Microbiological and Clinical Assessments of Erbium Chromium: YSGG Laser as an Adjunctive to Surgical Treatment of Chronic Periodontitis

(Randomized Clinical Trial)

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Alaa S. M. Hashim

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List of Abbreviations

AA	*Actinobacillus Actinomycetemcomitans*
B-DNA load	*Bacterial Deoxyribonucleic acid load.*
B-DNA	Bacterial deoxy nucleotide
CAL	Clinical attachment loss
CO2 laser	Carbon dioxide laser
CS	Conservative surgeries
DGJ	Dentogingival junction
ELAPT	Er, Cr: YSGG laser assisted pocket therapy
ELISA	Enzyme-linked immunosorbent assay
Er, Cr: YSGG laser	Erbium, Chromium: Yttrium, Scandium, Gallium, Garnet laser.
Er: YAG laser	Erbium: Yttrium- Aluminum- Garnet laser
FDA	Food and Drug Administration

GCF	Gingival crevicular fluid
GI	Gingival index.
GR	Gingival recession.
HGF	Human Gingival Fibroblast Cell Line
Laser	"Light Amplification by Stimulated Emission of Radiation"
LCPT	Laser-Assisted Comprehensive Pocket Therapy
LPS	Lipopolysaccharide
MIS	Minimally invasive surgery
MIST	Minimally invasive surgical technique
M-MIST	Modified minimally invasive surgical technique
MPPT	Modified papilla preservation technique
MSBI	Modified sulcular bleeding index
Nd: YAG laser	Neodymium: Yttrium–Aluminum–Garnet laser
OFD	Open flap debridement

PCR	Polymerase chain reaction
PD	Probing depth
PDP	Periodontal disease progression
PG	Porphyromonas Gingivalis
PI	Plaque index
PPF	Papillary preservation flap
QPCR	Quantitative Polymerase chain reaction
RFPT	Radial Firing Perio Tip
RT- qPCR	Real-time quantitative PCR
SFA	Single flap approach
SPPF	*Simplified papilla preservation flap*
TF	*Tannerella Forsythia*

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Introduction

Periodontal disease is considered a multifactorial disease of high worldwide prevalence ***(Pihlstrom et al. 2005)***. Periodontal disease is an inflammatory disease initiated by opportunistic bacteria residing in the oral cavity and causes the periodontal breakdown. The aim of periodontal therapy is to involve both arresting the disease process and the regeneration of the lost tissues to the preexisting state ***(Pihlstrom et al. 2005).***

Scaling and root planing with hand instruments are regarded as the gold standard in treating periodontal diseases. However, there are some limitations, such as the difficulty to access deep pockets and furcation areas, in addition to the long treatment time and patient discomfort. Additionally, manual scaling produces a smear layer, which in turn may be related to lower initial stability of the clot on the root surface, which marks the initial process of periodontal regeneration ***(Lopes et al. 2008)***.

Clinicians continue to search for therapeutic modalities to assist in both surgical and non-surgical periodontal therapy to overcome its limitations and enhance regeneration of lost tissues **(Cochran et al. 2015; Mathew et al. 2018)**.

Dealing with emerging technologies, require an illustration of both positive and negative issues of clinician adoption and patient acceptance of treatment ***(Cochran et al. 2015)***.

Obstacles to adopting an emerging technology include limited evidence supporting the efficacy and indications for use, safety issues include unknown long-term effects along with known risks ***(Cochran et al. 2015)***.

Recently, various emerging technologies for periodontal regeneration were discussed, as protein and peptide therapy, cell-based therapy, genetic therapy, application of scaffolds, bone anabolic, and lasers. Other approaches included therapies directed at the resolution of inflammation, therapies that took into account the influence of the microbiome and therapies involving the local regulation of phosphate and pyrophosphate metabolism ***(Cochran et al. 2015)***.

A growing interest for more friendly and patient-oriented surgery has urged clinical investigators to focus their interest in the development of less invasive approaches ***(Cortellini 2012)***. In the past few decades, Laser Assisted Comprehensive Pocket Therapy (LCPT) concept has gained considerable interest in the field of periodontal therapy ***(Aoki et al. 2015)***.

As laser techniques are strictly frequency and tissue dependent. One laser cannot be applied to all the various tissue