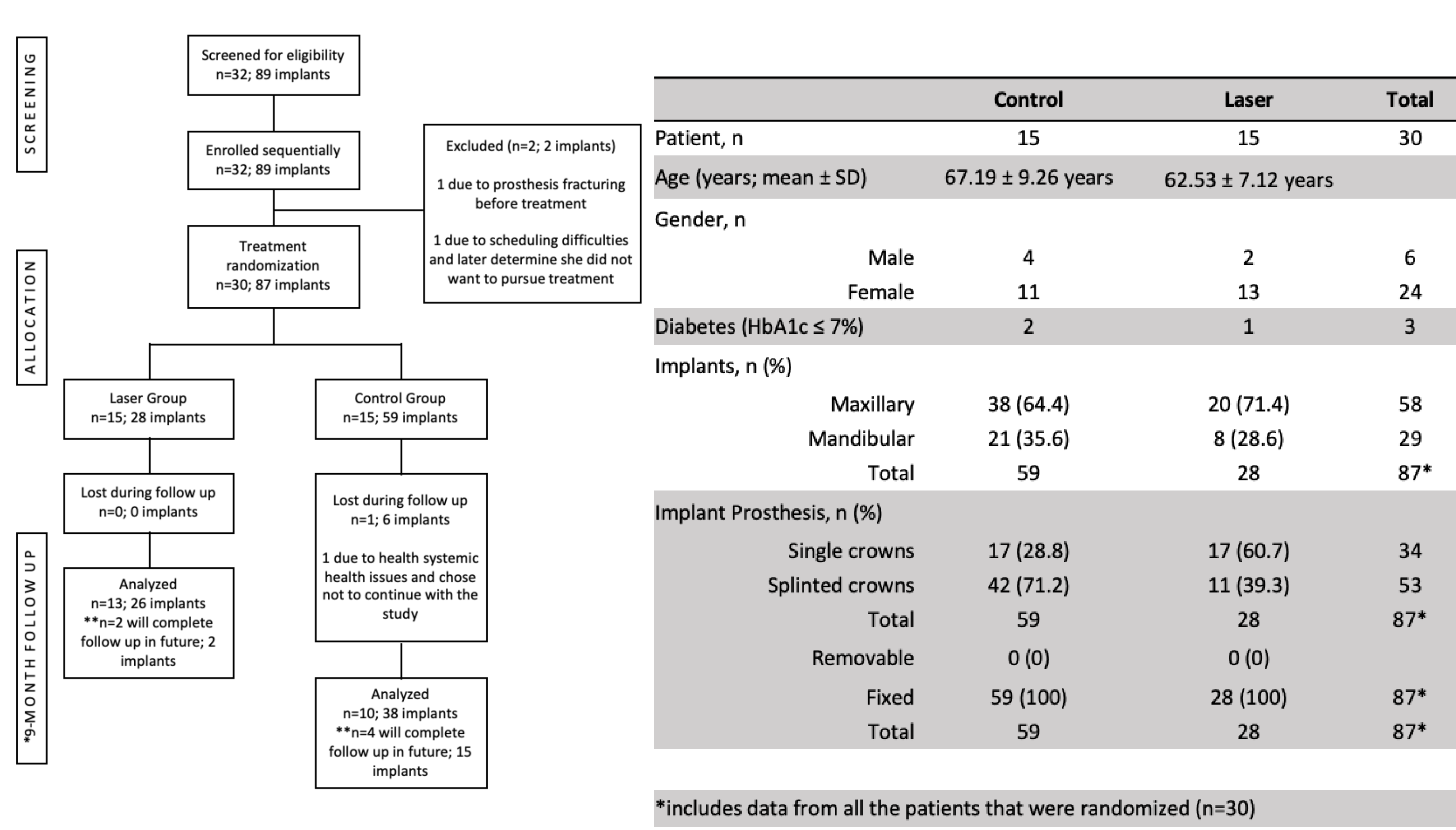
- Thirty-two patients recruited for a double-blind randomized control trial
- Inclusion criteria
  - Presence of at least 1 implant diagnosed with early to moderate peri-implantitis<sup>2</sup>
  - Medically healthy non-smokers (diabetic patients were included if HbA1c ≤ 7%)
  - No previous periodontal treatment except routine maintenance in the previous 3 months
- Power calculation shows that at least 13 patients per treatment arm were needed to have 90% power to detect a difference of 1.72 mm (SD: 1.13mm) in probing depth at 9 months of follow up after the use of Er,Cr:YSGG laser therapy<sup>8</sup>
- Primary outcomes: changes in probing depth and attachment loss; Secondary outcomes: changes in radiographic bone level, bleeding on probing, and plaque index
- At baseline and 9 months: standardized periapical x-rays and periodontal parameters recorded (6 sites per tooth/implant) including: probing depths (PD), clinical attachment levels (CAL), bleeding on probing (BoP), and plaque index (PI)
- Examiners and patients were blinded to treatment allocation. Randomization through sealed opaque envelopes opened by the operator at the time of therapy
- Treatment Arms:
  - Control: Scaling and root planning with an ultrasonic scaler (regular tips) and hand instrumentation (stainless steel curettes and scalers) and sham laser therapy
  - Test: Er,Cr:YSGG laser (Biolase), following the “Repair Protocol”
- Follow ups
  - At 1 week and 3, 6 and 9 months. Oral hygiene instructions provided at all follow-ups
  - Full mouth supragingival polishing at 3 and 6 months with prophy brush and paste
- Statistical analysis
  - Non-parametric Wilcoxon rank test was used for pair-wise comparisons between baseline and 9 months of periodontal outcomes in each group
  - Mann Whitney U test was used for comparing the treatment outcome between control and intervention group. A p-value less than 0.05 was considered as statistically significant

## RESULTS

- Data analysis was performed as intent-to-treat analysis including all randomized patients (n=30) and patients with 9 months follow-up results available (n=23; 13 laser, 10 control).
- Implant-Level Analysis**
- Probing Depths (PD)**
  - Baseline: Mean PD was comparable between laser (4.9mm) and control (4.7mm) (95% CI: 4.4-5.3mm and 4.3-4.9mm, respectively)
  - 9 months: Mean PD improved to 3.6mm (laser) and 4.0mm (control) (95% CI: 3.2-4.1mm and 3.6-4.3mm, respectively)
  - While PD improvements were significant within both laser and control groups (p<0.0001), there was no statistical difference between groups at 9 month follow up (p>0.05)
- Clinical Attachment Levels (CAL)**
  - Baseline: Mean CAL for laser and control groups were 5.7mm (95% CI: 5.1-6.2mm) and 5.2mm (95% CI: 4.9-5.5), respectively
  - 9 months: Mean CAL improved to 4.5 mm (laser) and 4.3mm (control) (95% CI: 3.9-5.1mm and 4.0-4.6mm, respectively)
  - Mean CAL improved for both laser and control groups (p<0.05) but improvements were not significant within treatment groups (p>0.05)
- Bleeding on Probing (BoP)**
  - Control: BoP decreased from 71% (95% CI: 55%-87%) to 51% (95% CI: 40%-62%) (p<0.05)
  - Laser: BoP decreased from 81% (95% CI: 69%-94%) to 45% (95% CI:23%-67%) (p<0.05)
  - While changes in BoP for both laser and control groups were significant (p<0.05) at 9 months, there were no significant differences between groups at 9 months (p>0.05)
- Plaque Index (PI)**
  - Control: PI decreased from 64% (95% CI: 48%-79%) to 34% (95% CI: 17%-50%) (p<0.05)
  - Laser: PI decreased from 55% (95% CI: 32%-77%) to 26% (95% CI:10%-42%) (p<0.05)
  - While changes in PI for both laser and control groups were significant (p<0.05) at 9 months, there were no significant differences in PI between groups at 9 months (p>0.05)

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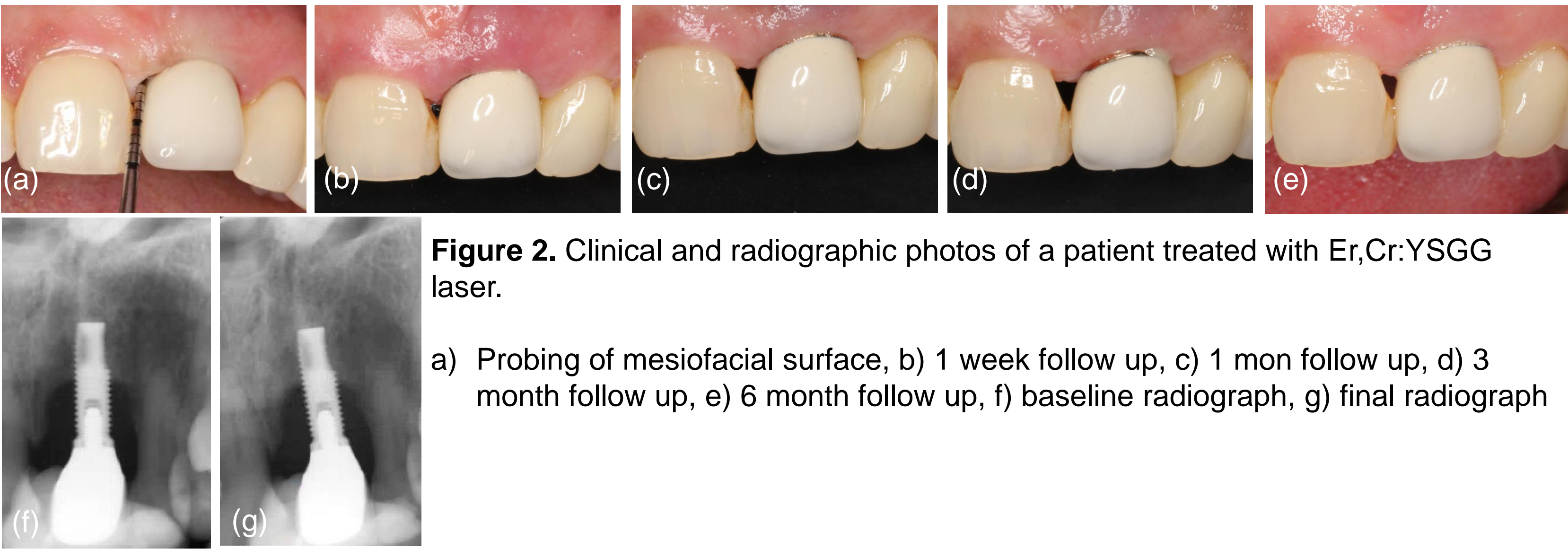


**Figure 1.** Flow chart depicting study design and allocation.

**Table 1.** Demographics and baseline parameters.

Parameter Mean ± 95% CI	Group	Baseline Laser: n=15 Control: n=15	9 Month Laser: n=13 Control: n=10	p-value
Full Mouth				
Probing Depth (PD), mm	Laser	2.7 (2.6-2.7)	2.5 (2.4-2.5))	<0.0001
	Control	3.0 (2.9-3.0)	2.7 (2.6-2.7)	<0.0001
	p between groups		<0.0001	
Clinical attachment level (CAL), mm	Laser	3.2 (3.1-3.3)	2.9 (2.8-3.0)	<0.0001
	Control	3.5 (3.5-3.7)	3.1 (3.0-3.1)	<0.0001
	p between groups		<0.0001	
Bleeding on Probing (BoP), %	Laser	24 (22-26)	17 (15-19)	<0.05
	Control	31 (29-33)	28 (26-30)	>0.05
	p between groups		<0.0001	
Plaque index (PI), %	Laser	38 (36-40)	34 (31-36)	<0.05
	Control	46 (44-28)	27 (24-29)	<0.05
	p between groups		<0.05	
Implant-level				
Probing Depth (PD), mm	Laser	4.9 (4.4-5.3)	3.6 (3.2-4.1)	<0.0001
	Control	4.7 (4.3-4.9)	4.0 (3.6-4.3)	<0.0001
	p between groups		>0.05	
Clinical attachment level (CAL), mm	Laser	5.7 (5.1-6.2)	4.5 (3.9-5.1)	<0.05
	Control	5.2 (4.9-5.5)	4.3 (4.0-4.6)	<0.05
	p between groups		>0.05	
Bleeding on Probing (BoP), %	Laser	81 (69-94)	45 (23-67)	<0.05
	Control	71 (55-87)	51 (40-62)	<0.05
	p between groups		>0.5	
Plaque index (PI), %	Laser	55 (32-77)	26 (10-42)	<0.05
	Control	64 (48-79)	34 (17-50)	<0.05
	p between groups		>0.5	

**Table 2.** Means (95% CI) of the baseline and 9 month periodontal and peri-implant parameters.



## CONCLUSIONS

- Non-surgical treatment of peri-implantitis by mechanical debridement or laser result in clinically healthier periodontal parameters
- Statistically significant differences were not observed at 9 months between control and laser groups in different periodontal parameters such as CAL, PD, BoP, and PI

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