THE TREATMENT OF CHRONIC PERIODONTITIS BY NON-SURGICAL PERIODONTAL THERAPY IN ASSOCIATION WITH DIODE LASER COMPARED TO CONVENTIONAL NON-SURGICAL THERAPY

Randomized controlled clinical trial

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KEYWORDS: Periodontitis, ablation, root planing, laser therapy

ABSTRACT

Mechanical surface treatment and removal of the above and subgingival biofilm (Tartar ablation; SRP) are considered the most suitable tools for the treatment of periodontal inflammatory diseases, with the aim of destroying bacterial biofilm, reducing bacteria, and slowing down recolonization by pathogenic microorganisms.

Often, however, the only SRP are not enough, as there are patients who are experiencing relapses.

Recently, laser therapy has been suggested as a potential tool to improve the outcome of periodontal non-surgical treatment.

The objective of the following study was to evaluate the clinical healing of periodontal pockets treated with mechanical therapy, scaling and root planing, and diode laser application, compared to that obtained with non-surgical mechanical therapy alone.

The study was designed as a randomized controlled clinical trial. Patients in the control group (13 patients) underwent conventional non-surgical therapy only, while patients in the test group (17 patients) were associated with conventional non-surgical treatment, a laser irradiation session.

At baseline and after 6 months, the parameters of probing depth (PD), bleeding on probing (BOP), gingival recession (REC) were assessed

The main variable of this study was the PD (probing depth)

FMPS and FMBS at follow-up improved in both groups. The FMPS baseline test group 32.59 ± 6.74 - follow up 12.00 ± 3.16 .

The baseline of the control group showed 33.00 ± 9.55 , the follow up 13.15 ± 4.85 The FMBS baseline test group found 24.29 ± 5.01 while at follow 9.65 ± 2.69 . The baseline control group 30.31 ± 7.74 , Follow up 11.08 ± 2.33 . There is a statistical significance. (P.VALUE 0.0001)

There were no significant differences between the groups in terms of PD, CAL and BOP at baseline and at follow-up.

PD Test group	4.89 ± 1.58	3.95 ± 0.85	0,0001
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Control group	5.02 ± 1.57	4.01 ± 0.86	
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CAL (mm) Test group	0.89 ± 2.29	0.77 ± 1.91	
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Control group	0.28 ± 1.38	0.24 ± 1.14	
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REC Test group	0.19 ± 0.49	0.19 ± 0.51	
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Control group	0.06 ± 0.29	0.57 ± 0.29	
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BOP Test group	51,2%	23,5%	
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Control group	54,0%	20,9%	
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The results showed differences in both baseline and follow-up for REC.

Test group	0.19 ± 0.49	0.19 ± 0.51	
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Control group	0.06 ± 0.29	0.57 ± 0.29	
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In intra-group analyzes, there are differences between baseline and follow-up for all values, except for REC in the control group.

The diode laser can be used as an appropriate device for periodontal treatments, but it can offer additional and significant benefits if used according to appropriate protocols and parameters, and especially if associated with non-surgical, manual and ultrasound periodontal instrumentation, always site-specific, as it is a tool that does not replace traditional methods.

INTRODUCTION

Periodontal disease is a chronic inflammatory process, characterized by a bacterial etiology and by a cyclic evolution that determines a progressive and specific destruction of the supporting tissues of the tooth.¹ The use

of the diode laser in non-surgical therapy does not replace treatment conventional, but can be associated and contribute to the success of therapy^{2,3}. The term "laser" is an acronym: light amplification by stimulated emission of radiation, which indicates an amplified light

radiation.⁴ Periodontitis is an inflammatory response to the accumulation of bacterial biofilm with consequent destruction of the surrounding tissues. Non-surgical therapy is carried out to remove the bacterial biofilm from the root surface and stop the inflammatory process thus decreasing the bacterial load.⁵⁻⁶

It is now known that non-surgical etiological therapy, through the control and removal of the bacterial biofilm and the tartar above and below the gingival, is at the basis of the prevention of periodontal disease and the maintenance of periodontal patients.⁷⁻⁸

The etiology of this pathology is not attributable to a single bacterial species, but on the contrary it is the interaction between several specific pathogenic species, which contributes to the destruction of periodontal tissues.

In particular, subgingival species such as *Aggregatibacter actinomycetemcomitans* (Aa), *Porphyromonas gingivalis* (Pg) *Prevotella intermedia* (Pi) *Tannerella forsythensis* (Tf) and *Treponema denticola* (Td) are considered to be the pathogenic species responsible for the disease.⁹

Over time, it was then observed that the results obtained with the ablation techniques with manual instruments and with sonic and ultrasonic instruments, proved to be superimposable.¹⁰

Starting from these bases, the interest of the scientific community has slowly shifted more and more on the modifications that these treatments cause on the subgingival microflora, highlighting an effective reduction of the bacterial load, following the periodontal scaling therapies, once again confirming the efficacy of such therapies for the treatment of periodontal disease.¹¹

Finally, in recent years, the use of laser light in addition to conventional methods is spreading, but information about the results obtained is scarce.

The effective bactericidal power of this light radiation has been amply demonstrated in the bibliography, both through in vitro and in vivo studies.¹²

Some studies, including the one conducted by Derdilo-poulou and coll.¹³ in which an Er: YAG laser is used, and the most recent systematic review concerning the matter, agree in stating that the use of the laser to reduce the charge bacterial periodontal pathogen, does not appear to guarantee any additional effect, compared to normal periodontal scaling procedures.

Articles that focus their attention on the microbiological effects of the diode laser, compared to clinical evaluations are scarce, but even here many agree in reiterating that there are no substantial differences.¹⁴

Non-surgical periodontal therapy aims at the cleansing and / or detoxification of the coronal and radicular surfaces¹⁵ in order to promote the existence of a subgingival microflora that is compatible with the periodontal health¹⁶ and above all the maintenance of the balance conditions achieved.¹⁷

Evidence-based dental literature agrees that non-surgical periodontal instrumentation is associated with a greater attack gain than surgery.¹⁸⁻¹⁹

Over time (5-6 years), all periodontal parameters are improved in case of non-surgical treatment.²⁰

Non-surgical periodontal instrumentation can be performed according to multiple and different protocols.²¹⁻²²⁻²³⁻²⁴

There is no ideal protocol for the initial preparation, therefore the operator will evaluate the patient's clinical conditions and psychological aspect and then de-

cide on the most appropriate and personalized treatment modalities for individual needs.

The effectiveness of non-surgical periodontal treatment is linked both to the technique and manual skill of the operator but also to the selection of suitable instruments.²⁵

■ LASER ASSISTED PERIODONTAL THERAPY

An emerging technology also in the field of non-surgical periodontology is represented by the laser with a wavelength between 808 and 980 nanometers, in the infrared spectrum, with a gallium arsenide source, more commonly called diode.

Used according to the protocols of international scientific literature, it has a bactericidal and detoxifying effect on the root surface, as it inactivates bacterial toxins²⁶, causes haemostasis, does not produce smearlayer, however randomized controlled studies that demonstrate its efficacy and cost-evaluation are lacking. benefit is still unfavorable if its use is limited to non-surgical periodontology, intended as a causal preparation.²⁷ Laser therapy has an anesthetizing effect²⁸, because it reverses the Sodium and Potassium pump at the cell membrane level for about 30 minutes, therefore this protects the patient's comfort. Interacting with endogenous chromophores such as melanin and hemoglobin, it causes the vaporization of the granulation tissue, which comes out of the pocket in the form of clots, associated with reduced bleeding thanks to the hemostasis effect. The reduction of the inflamed tissue thus obtained facilitates the operator in subsequent instrumentation maneuvers, which remain necessary.

The use of the laser must be preceded and followed by abundant washing with chlorhexidine digluconate, for preoperative disinfection and to facilitate the elimination of clots, whips and residual deposits in the pocket.

Different powers are used to activate a photothermal interaction that acts on the different biological tissues.²⁹ The passage of the electric current causes an induced heating of the laser beam which generates pressure pulses, both in the air close to the irradiated surface and in the fabric itself, with consequent photomechanical reaction. It also triggers a photochemical reaction with endogenous chromophores such as melanin and hemoglobin.³⁰

■ BACKGROUND OF THE STUDY

The treatment of choice for periodontitis must be the simplest and least traumatic one capable of stopping the disease by controlling its activity phases.

The first therapeutic approach is based on mechanical procedure³¹, the so-called scaling & root planing (S&RP)³² which allow the removal of this biofilm and promote tissue repair.³³

In non-responsive patients additional therapeutic strategies are associated with treatment with S&RP which improve the results. Traditionally, the choice of additional therapy necessarily fell on the use of antibiotics given systemically or topically or on the use of antiseptics such as chlorhexidine.

In both the first and the second case, the rationale for this association lies in the fact that while mechanical therapy removes the sessile forms of the bacteria that make up the biofilm, antibiotics or antiseptics destroy the planktonic forms including those released by the biofilm by mechanical therapy. and prevents them from

FOLLOW-UP

[illegible]

CASE 2: CONTROL GROUP
Dental element 34 mesio-buccal, male, non-smoking smoke
BASELINE:

[illegible]

u^b

CASE 2: TEST GROUP

Disto-buccal dental element 15, Male, Smoker smoke <10 / day

BASELINE:

Laser therapy

FOLLOW-UP

zmk bern
Zahnmedizinische Kliniken
der Universität Bern

u^b

Clinica di Parodontologia

Cartella Parodontale

Data: 20/04/2017

Paziente Cognome: DE CRESCENZO Nome: ANTONIO Data di nascita: 10/07/1978

☐ Visita Iniziale ☒ Rivalutazione

Denuncia corrente

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Strat. corono-odontale	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Placca	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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Strat. corono-odontale	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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TAB.1	GRUPPO TEST (N° 17)	GRUPPO CONTROLLO (N°13)	p-VALUE
ETÀ	49,76±6,57	51,85±6,65	0,345
SESSO	6F/11M	9F/4M	0,065
FUMO	9N/8S	10N/3S	0,177

Tab. 1 - Demographic data

TAB.2	BASELINE	FOLLOW-UP	P-VALUE
FMPS			
Test group	32,59±6,74	12,00±3,16	0,0001S
Control group	33,00±9,55	13,15±4,85	0,001 S
P-value	0,769	0,528	
FMBS			
Test group	24,29±5,01	9,65±2,69	0,001 S
Control group	30,31±7,74	11,08±2,33	0,0001 S
P-value	0,029S	0,083	

Tab. 2 - Clinical variations relating to fmfs and fmbs Register with baseline and after 6 months of follow-up

TAB.3	Baseline	Follow-up	p-Value
PD (mm)			
Test group	4,89±1,58	3,95±0,85	0,0001S
Control group	5,02±1,57	4,01±0,86	0,0001 S
p-value	0,075	0,129	
CAL (mm)			
Test group	0,89±2,29	0,77±1,91	0,0001 S
Control group	0,28±1,38	0,24±1,14	0,0001 S
p-value	0,0001 S	0,0001 S	
REC			
Test group	0,19±0,49	0,19±0,51	0,999
Control group	0,06±0,29	0,57±0,29	0,096
p-value	0,0001 S	0,0001 S	
BOP			
Test group	51,2%	23,5%	0,0001 S
Control group	54,0%	20,9%	0,0001 S
p-value	0,237	0,212	

Tab. 3 - Clinical variations relating to variables register with baseline and after 6 months of follow-up

- Finally, a six-month follow-up was carried out, with the aim of re-evaluating the data collected during the initial charting, to verify the effectiveness of the traditional non-surgical treatment, and of the non-surgical treatment associated with laser therapy.

Statistical analyses

The variables considered are expressed in millimeters for PD, REC, CAL and in percentages for FMBS, FMPS and BOP.

Baseline and follow up values were compared by paired tests.

The tests used are those of Wilcoxon and T-TEST
A p-value <0.05 was considered statistically significant.

RESULTS

DEMOGRAPHIC DATA: TABLE 1 for this experimental study we initially considered 40 patients, evaluating the exclusion and inclusion criteria we chose 30 patients for the randomized controlled clinical study. In the test group (GT) we studied 17 patients as clinical cases, in the control group (GC) 13 patients. An initial baseline visit and a six-month follow-up took place. According to statistics, the average age of the patients is around 49-51 years, in the GT male and non-smokers prevail; in the GC female and smokers prevail. (Fig.3)

CLINICAL VARIATIONS RELATING TO FMBS AND FMPS: TABLE 2

From the statistics carried out the FMPS and FMBS to

follow-up improved in both groups. There is a statistical significance.

CLINICAL VARIATIONS RELATING TO THE VARIABLES: TABLE 3

From the statistics carried out it is clear that there are no significant differences between the groups in terms of PD, CAL and BOP at the baseline and at follow-up. There are differences in both baseline and follow-up for REC.

In intra-group analyzes, there are differences between baseline and follow-up for all values, except for REC in the control group.

DISCUSSION

The purpose of periodontal treatment is biological restoration and reattachment of periodontal tissues to the root surface. Thus, in the first phase of periodontal treatments, mechanical debridement and planning of the root surface are performed by manual and ultrasonic instruments. These tools make the tooth surface less susceptible to bacterial adhesion and predisposing them to a new periodontal clinical attack.

In the current study, the clinical parameters of PD,

CAL, REC and BOP were measured before and 6 months after treatment.

Patients who met the selected inclusion criteria were selected for the trial.

The results indicate an improvement in these indices both in the laser group and in the control group, except for the REC in the latter.

Although the improvements have been more evident, the difference is not statistically significant.

The laser can be considered an adjunctive therapy to other conventional methods of treatment.

CONCLUSIONS

The analysis of the results obtained leads to conclusions consistent with what is already present in the literature.

The diode laser can be used as an appropriate device for periodontal treatments, but it can offer additional and significant benefits if used according to appropriate protocols and parameters, and especially if associated with non-surgical, manual and ultrasound periodontal instrumentation, always site-specific , as it is a tool that does not replace traditional methods.

Fig. 3 (demographic data)

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