



Er: YAG Laser-assisted Surgical Treatment for Moderate to Advanced Peri-implantitis

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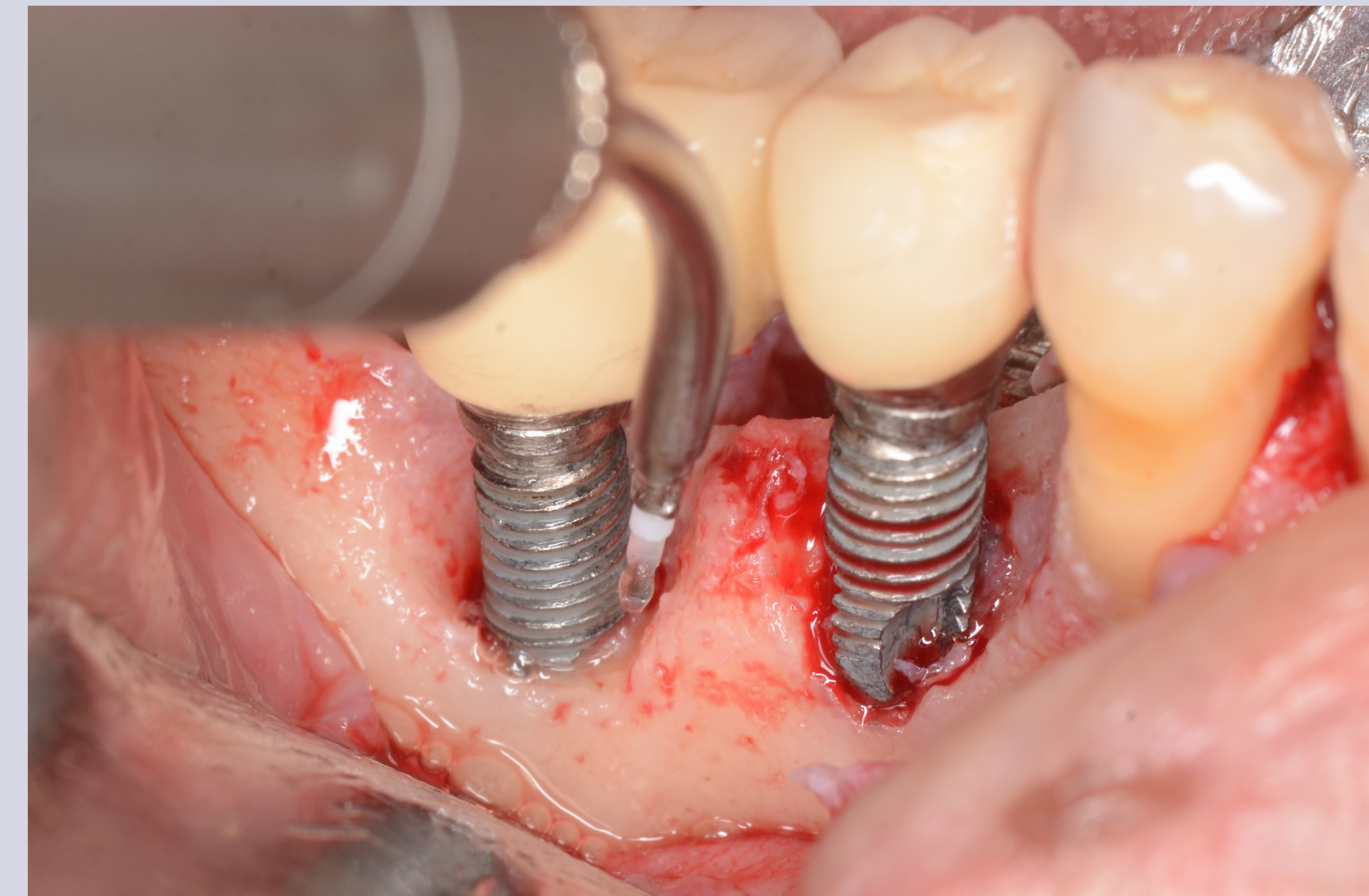
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Introduction

Peri-implantitis

- A common and tricky biological complication. (Derks J, 2015)
- Non-surgical treatment
 - Reduce soft-tissue inflammation (BoP). (Suárez-López Del Amo F, 2016; Ramanauskaite A, 2016)
 - Not effective in disease resolution. (Figuero E, 2014)
- Surgical treatment
 - Implantoplasty: effective in disease resolution. (Romeo E, 2005, 2007; Monje A, 2022)
 - Do not favor any decontamination approaches. (Suarez F, 2013; Koo KT, 2019)
- Lasers
 - A bactericidal effect without alteration of the implant surface. (Schwarz F, 2005)
 - Assist in probing depth reduction (Wang CW, 2021)
 - Limited evidence and presented controversial short- and long-term clinical benefits (Kotsakis GA, 2014; Natto ZS, 2015; Lin GH, 2018)



Aim

- To evaluate the outcome of using the erbium-doped yttrium aluminum garnet (Er: YAG) laser for decontamination in the surgical treatment of moderate to advanced peri-implantitis.



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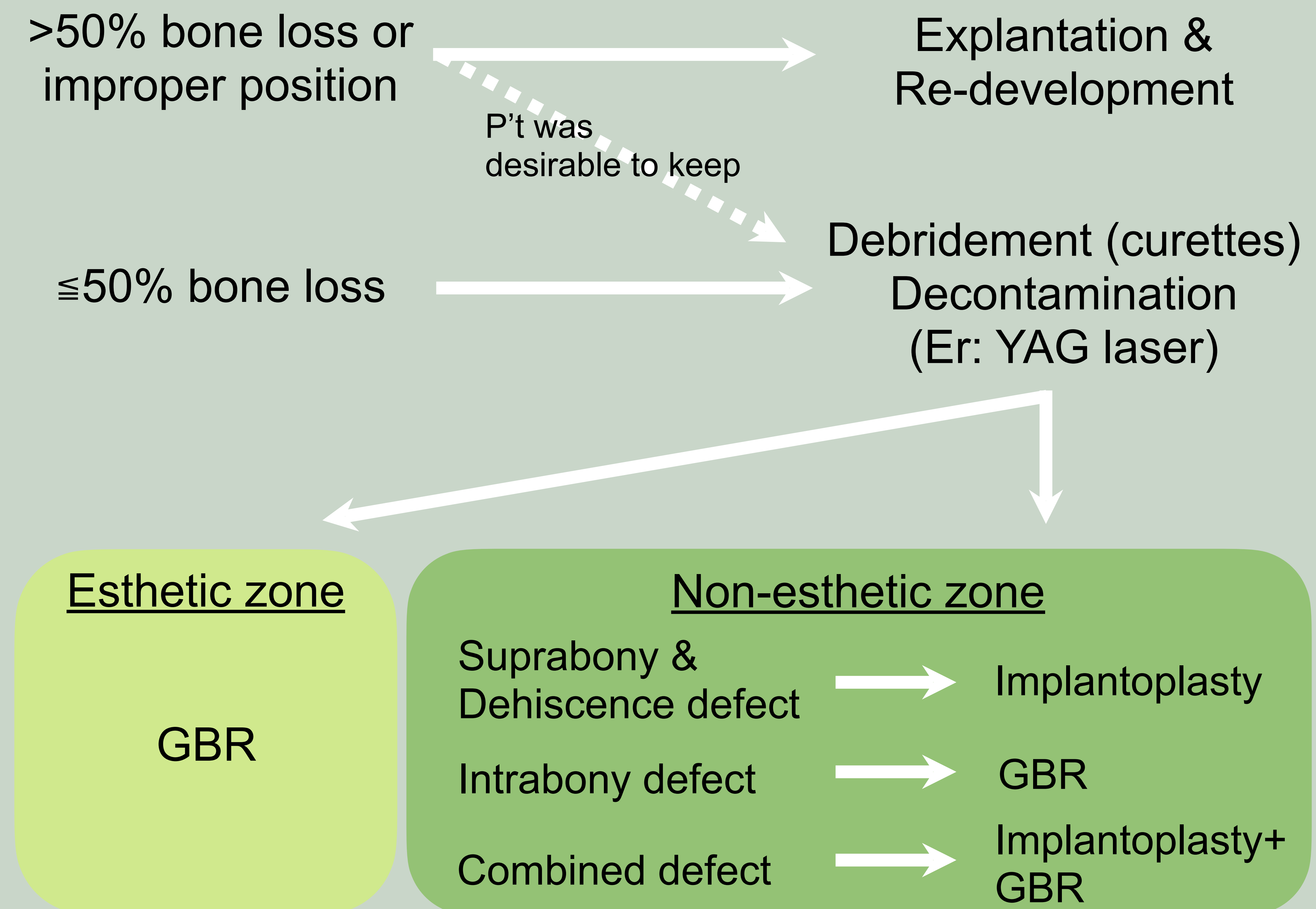
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Materials and Methods

- All patients diagnosed with peri-implantitis received non-surgical and surgical treatment by the same surgeon (Tai-Yang Lin).
- During surgical treatment, implant surface debridement and decontamination with titanium curettes (Hu-Friedy Co., USA) and Er: YAG laser (AdvErL EVO, Morita, Japan) (20 PPS, 60 mJ/pulse) were accomplished.
- In the non-aesthetic zone, implantoplasty was done over supra-bony and dehiscence defects, and regenerative therapy with freeze-dried bone allograft (OraGRAFT®, LifeNet Health Inc., USA) and collagen membranes (BioGide®, Geistlich Biomaterials, Switzerland) over intra-bony defects was also completed.
- In the aesthetic zone, the operator would do only regenerative therapy after implant surface debridement and decontamination.
- Re-evaluation was arranged six months after surgery and kept a 3-month follow-up.

Decision-Making Process of Surgical Treatment





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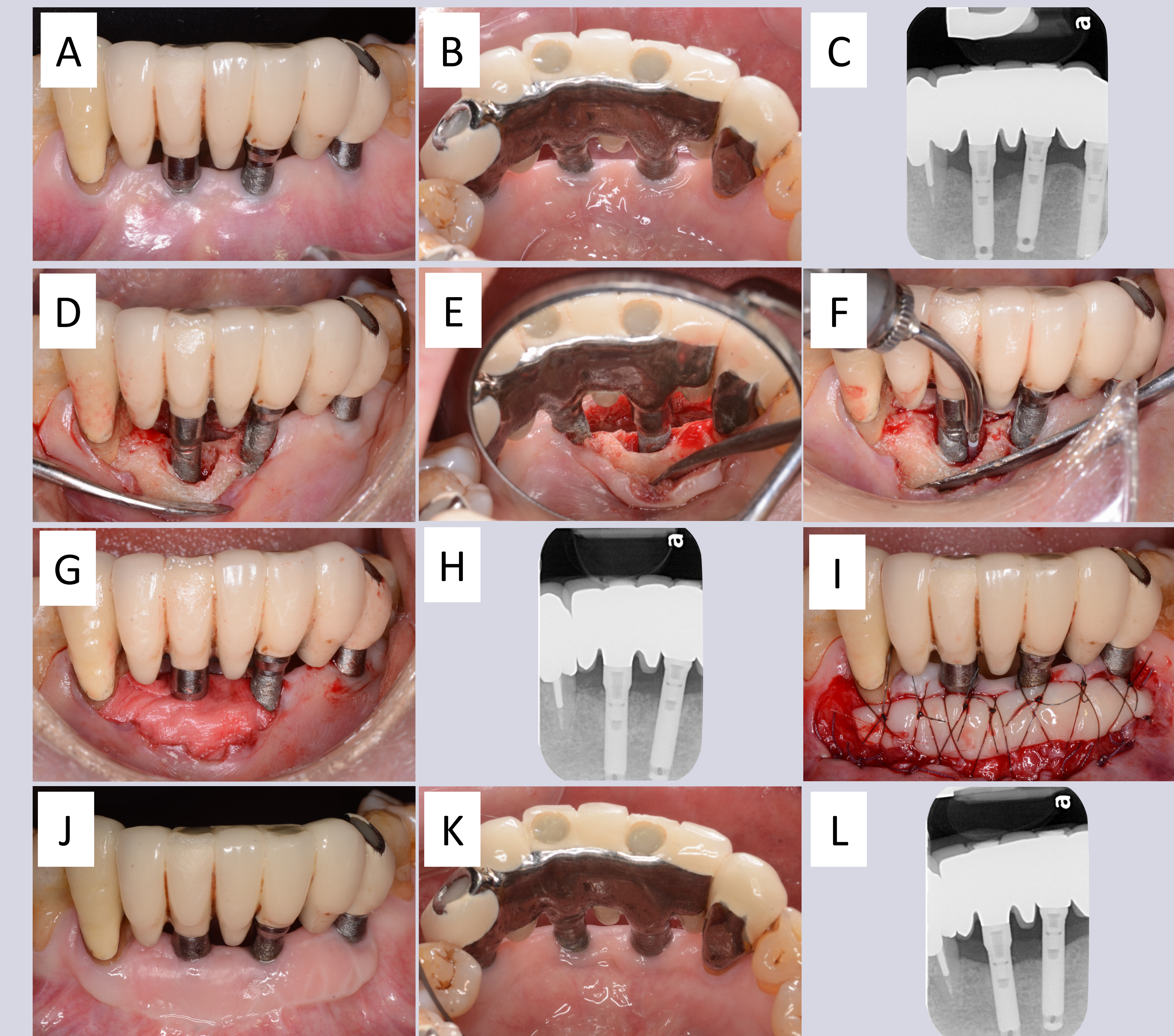
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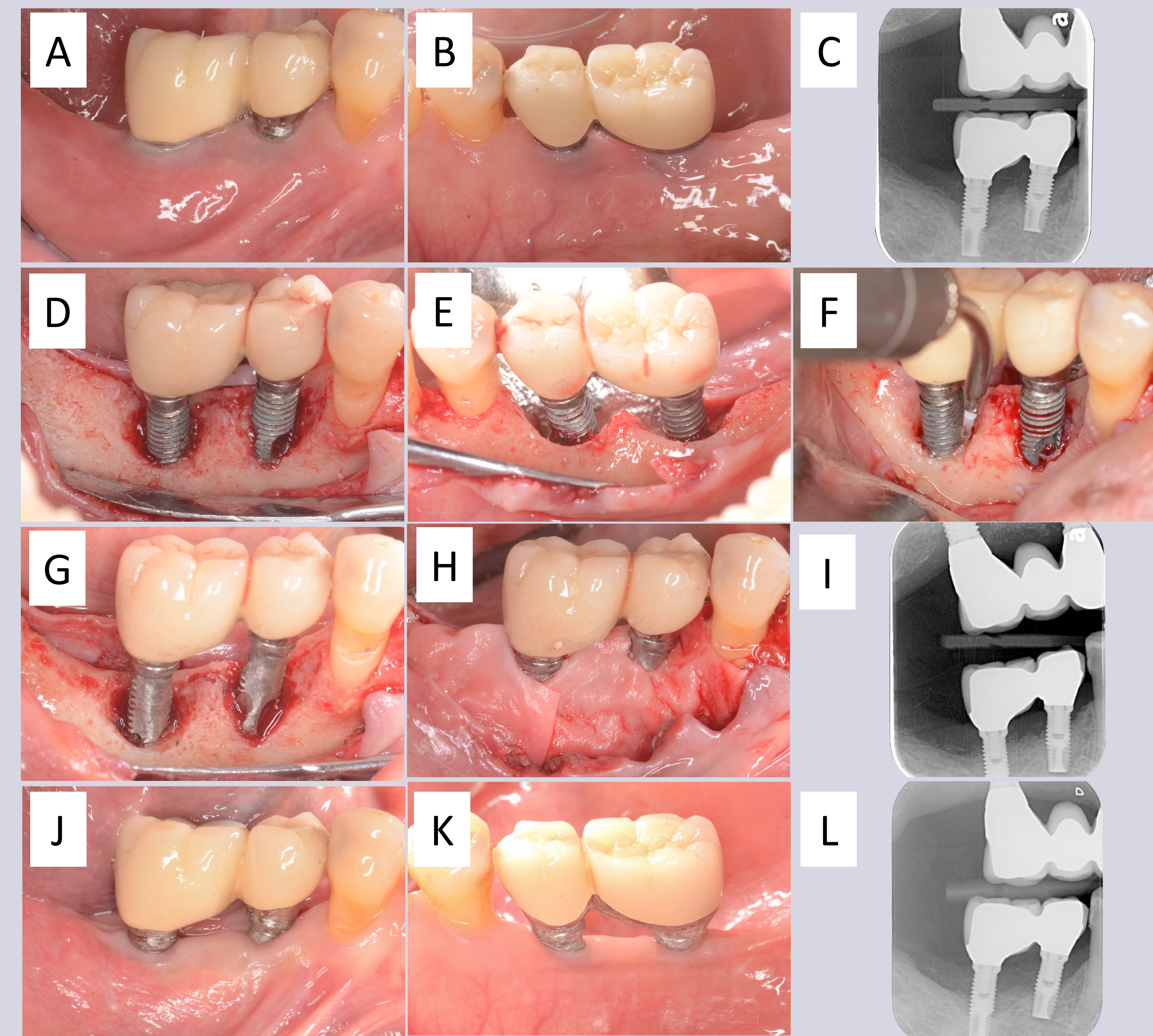
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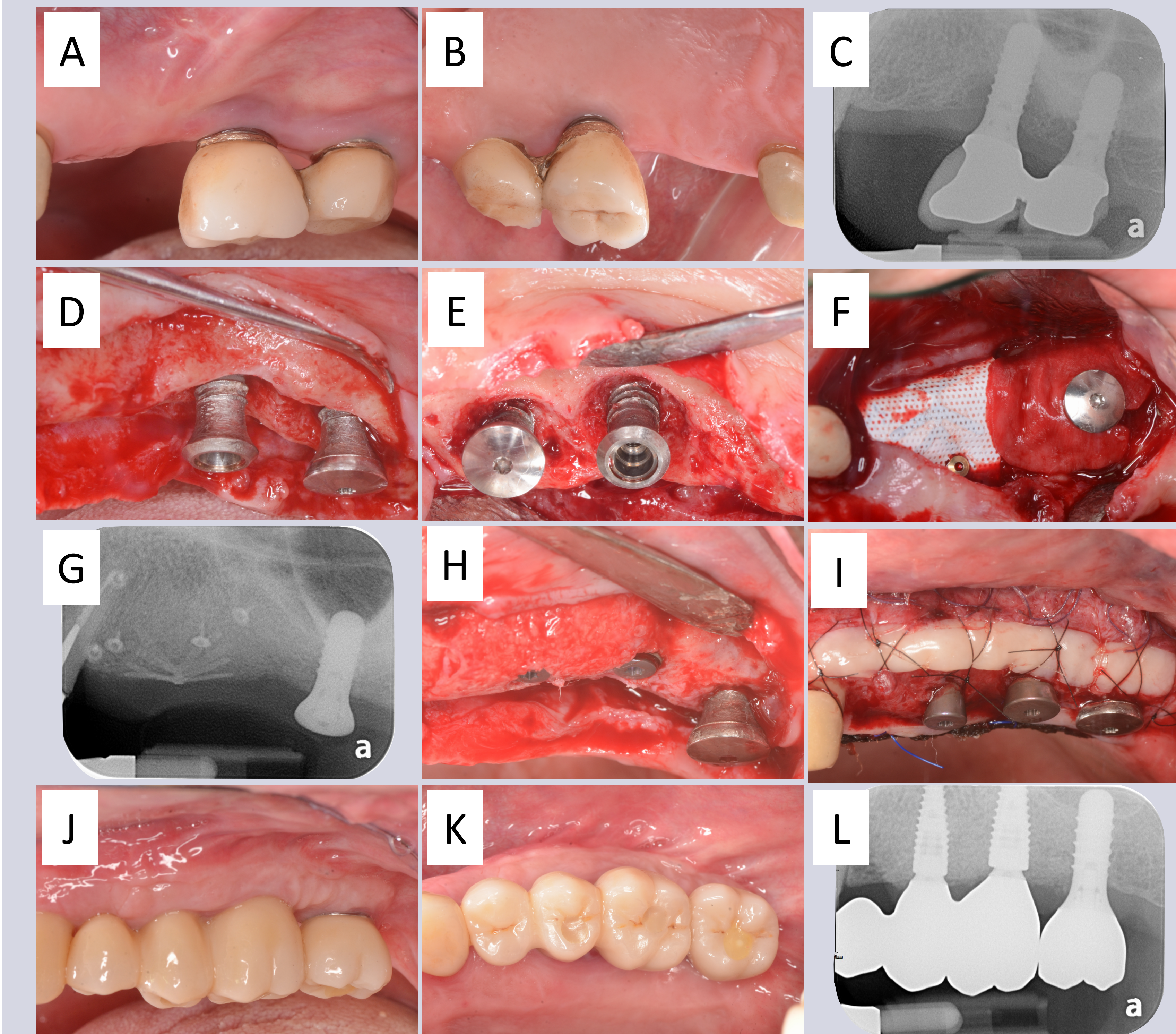
Materials and Methods



(A-C) Initial photo and x-ray; (D, E) Flap reflection; (F) Er: YAG laser decontamination; (G) Bone augmentation; (H) Post-OP x-ray (I) Free keratinized mucosal graft; (J-L) 24 M follow-up



(A-C) Initial photo and x-ray; (D, E) Flap reflection; (F) Er: YAG laser decontamination; (G) Implantoplasty; (H) Bone augmentation; (I) Post-OP x-ray; (J-L) 12 M follow-up



(A-C) Initial photo and x-ray; (D, E) Flap reflection & Er: YAG laser decontamination; (F) Bone augmentation; (G) Post-OP x-ray ; (H) Re-entry & implantation; (I) Free keratinized mucosal graft; (J-L) 18 M follow-up



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Results

- Thirteen implants (mean function time of 10.8 years) in eight patients (mean age of 65.6 years) diagnosed with moderate to advanced peri-implantitis were successfully treated by Er: YAG laser-assisted surgical treatment.
- The operator performed all surgeries uneventfully following the decision-making process. No membrane exposure and other complications have occurred.
- The mean probing depth reduction and radiographic bone fill (RBF) was 3.5±0.7 mm and 2.9±1.0 mm, respectively.
- The mean reduction in bleeding on probing (BoP) was 84.6±12.6 %.
- All implants became maintainable, healthy, and also aesthetic in the aesthetic zone during the 6 to 30 months follow-up.

	Age	Function time (year)	Re-evaluation Time (M)	Probing depth (PD)			ΔBoP (%)	RBF (mm)	RBF (%)
				Pre-OP	Re-evaluation	Reduction			
Mean (SD)	65.6±6.2	10.8±5.4	6-30	*6.7±0.6	*3.1±0.5	*3.5±0.7	◆84.6±12.6	2.9±1.0	83.8±18.5

BOP: bleeding on probing. RBF: radiographic bone fill. * Mean PD (mm) at initial PD for sites ≥ 6 mm ◆ Mean BoP (%) reduction at initial BoP sites



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Discussion & Conclusion

- Er: YAG laser-assisted surgery showed better radiography bone fill and probing depth reduction compared to previous review studies.
- Er: YAG laser-assisted surgical treatment may arrest moderate to advanced peri-implantitis and demonstrate promising clinical and radiographic improvements 6 to 30 months postoperatively.

Author (year)	Study Type	Re-evaluation (M)	CAL gain (mm)	PD reduction (mm)	ΔBOP (%)	RBF (mm)
P Sahrman (2011)	Systematic Review	5-36		3.29 (GBR)	36-68.7 (GBR)	2.2 (GBR)
CM Faggion (2013)	Network Meta-Analysis	4-12	0.67 (non-surgical) 1.1 (surgical)	0.66 (non-surgical) 2.84-3.1 (surgical)		
HL Chan (2014)	Systematic Review Meta-Analysis			2.38±0.53(OFD) 2.04±0.15 (ROS) 2.32±1.29(Graft) 3.16±0.62(GBR)		2 (Graft) 2 (GBR)
C Tomasi (2019)	Systematic Review Meta-Analysis	12	1.8 (regeneration)	2.8 (regeneration)		2 (GBR)
Our Study	Case Series	6-30		3.5±0.7	84.6±12.6	2.9±1.0

OFD: open flap debridement. ROS: recsective osseous surgery. GBR: guided bone regeneration.