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Clinical Efficacy of Soft Tissue Diode Laser as an Adjunct to Non Surgical Periodontal Therapy

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ABSTRACT

Objectives: The aim of this study is to evaluate the clinical efficacy of soft tissue 980-nm diode laser with SRP versus the effects of SRP alone.

Materials and Methods*:* 50 patients with chronic periodontitis were selected for clinical study. SRP was performed using sonic device and hand instruments and sites were randomized to receive Laser Treatment (Test Group and Control Group).Laser therapy was applied to periodontal pockets on day 1, at 7th day and at 3 months. After SRP. Baseline data, including Pocket probing Depth (PPD), Clinical Attachment level (CAL) ,Plaque index (Silness and Loe 1964) ,Gingival index (Loe & Silness 1963) and Gingival Bleeding index (Ainamo & Bay 1975)were recorded before the treatment, at 6 weeks, at 3 months and at 6 months after treatment.

Results*:* The results revealed significant reductions in PD and CAL values were observed in both groups after 6 and 18 weeks. However, no significant differences in BOP were seen between the groups after 6 weeks ($P < 0.05$). Significant differences were found in Plaque Index and Gingival Index between Group I and Group II at baseline or at 6 and 18 weeks after treatment similar for both groups

Conclusion*:* The present study indicates that, compared to SRP alone, multiple adjunctive applications of a 980-nm diode laser with SRP showed improvements in clinical parameters.

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Keywords: Lasers; Soft Tissue Diode Lasers; Periodontal diseases; Periodontitis; Scaling and root planning (SRP); Probing Depth; Plaque.

INTRODUCTION

Chronic periodontitis is a disease characterized by inflammation within the supporting tissues of the teeth, progressive attachment loss and bone, along with periodontal pocket formation and/or recession of the gingiva.(1) The inflammatory periodontal diseases are known as being caused by dental plaque.(2) The main objective of periodontal therapy is to restore and maintain the health of teeth and periodontium.

Both surgical and non-surgical treatment modalities have been used in the treatment of periodontal diseases. Non-surgical periodontal treatment is the starting point of periodontal therapy and the first approach for the control of periodontal infections. However, conventional debridement using curettes is still technically difficult and complete removal of bacterial deposits and their toxins from the root surface is not necessarily attained with conventional mechanical therapy.(3)

In addition, access to areas which include furcations, concavities, grooves is limited.(4) These concerns provided the limiting factors to long term stability of the treatment outcomes of non-surgical techniques and became the basis for the need for adjunctive therapies.(5)

Laser therapy has been postulated as an alternative or adjunctive treatment to periodontal therapy. The bactericidal and detoxifying effects of the soft tissue diode laser during non-surgical periodontal treatment have been documented. (6) Also for patients with aggressive periodontitis (AgP), the use of a diode laser with scaling and root planning (SRP) has shown

an overt effect over SRP or the laser alone for certain parameters. Moritz et al concluded a significant reduction in the amount of bacteria and inflammation using a diode laser in combination with SRP. [7] However controversy remains concerning the efficacy of diode laser therapy during periodontal treatment. The results of some literature did not demonstrate effectiveness of the combination of laser and SRP therapy when compared with SRP alone in terms of microbiologic and gingival inflammation parameters.

Lasers have been used extensively in the dental field since their inception and have been in continuous use since then. Lasers have a variety of uses including periodontal involvement and in this study this use of lasers has been applied. After phase I of SRP, Laser therapy was instituted at the Test sites, gave an immense improvement as compared to sites without Lasers comparing all clinical parameters. Apart from providing reduction in plaque scores and gingival bleeding, treatment was completed with no reported discomfort and pain. Therefore Lasers can be applied and act as a motivating therapy in patients of Periodontitis.

The aim of this study is to evaluate the clinical efficacy of a soft tissue 980-nm diode laser with SRP versus the effects of SRP alone.

MATERIALS AND METHODS

Patient Selection and Study Design: A randomized controlled, single-masked clinical study was conducted on patients of chronic periodontitis reporting at Department of Periodontics, at I.T.S Dental College, Hospital& Research Centre, Greater Noida. It was done to evaluate and compare effects of SRP with and without the usage of diode laser in terms of clinical parameters. Ethical clearance was obtained from Ethical Committee at I.T.S Dental College, Hospital& Research Centre, Greater Noida. Patient consent was taken as per Helsinki guidelines.[8] Ethical clearance certificate was obtained study from the local ethical committee before starting the study.

The sample consisted of 50 patients (32 males and 18 females) which were diagnosed with Chronic Periodontitis according to the criteria of 1999 American Academy of Periodontology Workshop. [9]

Patients were selected according to the inclusion criteria:

- No periodontal treatment within the previous 12 months
- No use of antibiotics within the previous 6 months
- No systemic disease that could impact the outcome of periodontal therapy
- No pregnancy
- No use of hormonal contraceptives.

Patients were selected according to the Exclusion criteria:

- Patients with <16 teeth, or fixed prosthodontics appliances
- Teeth with grade III mobility
- Periodontal pockets deeper than 10 mm in the studied areas were not included.

All selected patients signed a consent form before undergoing the procedure. A case history file and treatment file and examination file were created for each patient, which contained information about the clinical measurements. Cleaning of the teeth was performed using hand instruments and a sonic device with tip no. 5/6/. The sonic device was used with a frequency of 6,000 Hz and constant water irrigation. Subsequently, two quadrants Group II were treated using hand instruments, curettes, and sonic device. The other quadrant Group I were treated with hand instruments and the sonic device in combination with the soft tissue diode laser. All 50 patients included in the study completed the periodontal therapy and were followed up to the end of the study. In total, 150 sites in the Group I and 150 sites in the Group II were examined.

Treatment Protocol: Quadrant wise SRP was performed in single appointment for all patients in all groups using hand instruments and sonic devices by the clinician. The laser therapy was performed three times in the Group I on days 1st, 7th, and at 3 months after SRP treatment. Laser treatment was performed using a diode laser with a 400-mm fiberoptic delivery system that was inserted parallel to the cement surface with apicocervical movements for 10 seconds per tooth. The fiber was cleaved by the cleaver provided by the company before and between the laser treatments of each tooth. The fiber was introduced at 1 mm less than the value obtained

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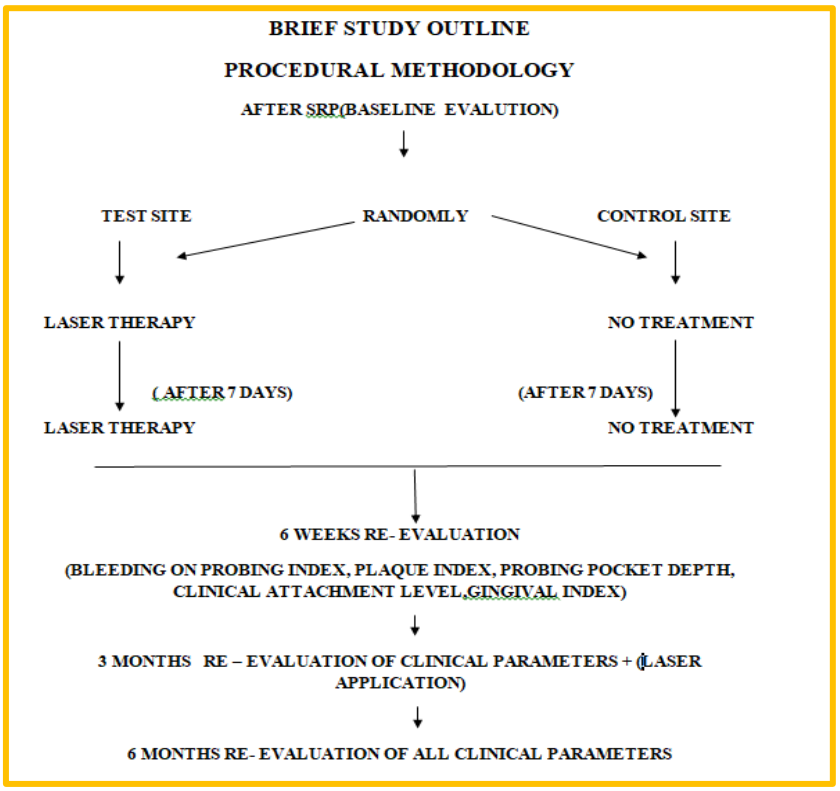
during the measurements using the endodontic stopper, fixed on the fibre. The physical parameters of the unit were as follows: peak power, 2 W; average power, 0.66 W; time on (laser beam operative), 25 ms; and 50 ms with a continuous timer (laser beam operated by a foot switch).



Clinical Evaluation: Periodontal parameters were measured before the treatment, 6 weeks, 3 months and at 6 months after treatment. Clinical measurements were obtained at four points around each tooth using a graduated William's periodontal probe. The following periodontal clinical parameters were recorded: Pocket probing Depth (PPD), Clinical Attachment level (CAL), [10] Plaque index (Silness and Loe 1964), [11] Gingival index (Loe & Silness 1963), [12] and Gingival Bleeding index (Ainamo& Bay 1975).

STATISTICAL ANALYSES

Analysis was performed with a software program. In the present study, all the statistical calculations were performed through SPSS for windows (Statistical Product and Service Solutions).2010 IBM Inc., Chicago, version 21.0.The difference between the Control Group and Laser Group was evaluated according to the mean values of BOP, PD, CAL, GBI and GI. The ANOVA were used for CAL, BOP, and PD analysis because the data were not normally distributed. For Wilcoxon and t test-related pairs, the Bonferroni corrections were made.

RESULTS

The Overall results for Group I and Group II at baseline and at 6 and 18 weeks are presented in Table 1.

Statistically Significant reductions in PD and CAL values were observed in both groups after 6 and 18 weeks. However, no significant differences in BOP were seen between the groups after 6 weeks. Significant differences were found in PI between Group I and Group II at baseline or at 6 and 18 weeks after treatment.

There was a 95% Confidence Interval, Post Hoc (Bonferroni's test) was statistically significant. Changes in PD and CAL in both groups are presented in Table 2 and Table 3 respectively. Significant differences were found in PD and CAL before the treatment and at 6 and 18 weeks for both Group I and

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Group II respectively. Bar charts comparing all clinical parameters are presented in Chart 1.

DISCUSSION

Periodontal diseases are various group of clinical entities in which induction of an inflammatory process results in destruction of attachment apparatus, loss of supporting alveolar bone and if untreated, tooth loss[13]. The main goals of periodontal therapy are to reduce bacterial deposits and niches by removing the biofilms and to restore the biological ability of periodontally diseased root surfaces for subsequent reattachment of periodontal tissues to the treated root surface. [14] The use of Laser as an adjunct to conventional SRP is based on the fact that subgingival debridement and eradication of pathogenic microorganism could provide new sites for attachment of connective tissue attachment.

The present study was undertaken to compare the efficacy of SRP with and without diode laser therapy in the management of chronic periodontitis. Fifty patients suffering from chronic periodontitis having pocket probing depth ≥ 4mm as per AAP [9] in two different quadrants were selected for the study who had not received any periodontal treatment in the past 6 months. Patients suffering from any systemic disease or on any antibiotic therapy within the past 6 months were excluded from the study.

After completion of Phase I periodontal therapy (scaling and root planing) in all the patients, laser procedure was carried out with a diode laser in quadrant randomly selected for test group. The use of Nd:YAG and Er:YAG lasers has also been proposed for tissues adjacent to the periodontal pocket, but their use can be harmful causing charring, carbonization, melting, and crater production as stated by **Morlock et al.[15].** In the present study diode laser was used at wavelength of 805 nm **.**All periodontal pockets of selected quadrant were lased at an output power of 0.5W to 1 W in a non-contact pulse (decontamination) mode. According to **Moritz et al.[16]** showed that the duration of laser procedure depends on the depth of the respective periodontal pocket i.e. the pocket depth in mm corresponding to the exposure time in seconds

The results of the present study revealed that there was a statistically significant reduction in pocket probing depth (PPD) in both test group (0.242±0.66) and control group (0.508±0.054) from baseline to 6 months groups ($p \leq 0.005$). Probing pocket depth is still one of the most important clinical parameter for periodontal diagnosis and prognosis. **Lang& Bragger [17]** stated that increased probing depth and loss of clinical attachment are path gnomic of periodontitis and hence pocket probing is a crucial and mandatory procedure in diagnosing periodontitis and determining the success of periodontal therapy.

This is in accordance with a study done by **Kaldahl et al.[18]** which reported a 1.23mm reduction in probing depth for sites with initial probing depths from 5.0-6.0mm at 3 months following scaling and root planing. A probing depth reduction of 2.18mm (1.66mm gain in clinical attachment) in sites ≥ 7.0mm was noted. Although sites in both the groups responded favorably to treatment, additional application of diode laser in test group resulted in higher improvement and the difference between the two groups was statistically significant. This reduction in pocket probing depth at the test sites might be associated with the improvement in periodontal inflammation: because they experience less distress, patients may be able to brush more thoroughly and maintain good oral hygiene at these sites suggesting that the application of lasers as an adjunct to scaling and root planing may be helpful in reducing the periodontal disease as showed by **Yukna et al.[19]**

In the present study, the results showed significant reduction in mean plaque scores in both the groups. When the groups were compared, test group showed lesser mean plaque scores from baseline to 6 months than control groups. Similar findings were observed with respect to plaque scores within the groups and between the test and control site. The overall mean reduction in the Plaque index in both the groups can be assigned to the nonsurgical periodontal therapy and oral hygiene instructions given to all the patients. Phase I periodontal therapy improves the periodontal health by decreasing the etiological factors responsible for the formation of plaque biofilm.

The mean difference in the Gingival index from baseline to 6 weeks postoperative was (0.092±0.011) in the test group and (0.027±0.006) in the control group and from baseline to 6 weeks postoperative was (0.0399±0.012) in test group and (0.226±0.07) in control group. This mean difference was statistically

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highly significant in both the test and control groups when compared to baseline ($p \leq 0.005$)

The reduction in Gingival index can be attributed to reduction in gingival inflammation after scaling and root planing. With the removal of plaque and calculus with Phase I periodontal therapy, the etiological factors responsible for gingivitis are reduced and thus gingival health of the patients is improved. Significant decrease in gingival index has also been reported by Saglam M et al [20] in the present study, the test group showed higher improvement. Finally, it is necessary to provide standard criteria for periodontal laser therapy in terms of how much energy used, application time, different modes of irradiation, power setting, and laser types; this would facilitate analysis of results.

Conclusions:

Within the limitations of this study, our results suggest that

1. Adjunctive use of diode laser to scaling and root planing to be favourable
2. Use of diode laser provides clinical improvement in all clinical parameters.
3. Help in reduction of Plaque.
4. Maintaining and motivating Oral Hygiene.

REFERENCES

1. American Academy of Periodontology. Glossary of Periodontal Terms, 4th ed. Chicago: American Academy of Periodontology : 2001: p. 40
2. Socransky SS, Haffajee AD. The bacterial etiology of destructive periodontal diseases: Current concepts. J Periodontol 1992: 63:322-31
3. Ishikawa I, Baehni P. Nonsurgical periodontal therapy – where do we stand now Periodontol 2000 2004: 36: 9-13.
4. Aoki A, Sasaki KM, Watanabe H, Ishikawa I. Lasers in nonsurgical periodontal therapy.Periodontol 2000 2004: 36:59-97
5. Saglam M, Kantarci A, Dundar N and Hakki SS. Clinical and biochemical effects of diode laser as an adjunct to nonsurgical treatment of chronic periodontitis: a randomized, controlled clinical trial. Lasers Med Sci 2012 :103-112
6. Lin J, Bi L, Wang L, Song Y, Ma W, Jensen S, Cao D: Gingival curettage study comparing a laser treatment to hand instruments: Lasers Med Sci 2011: 26: 7-11.
7. Moritz A, Schoop U, Goharkhay K, Schauer P, Doertbudak O and Wernisch J. Treatment of Periodontal Pockets With A Diode Laser : Laser Surg Med 1998: 22: 302-311.
8. Available at www.WMA.net.(WorldMedical Association)
9. Eke PI,Genco RJ.CDC Periodontal Disease Surveillance Project: Background, Objectives and Progress Report
10. Machti EE,Ben-Yahouda A. The effect of post-surgical flap placement on probing depth and attachment level. J Periodontol 1994:65:855-88
11. Nield S Gehrig. Fundmentals of Periodontal Instrumentation and advanced root instrumentation.Williams & Wilkins, 2007 :1st Edition :78-81
12. Loe H. The gingival index, the plaque index and retention index systems. J Periodontol 1967 :38:610-15
13. Philstorm BL,Micchalowics BS,Johnson NW Periodontal Diseases Lancet 2005 19 :366(9499):1809-20
14. Dahlen G, Lindhe J, Sato K, Hanamura H and Okamoto H.The effect of a supragingival plaque control on the subgingival microbiota in subjects with periodontal diseases. Journal of Clinical Periodontology 1992 :19:802-9
15. Morlock BJ, Pippin J, Cobb C, Killoy W and Rapley J. The Effect of Nd:YAG Laser Exposure on Root Surfaces When Used as an Adjunct to Root Planing: An In Vitro Study. J Periodontol 1992 :63:637-641
16. Moritz A, Schoop U, Goharkhay K, Schauer P, Doertbudak O and Wernisch J. Treatment of Periodontal Pockets With A Diode Laser : Laser Surg Med 1998 :22: 302-311
17. Lang N.P and Bragger u.Periodontal diagnosis in the 1990s. J Clin Periodontol 1991 :18:370-379
18. Kaldahl WB, Kalkwarf KL, Patil KD, Dyer JK.Evalution of four modalities of periodontal therapy. Mean probing depth, probing attachment level and recession changes. J Periodontol 1988 :59(12):783-93

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19. Yukna RA, Carr RL .Histological evaluation of an ND:YAG laser assisted new attachment procedure in humans .Int J Periodontics Restorative Dent 2007 :27(6):577-87

20. Saglam M, Kantarci A, Dundar N and Hakki SS. Clinical and biochemical effects of diode laser as an adjunct to nonsurgical treatment of chronic periodontitis: a randomized, controlled clinical trial. Lasers Med Sci 2012 :103-112

FIGURES AND TABLLES

Image 1: POCKET PROBING DEPTH MEASURED USING STENT

Image 2: MEASUREMENTS USING ENDODONTIC FILE STOPPER

Image 3: APPLICATION OF LASER

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TABLES

Table 1: Comparative Analysis of Mean Values of Clinical Parameters in Test and Control Group from Baseline to 6 Months

	BASELINE-6 WEEKS		BASELINE-3 MONTHS		BASELINE-6 MONTHS		3 MONTHS-6 MONTHS	
GROUP	I	II	I	II	I	II	I	II
POCKET PROBING REDUCTION	0.242 ±0.66	0.508 ±0.504	2.049± 1.34	1.425 ±0.83	2.125±0.94	1.492±0.070	0.076±1.33	0.067±0.091
p value	0.002*		0.006		0.008		1.00	
CLINICAL ATTACHMENT GAIN	0.183± 0.037	0.417± 0.048	0.925± 0.058	0.908 ±0.059	1.350±0.064	1.217±0.056	0.425±0.051	0.308±0.051
p value	0.002		0.003*		0.005*		1.00	
GINGIVAL INDEX	0.097± 0.011	0.027± 0.006	0.247± 0.010	0.136 ±0.007	0.399±0.012	0.226±0.007	0.152±0.006	0.090±0.005
p value	0.003		0.005		0.006*		0.002	
PLAQUE INDEX	0.569± 0.015	0.256± 0.007	1.053± 0.017	0.542 ±0.011	1.493±0.018	1.150±0.020	0.439±0.013	0.608±0.016
p value	0.002*		0.005		0.006*		0.004*	
GINGIVAL BLEEDING INDEX	0.254± 0.008	0.250± 0.010	0.550± 0.013	0.551 ±0.016	1.139±0.015	1.149±0.20	0.618±0.020	0.678±0.015
p value	0.004		0.006		0.007*		0.005	

Table 2: Mean ± Standard Deviation of Pocket Probing Depth Reduction for Group I (Test) and Group I (Control) I at Intervals from Baseline to 6 months

GROUP	BASELINE-6 WEEKS	BASELINE-3 MONTHS	BASELINE-6 MONTHS	3 MONTHS-6 MONTHS
I	0.242±0.66	2.049±0.134	2.125±0.94	0.076±0.133
II	0.508±0.054	1.42±0.83	1.492±0.70	0.062±0.095
p value	0.002*	0.006*	0.008*	1.00

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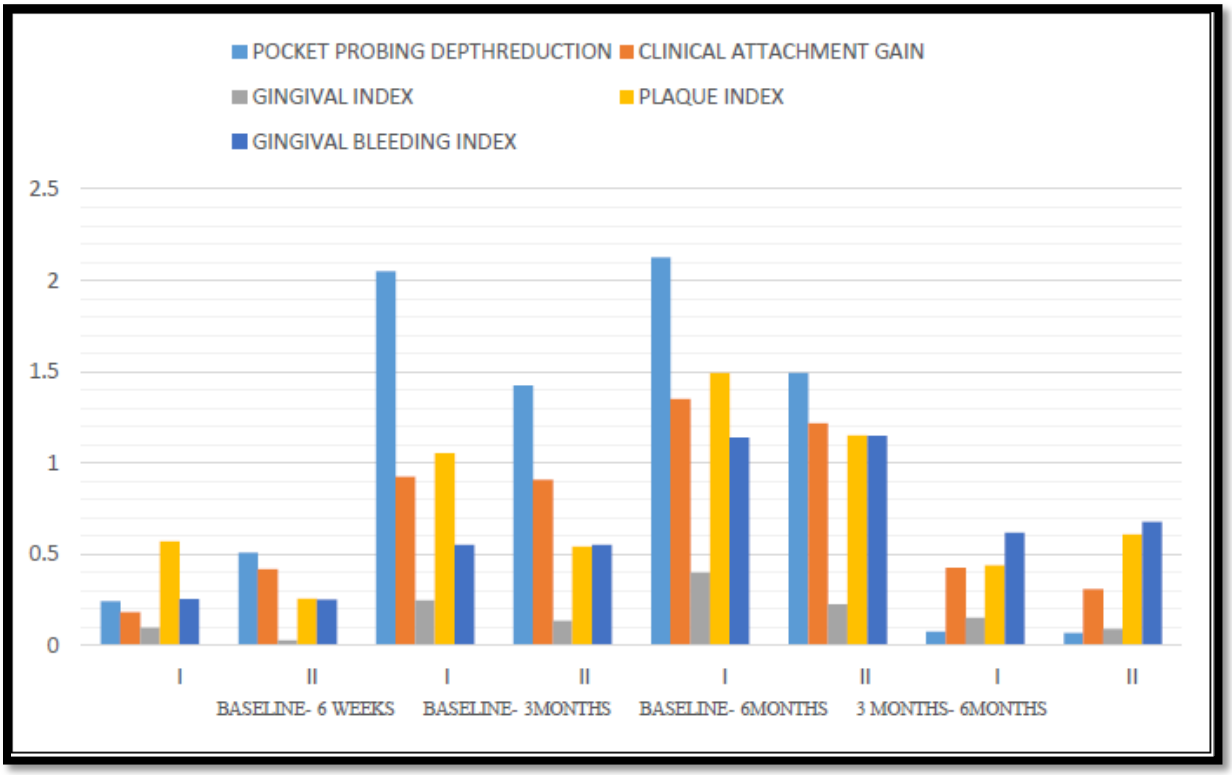
Table 3: Mean±Standard Deviation of Clinical Attachment level gain for Group I (Test) and Group II (Control) at Intervals from Baseline to 6 Months

GROUP	BASELINE-6 WEEKS	BASELINE-3 MONTHS	BASELINE-6 MONTHS	3 MONTHS-6 MONTHS
I	0.183±0.03	0.925±0.58	1.350±0.064	0.42±0.051
II	0.412±0.048	0.908±0.059	1.217±0.056	0.368±0.053
p value	0.002*	0.003*	0.05*	1.00*

Chart 1: Comparative Analysis of Mean Values of Clinical Parameters in Test and Control Group from Baseline to 6 Months



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