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ORIGINAL RESEARCH PAPER

Evaluation of Ornidazole as an Adjunct to Mechanical Debridement and Comparison of Its Effectiveness with Metronidazole

Bharat Bhushan Awasthi,* Saurabh Singh

Department of Dentistry, Government Medical College, Haldwani 263139 (India)

* For correspondence
Email: drbharatawasthi123@gmail.com

Key words
Periodontal disease, Mechanical debridement, Ornidazole, Metronidazole, Scaling, Root planning, Gingival inflammation, Periodontal pocket

Abstract
The study was aimed to evaluate the effectiveness of ornidazole as an adjunct to the mechanical debridement and to compare its effectiveness with metronidazole on adult periodontitis subjects over a period of 14 days. The clinical, microbiological and histopathological parameters were examined to evaluate the effectiveness of five modes of therapy. A significant improvement was noted in all the five treatment modalities in treating gingival inflammation, pocket depth and bleeding on probing. During the microbiological examination, both the drugs, metronidazole and ornidazole, were equally effective when used alone and with scaling and root planning (SRP) in reducing spirochaetes, Gram -ve cocci, and Gram -ve bacilli. The microbiological investigation results concluded that, for a shorter period, ornidazole showed better results. Best histopathological results were obtained with ornidazole + SRP therapy.

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INTRODUCTION

Periodontitis in humans consists of a mixture of diseases, caused by the presence of microorganisms in subgingival plaque[1]. The microfloras associated with periodontal diseases are gram negative anaerobic bacteria (*Porphyromonas gingivalis*, *Prevotella intermedia*, *Bacteroides*, *Fusobacterium species and Actinobacillus actinomycetem-comitans*)[2-5]. The adjunctive use of antibiotics such as metronidazole or ornidazole has been proved to be effective in eradication or suppression of periodontal pathogens[6-8]. The meta-analysis study of the effect of systemic metronidazole as an adjunct to scaling and root planning conclude that its use may offer benefits in the treatment of adult periodontitis[9]. It has been reported that ornidazole is more effective in the treatment of anaerobic infections when compared to the metronidazole[10]. Comparative pharmacokinetic studies have shown that ornidazole has a greater elimination half-life (14.4 h) than metronidazole (7.3 h), therefore requires less frequent intake.

The main objective of this study was to evaluate the effectiveness of ornidazole as an adjunct to the mechanical debridement and to compare its effectiveness with metronidazole. The clinical, microbiological and histopathological parameters were used to evaluate the effectiveness of five modes of therapy.

MATERIALS AND METHODS

The study was carried out on 40 subjects, irrespective of gender, in age group of 18-42 years, attending the post graduate clinic of the department of periodontics, Faculty of dental sciences in collaboration with the department of pathology and department of microbiology, CMS Medical University, Lucknow. The study protocol was approved by the institutional ethics committee and informed consent for using the patient sample and data was taken. The inclusion and exclusion criteria for selection of study subjects are presented in Table 1.

Table 1 Inclusion and exclusion criteria for the selection of study subjects

Inclusion criteria	Exclusion criteria
Systemically healthy subjects	Subjects with smoking or tobacco chewing habits, alcoholic and drug abusers
Subjects with moderate to serve periodontitis with pocket depth ≥ 4 mm	Pregnant or lactating mothers
Subjects with moderate to severe inflamed gingival	Subjects on antibiotics and antioxidents therapy 3 months prior to treatment
No scaling and root planning within the past 3 months	Mobile and carious teeth

Forty subjects were randomly placed into three groups on the basis of treatment executed (Table 2). The group I and II were further subdivided into two subgroups comprising of eight subjects each. Group I: Subjects were subjected to scaling and root planning (SRP) in addition to drugs given only. Group II: Only drugs were given orally without SRP. Group III or placebo: SRP was performed in addition to placebo given orally.

Table 2 Group of periodontitis subjects used for clinical, microbiological and histopathological investigations (n = 8 for each group)

Groups	Subgroups	Treatment
Group I	Subgroup: Ia	Drug A + SRP
	Subgroup:Ib	Drug B + SRP
Group II	Subgroup: IIa	Drug A only
	Subgroup:IIb	Drug B only
Group III (Placebo)		Drug C + SRP

Clinical Parameters

Clinical examination was done in each subject at baseline, after 7 days and 14 days post treatment. According to the Ramfjord, 6 teeth (16, 21, 24, 36, 41 and 44) were considered for clinical examination. Following clinical parameters were considered in the evaluation of effectiveness of the drugs:

1. **Gingivitis:** Status of gingival was clinically assessed using gingivitis index by Ramfjord using following criteria**:**
   0 - Absence of inflammation.
   1 - Mild to moderate inflammatory changes not extending all around the tooth.
   2 - Mild to moderately severe gingivitis extending all around the tooth.
   3 - Severe gingivitis characterized by redness, swelling tendency to bleed and ulceration.
2. **Pocket depth:** Probing pocket depth was measured by UNC 15 probe on each surface of the tooth (Mesial, mild facial, distal and mild-lingual). All measurements were rounded to the nearest millimetre.
3. **Bleeding on probing (BOP):** BOP was assessed using papillary bleeding index using following criteria**:**
   0 - No bleeding
   1 - Bleeding some seconds after probing
   2 - Bleeding immediately after probing
   3 - Bleeding on probing towards the marginal gingival

Treatment Procedure

Following the baseline recordings of clinical parameters, ultrasonic scaling and root planning with hand curettes was performed in group I and III subjects. Special attention was paid to the selected teeth and lower incisors.

Drug Sample Preparation

A total of 560 empty capsules (224 for Metronidazole and Ornidazole and 112 for placebo) of same size and colour were used for the study. Metronidazole tablet (400 mg) and Ornidazole tablet (500 mg) were crushed into fine powder form and filled into the capsule shell. Placebo capsules were filled with glucose. These capsules were placed in three containers and randomly labelled as A, B and C by a third person. The drugs were given to the subjects orally for 7 days.

Collection of Samples for Microbial Analysis

Three samples of Gingival Crevicular Fluid (GCF) were collected before the start of treatment, after 7 days and after 14 days post treatment from each subject. Thus, a total of 120 such samples were collected randomly from the facial surfaces of lower incisors. A standard size (No. 15) paper point was inserted in the periodontal pocket for 2 min, then withdrawn and placed in sterile eppendroff containing 1 mL of sterile normal saline. The samples were immediately taken to the department of microbiology for microbiological analysis.

Microbiological Analysis

Each sample was centrifuged at 3000 rpm and centrifuged deposit was suspended in 100 μL saline. The suspension (10 μL) was used for smear preparation. Minimum 5 fields in oil immersion were examined for bacterial count and their numbers were represented as percentage count. Gram's staining was used for the identifying and classifying bacteria in two major groups (gram positive and gram negative). The smears were examined for the presence of gram positive (cocci and bacilli), gram negative (cocci and bacilli) and spirochaetes. Staining of spirochaetes was done by Fontana's method.

Collection of Samples for Histopathological Examination

Two samples of gingival tissue were taken randomly from the lower incisor region, one before the treatment and another after 14 days post treatment. Prior to the surgery, subject consent was taken. Tissue samples were obtained under local anaesthesia (Lignocaine 2% with 1: 100000 adrenaline) while doing gingivectomy. The excised gingival tissue samples were washed with distilled water and normal saline thoroughly and placed in vials containing formalin for hisopathological examination.

Histopathological Examination

The tissue was kept in 10% formalin solution for 8 h and was passed in the automatic tissue processor (Histokinetic) for 20 h. The tissue was passed in formalin 10% (8 h), alcohol 50% (1 h), rectified spirit (1 h), absolute alcohol (4 h), wax I (1.5 h), and, wax II (4.5 h) at 60°C. Two L shaped metal pieces (Leuckhart's L pieces) were set together to form a box shape, and was filled with melted paraffin and the tissue was kept in a proper position. The paraffin was allowed to harden and the excess paraffin was cut off with a knife. The tissue samples were cut into 2 µm thick sections by rotary microtome. All the sections were stained with hematoxylin-eosin dye. These preparations were mounted in Canada balsom to observe under light microscope for inflammatory status. To evaluate the significance of a particular treatment in a particular group, the student't' test was used. The comparisons were carried out at a level of significance $p = 0.05$ and for a degree of freedom of 14 (n_1+n_2 -2).

RESULTS

The effectiveness of ornidazole as an adjunct to the mechanical debridement and its comparative effectiveness with metronidazole were assessed on the basis of clinical, microbiological and histopathological parameters. The study evaluated the significance of a particular treatment on different groups as well as on the same group in a periodic manner. The criteria for such an evaluation were based on a hypothecation that all modes of therapy yielded similar changes.

Results of clinical parameters

The results of clinical parameters in terms of gingival score, pocket depth and BOP at different time intervals for different groups are shown in Fig 1-3. Fig 1 shows mean pocket depth (in mm), Fig 2 shows the mean gingival score and Fig 3 shows the mean BPO score at different intervals (baseline, after 7 days and after 14 days) for the subjects of different groups (Ia, Ib, IIa, IIb and III).

The total scores of individual parameter for each subject in group Ia were calculated by dividing the teeth examined. The mean gingival score in 8 subjects ranges from 8.33 to 10.17 at baseline, 4.00 to 5.83 after 7 days and 1.83 to 2.17 after 14 days. A total score of 8 subjects was 78.01, 36.66 and 15.83, respectively. A mean value of this score was 9.75, 4.58 and 1.98, respectively, at baseline, after 7 days and after 14 days. The mean pocket depth score range between 13.67 to 16.33 at baseline, 11.00 to 13.00 after 7 days and 10.17 to 12.00 after 14 days with their total score 124.66, 96.34 and 87.00 and the mean score for this group was 15.58, 12.04 and 10.88, respectively, at different time intervals. The minimum value of pocket depth and BOP score at baseline was 10.33, after 7 days this value reduced to minimum of 2.83 to maximum of 3.33, and after 14 days, minimum value was 1.83 and maximum was 2.17. The total mean value of this group for pocket depth and BOP was 9.83, 3.15 and 2.04.

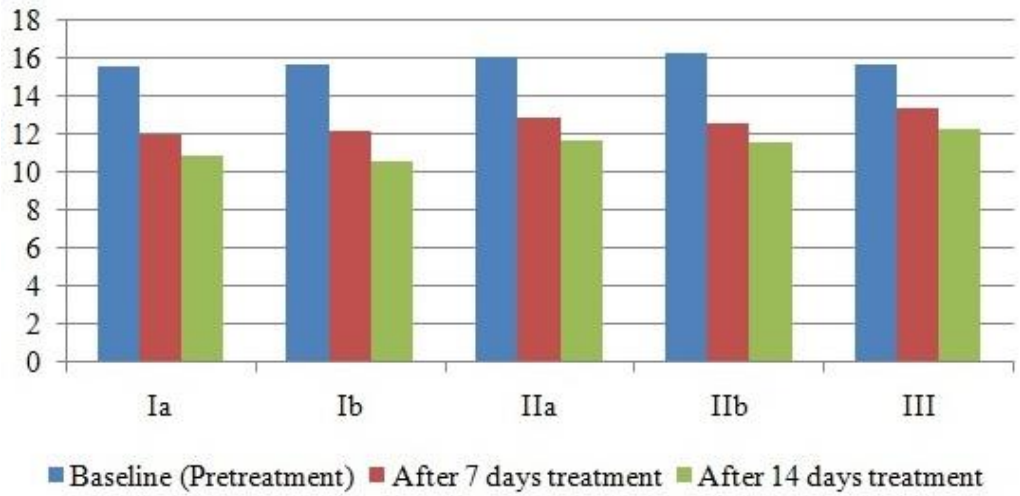

Fig 1. Bars showing mean pocket depth (in mm) at different time intervals for the subjects of different groups (Ia, IIb, IIa, IIb and III).

The mean gingival score in group Ib subjects ranges from 9.00 to 10.17 at baseline, 3.83 to 5.33 after 7 days, and 1.67 to 2.00 after 14 days. The total mean score of 8 subjects was 78.50, 34.65 respectively. A mean value of this score obtained were 9.91, 4.33 and 1.83, respectively, at baseline, after 7 days and after 14 days. The mean pocket depth score ranges between 14.50 to 16.83 at baseline, 11.00 to 13.17 after 7 days, and 8.83 to 11.50 after 14 days. A total mean score being 125.16, 97.83 and 84.50. The mean score of this group was 15.65, 12.23 and 10.56 at different time intervals. The minimum value of BOP score at baseline was 6.67 and maximum value was 10.83, after 7 days this sore at baseline was 6.67 and maximum value was 10.83, after 7 days this value reduces to a minimum of 2.67 to maximum of 3.17 and after 14 days minimum value was 1.83 and maximum was 2.50. The total mean value at different time intervals were 81.00, 24.18 and 16.33 and the mean value for this group were 10.13, 3.02 and 2.04. The results of gingival score in group Ib subjects are shown in Fig 2.

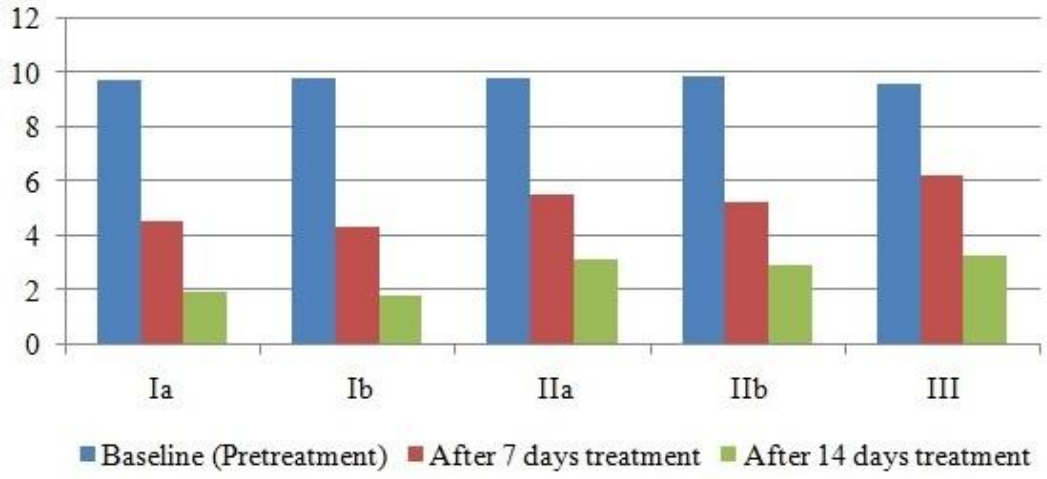

Fig 2. Bars showing mean gingival score at different time intervals for the subjects of different groups (Ia, IIb, IIa, IIb and III).

The mean gingival score in group IIa subjects was in the range from 8.83 to 10.33 at baseline, 5.00 to 6.17 after 7 days, and 2.83 to 3.83 after 14 days. The total score of 8 subjects was 78.83, 44.51 and 25.17, respectively. The mean values of this score obtained were 9.85, 5.56 and 3.15 at baseline, after 7 days, and after 14 days. The mean pocket depth score ranges between 15.00 to 16.83 at baseline, 10.17 to 14.33 after 7 days, and 10.17 to 13.00 after 14 days. Total score of this group was 16.313, 12.94 and 11.69 at different time intervals. The minimum value of BOP score at baseline was 9.50 and maximum value was 10.67, after 7 days this value reduced to minimum of 6.00 to maximum of 7.33 and after 14 days minimum value was3.17 and maximum was 5.00. The total values at different time intervals were 80.34, 53.50 and 32.00. The mean values for this group was 10.04, 6.69 and 4.00.

The clinical recordings for group IIb indicated minimum value of gingival score of 8.67 at baseline and maximum value of 10.50, after 7 days this value was decreased to a minimum of 4.83 and a maximum of 5.83 and after 14 days minimum value was 2.33 and maximum value was 3.67. The total values at different time intervals were 79.17, 42.16 and 23.34. The mean values of this group were 9.90, 5.27 and 2.92. The mean pocket depth score in this group ranges from 15.00 to 17.17 at baseline, 11.33 to 13.17 after 7 days and 10.17 to 13.17 after 14 days. The total mean scores of 8 subjects were 130.66, 100.50 and 93.00 at different time intervals. The mean value of this score was 16.33, 12.56 and 11.63. The BOP scores at baseline were 9.67 to 10.50, after 7 days 5.83 to 6.67 and after 14 days 3.00 to 4.83. The total mean score obtained were 81.00, 50.00 and 29.50. With mean value being 10.13, 6.25 and 3.69 in this group was calculated at different time intervals.

For group III, the minimum value of gingival score at baseline was 8.67 and maximum value was 10.17, after 7 days this value decreased to minimum of 5.50 and maximum of 6.67 and after 14 days minimum

value was 3.00 and maximum value was 3.67. The total values at different time intervals were 70.86, 50.00 and 26.66. The mean values of this group were 9.61, 6.25 and 3.33. The mean pocket depth score in this group ranges from 15.50 to 17.00 at baseline, 12.33 to 14.83 after 7 days and 10.67 to 13.50 after 14 days. The total mean scores of 8 subjects were 125.49, 106.99 and 98.34 at different time intervals. The mean value of this score was 15.69, 13.37 and 12.29. The BOP scores at baseline were 9.50 to 10.17, after 7 days 6.00 to 7.83 and after 14 days 4.00 to 6.17. The total mean score obtained were 78.18, 56.50 and 38.83. Mean value obtained were 9.77, 7.06 and 4.85 in this group was calculated at different time intervals.

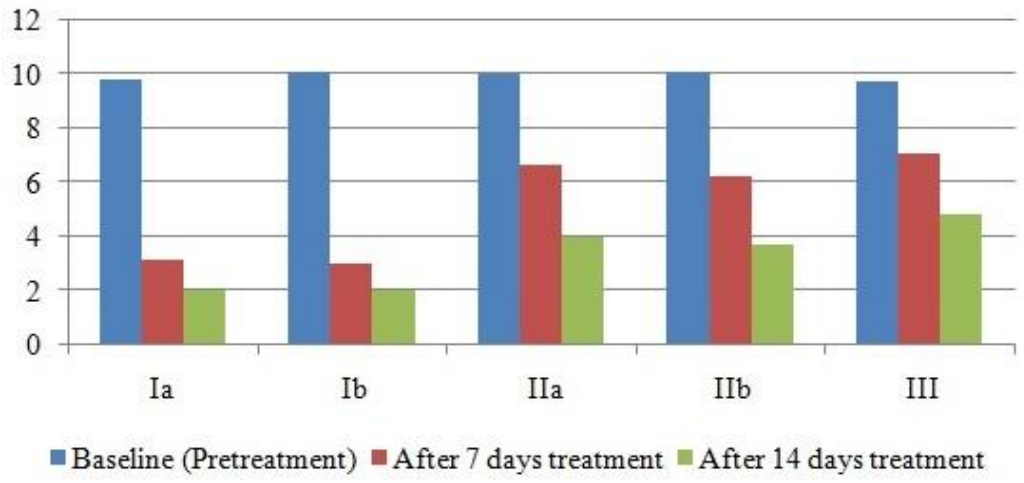

Fig 3. Bars showing mean BOP at different time intervals for the subjects of different groups (Ia, IIb, IIa, IIb and III).

Intra-group Comparative Analysis of Clinical Parameters

Pocket Depth Score

Intra group comparison of mean pocket depth score at different time intervals is documented in Fig 1. The mean pocket depth score in subjects belonging to group Ia at baseline was 15.58. It decreased to 12.04 after 7 days. This reduction was found to be statistically significant. The mean pocket depth score further decreased to 10.88 at the end of therapy, and was found to be significant. The difference of mean value between baseline and after day 14 was 4.70 and documented as significant. The mean depth score in subjects belonging to group Ib as obtained at baseline, after day 7 and after day 14 were 15.65, 12.23 and 10.56, respectively. Difference of mean between baseline and after day 7 was 3.42, after day 7 to day 14 was 1.67 and between baseline and day 14 was 5.09, which were found to be statistically significant. The mean pocket depth score in subjects belonging to group IIa as obtained at baseline was 16.13. It decreased to 12.94 after day 7. This reduction on statistical evaluation was found to be significant. The mean pocket depth score further decreased to 11.69 at the end of therapy, which was found to be statistically significant. Difference of means between baseline and after day 14 was 4.44 and found to be significant. The mean pocket depth score in subjects belonging to group IIb at baseline, after day 7 and after day 14 were 16.33, 12.56 and 11.63, respectively. Difference of mean between baseline and after day 7 was 3.77, after day 7 to day 14 was 0.93 and between baseline and day 14 was 4.70, which were found to be statistically significant. The mean pocket depth score in subjects belonging to group III at baseline was 15.69. It decreased to 13.37 after 7 days. This reduction was found to be statistically significant. The mean pocket depth score further decreased to 12.29 at the end of therapy, and was found to be significant. The difference of mean value between baseline and after day 14 was 3.40 and documented as significant.

Gingival Score

Intra group comparison of mean gingival score at different time intervals is documented in and Fig 2. The mean gingival score in subjects belonging to group Ia at baseline was 9.75. It decreased to 4.58 after 7 days. This reduction of 5.17 on statistical evaluation was found to be significant. The mean gingival score further decreased to 1.98 at the end of therapy. This reduction of 2.60 between day 7 and day 14 was found to be

significant. The mean gingival score in subjects belonging to group Ib as obtained at baseline, after 7 days and after 14 days are 9.81, 4.33 and 1.83, respectively. Difference of mean between baseline and after 14 days was 7.98. This was found to be statically significant. The mean gingival score in subjects belonging to group IIa at baseline was 9.85. It decreased to 5.56 after 7 days. This reduction was found to be statically significant. The mean gingival score further decreased to 3.15 at the end of therapy. This reduction of 2.60 between baseline and day 14 was found to be significant. The mean gingival score in subjects belonging to group IIb at baseline after day 7 and day 14 were 9.90, 5.27 and 2.29, respectively. The reduction in gingival score was found to be statically significant. The mean gingival score in subjects belonging to group III as obtained at baseline was 9.61. It decreased to 6.25 after day 7. This reduction was found to be significant. The mean gingival score was further decreased to 3.33 at the end of therapy, and was found to be significant. The difference of mean between baseline and after day 14 was 6.28, which was found to be statistically significant.

Bleeding on Probing (BOP)

The results of intra group comparison study of bleeding on probing at different time intervals are shown in Fig 3. The mean BOP score in subjects belonging to group Ia at baseline was 19.83. It decreased to 3.15 after 7 days. This reduction was found to be statistically significant. The mean BOP score further decreased to 2.04 at the end of therapy, and was found to be significant. The difference of mean value between baseline and after day 14 was 7.79 and documented as significant. The mean pocket depth score in subjects belongings to group Ib as obtained at the baseline, after 7 days and after 14 days were 10.13, 3.02 and 2.04 respectively. Differences of mean between baseline and after 7 days was 7.11, after 7 days and after 14 days was 0.98 and between baseline and after 14 days was 8.09, which were statically significant. The mean BOP score in subjects belonging to the group IIa as obtained at baseline was 10.04. It decreased to 6.69 after 7 days. The mean BOP score was further decreased to 4.00 at the end of therapy. The difference of means between baseline and after 14 days was found to be statically significant. The mean score in subjects of group IIb at baseline, after 7 days and after 14 days were 10.13, 6.25 and 3.69, respectively. Difference of means between baseline and after 7 days was 3.88, after 7 days and after 14 days was 2.56 and between baseline and after 14 days was 6.44, which was found to be statistically significant.

The mean BOP score in subjects belonging to group III at baseline was 9.77. It decreased to 7.06 after 7 days, which was further decreased to 4.85 at the end of 14th day of therapy. This difference in BOP was found to be statistically significant for all the comparisons in the same group at different time intervals.

Inter-group Comparative Analysis of Clinical Parameters

Gingival Score

The results of inter group comparison of mean gingival score at different time intervals are presented in Fig 4. After 7 days treatment, a non significant mean difference of 0.25 and 0.29 was obtained when group Ia was compared with group Ib, and IIa was compared with group IIb. Significant mean difference was present when Ia was compared with group IIa. Similar trend was observed when Ib was compared with group IIb. Significant mean difference of 1.67 was present when group Ia was compared with group III; and when group Ib was compared with group III. Again significant mean difference of 0.69 and 0.98 was obtained on intergroupncomparision between group IIa & III and & and III. When groups Ia & Ib and IIb & III were compared, their mean difference lies outside the acceptance limits.

Pocket Depth Score

After 7 days treatment, significant mean differences were obtained only between groups Ia & III and Ib & III. After 14 days treatment, change in the trend was observed in the reduction of pocket depth as compared to 7 days post treatment. Significant mean differences were present on intergroup comparison between group Ia & III, Ib & IIa, Ib & IIb, and Ib & III. The differences of mean were 1.41, 1.13, 1.07 and 1.73, respectively (Fig 5).

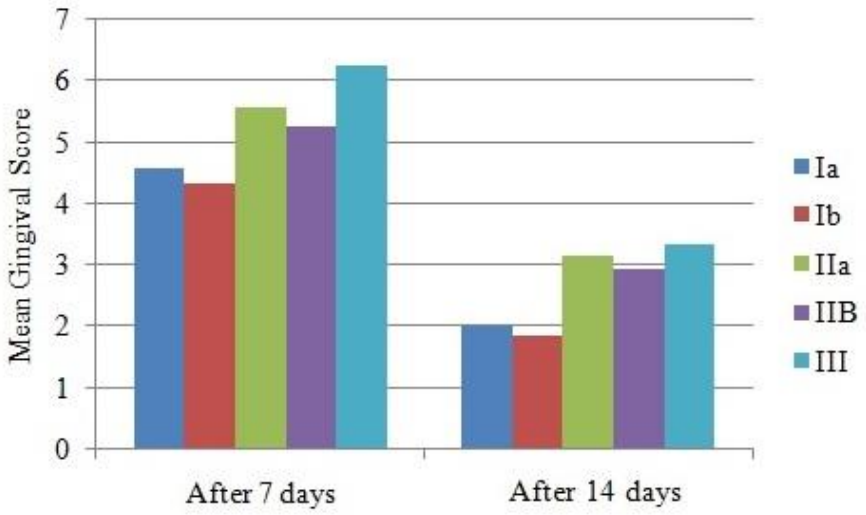

Fig 4. Bars showing mean gingival score in different groups at different time intervals

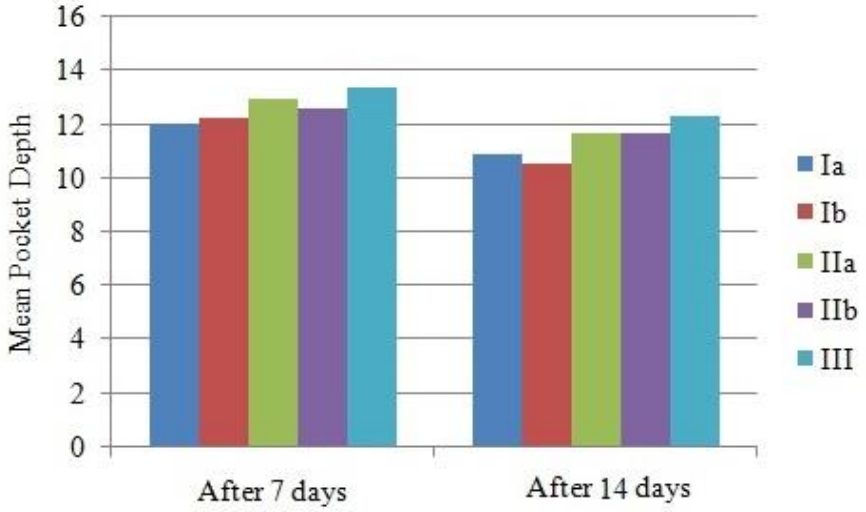

Fig 5. Bars showing mean pocket depth (in mm) in different groups at different time intervals

BOP Score

After 7 days treatment, the mean difference between group Ia and Ib was 0.13, which was nonsignificant. The reduction in mean BOP score between group Ia and IIa was 3.54 and between Ib and IIb was 3.23. Similarly, significant mean difference of 3.91 and 4.04 was present when group Ia and Ib were compared with group III. After 14 days treatment, the reduction in mean BOP score followed nearly the same trend as of 7 days post treatment, except, when group III was compared with IIa (Fig 6).

Microbiological Examinations

The number of spirochaetes, Gram + ve cocci, Gram – ve cocci, Gram + ve bacilli, and Gram – ve bacilli at different time intervals for group Ia subjects are depicted in Fig 7 to 11. The mean spirochaete score in 8 subjects was 18.75, 6.88 and 1.25 at baseline; after 7 days and 14 days, respectively. A mean value of 17, 37 and 45 was obtained at baseline; after 7 days and 14 days, respectively, for Gram + ve cocci. The mean Gram + ve bacilli score was 11.25, 26.00 and 36.25, respectively, at baseline; after 7 days and 14 days of the treatment. The mean Gram - ve bacilli score were 18.63, 17.50 and 13.50, respectively, at baseline; after 7 days and 14 days of the treatment.

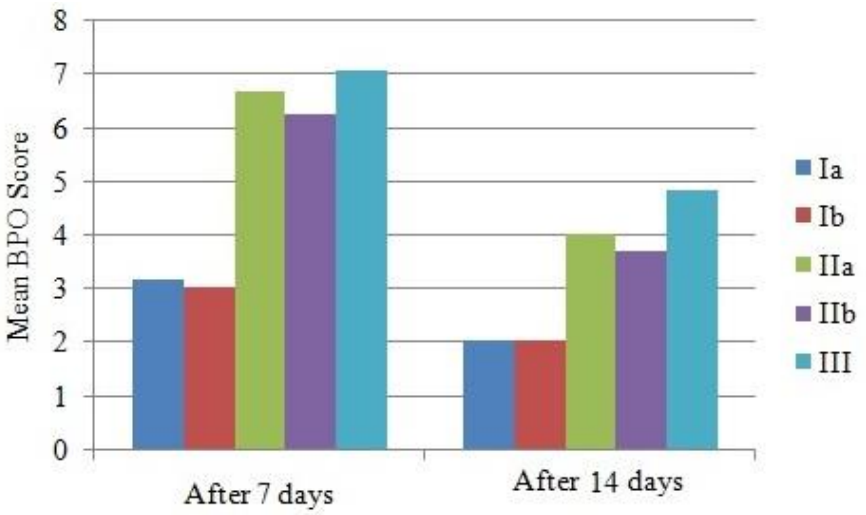

Fig 6. Bars showing mean BOP score in different groups at different time intervals

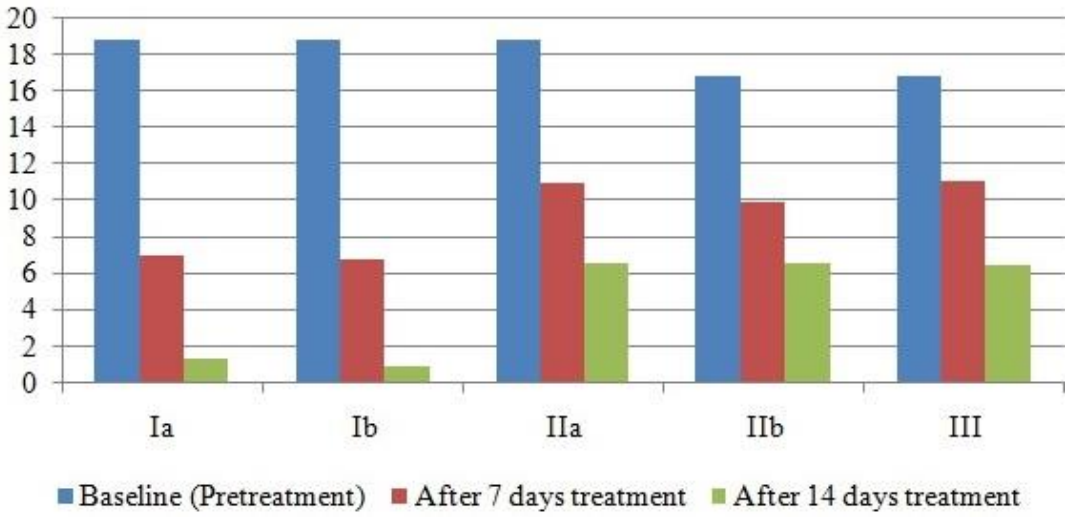

Fig 7. Bars showing mean spirocheate score at different time intervals in different groups

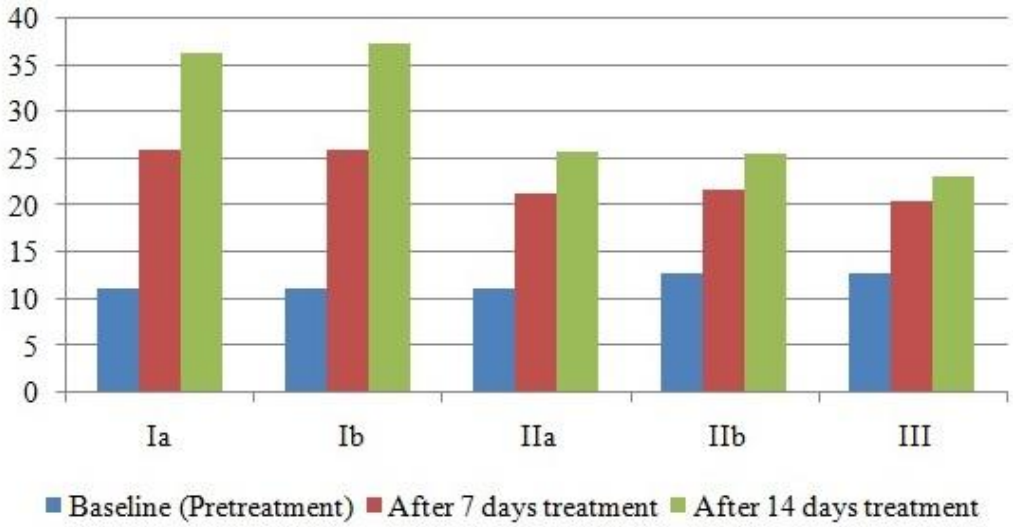

Fig 8. Bars showing mean +ve bacilli score at different time intervals in different groups

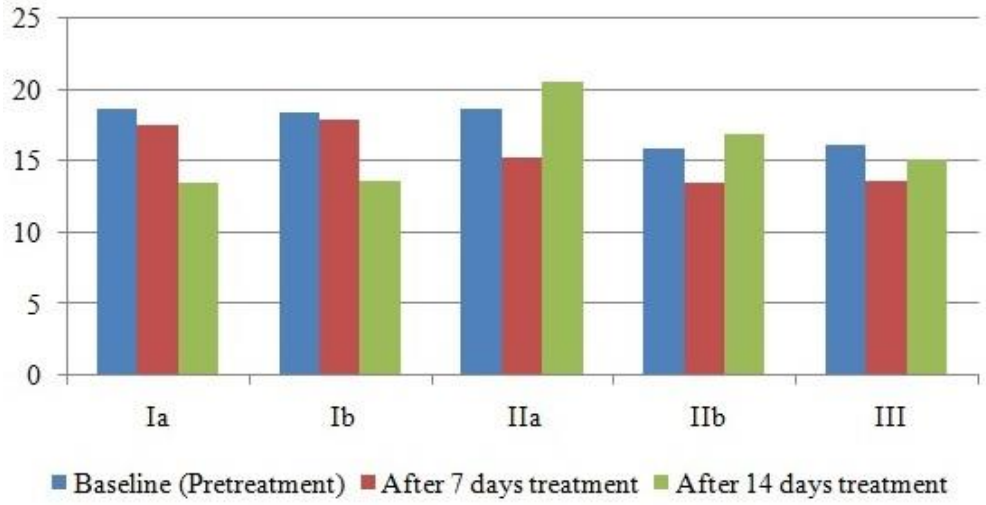

Fig 9. Bars showing mean Gram -ve bacilli score at different time intervals in different groups

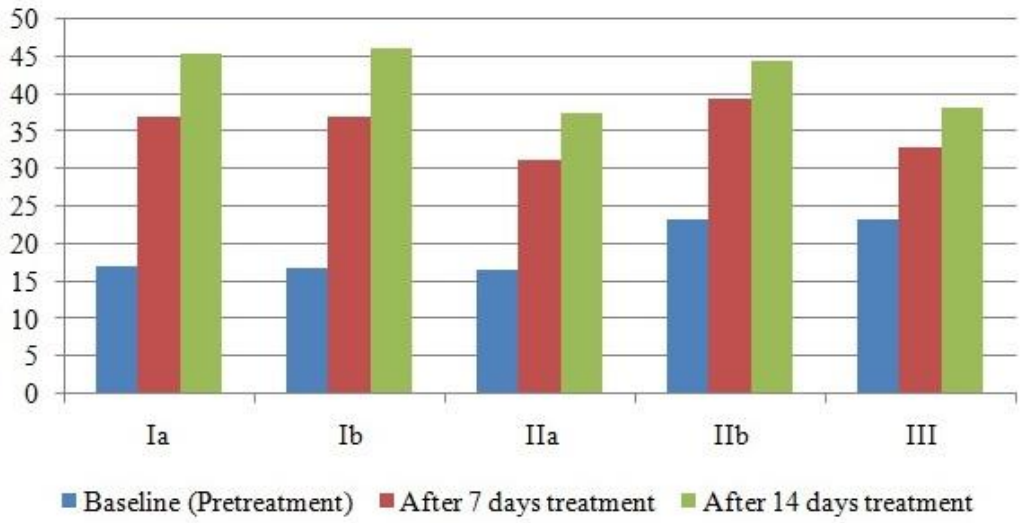

Fig 10. Bars showing mean Gram +ve cocci score at different time intervals in different groups

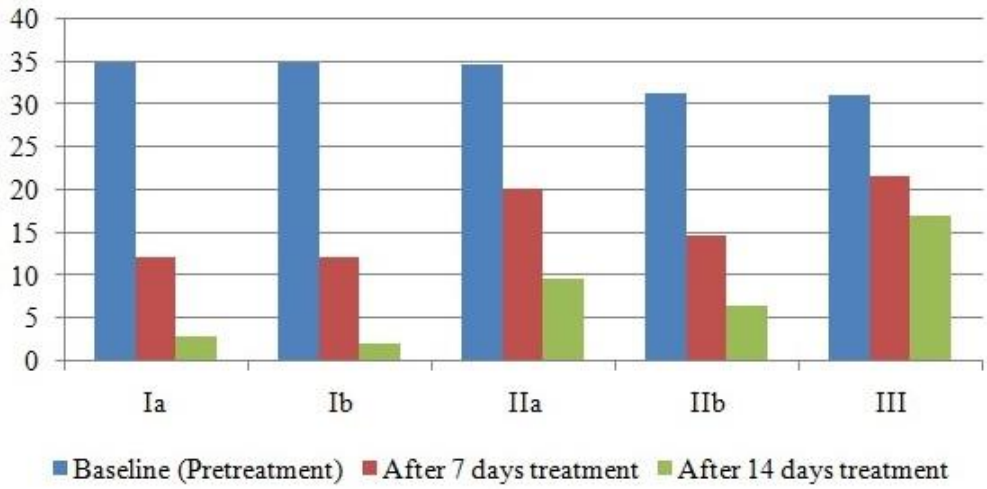

Fig 11. Bars showing mean Gram -ve cocci score at different time intervals in different groups

For group Ib, the mean spirochaete score was 18.75, 6.75 and 0.88, respectively, at different time intervals. The mean Gram + ve cocci score for this group was 16.75, 37.00 and 46.25 at different time intervals. The mean scores for Gram + ve bacilli were 11.25, 26.00 and 37.38, respectively, at different time intervals. Similarly, the mean score for Gram – ve cocci were 34.88, 12.13 and 2.00, respectively. The mean scores for Gram - ve bacilli were 18.38, 17.88 and 13.63, respectively, at different time intervals. In case of group IIa subjects, the mean spirochaete score were 18.75, 10.88 and 6.50, respectively, at baseline; after 7 days and 14 days of the treatment.

Histopathological examination

The histopathological examination of all the 5 groups (pre and post treatments) were done by using hematoxylin and eosin double staining and observed under light microscope. Fig 12(A) shows large number of inflammatory cells suggesting diffuse inflammation at day one and Fig 12(B) reveals tinned out epithelium with deep rete pegs at day 14. Fig 13(B) belongs to the group Ib (pre and post treatment). In the Fig 13(A), a thickened epithelium and inflammation with disrupted lining was observed.

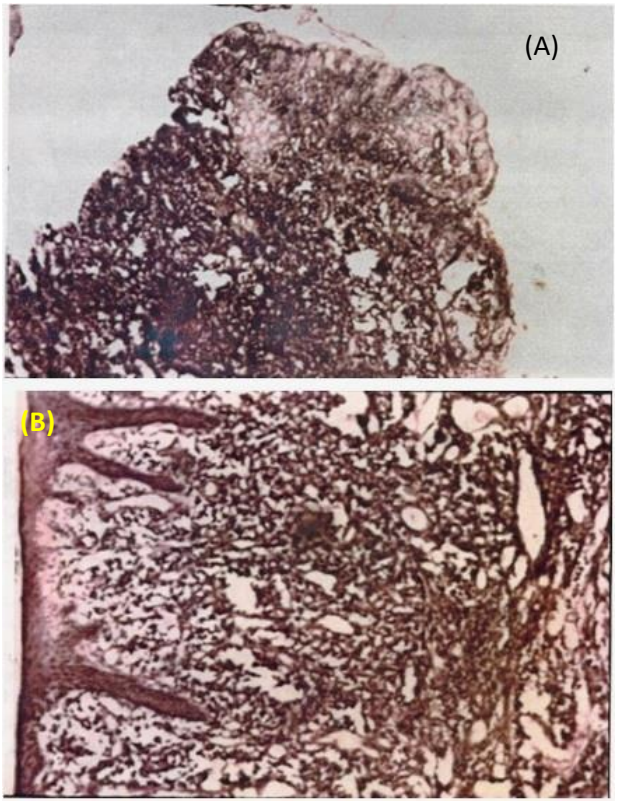

Fig 12. Histopathology of group Ia (metronidazole + SRP)

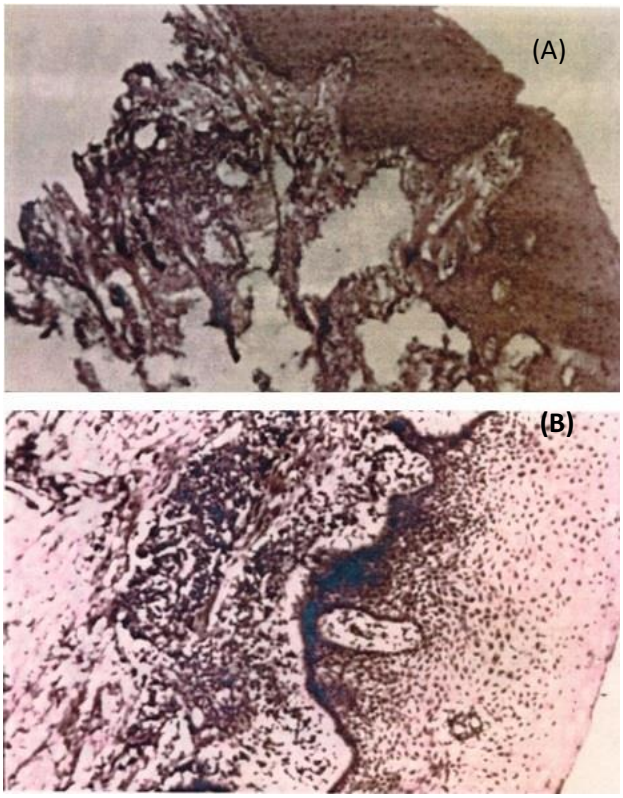

Fig 13. Histopathology of group Ib (ornidazole + SRP)

Fig 14(A) and (B) belong to group IIa pre and post treatments, respectively. Fig 14(A) exhibits thickened epithelium and large number of inflammatory cells. Fig 14(B) clearly demonstrates the presence of focal granuloma, deeply proliferating rete pegs and connective tissue area show collagen formation. Sub-epithelial zone shows inflammatory cells comprising plasma cells and lymphocytes and deeper zone shows spongiosis in pretreatment. Fig 15(A) of group IIb pre-treatment and Fig 15(B) for the same group post-treatment shows markedely proliferating epithelium with deep rate pegs. Fig 16(A) reveals chronic granulomatous inflammation and Fig 16(B) demonstrates markedly proliferating epithelium in group III.

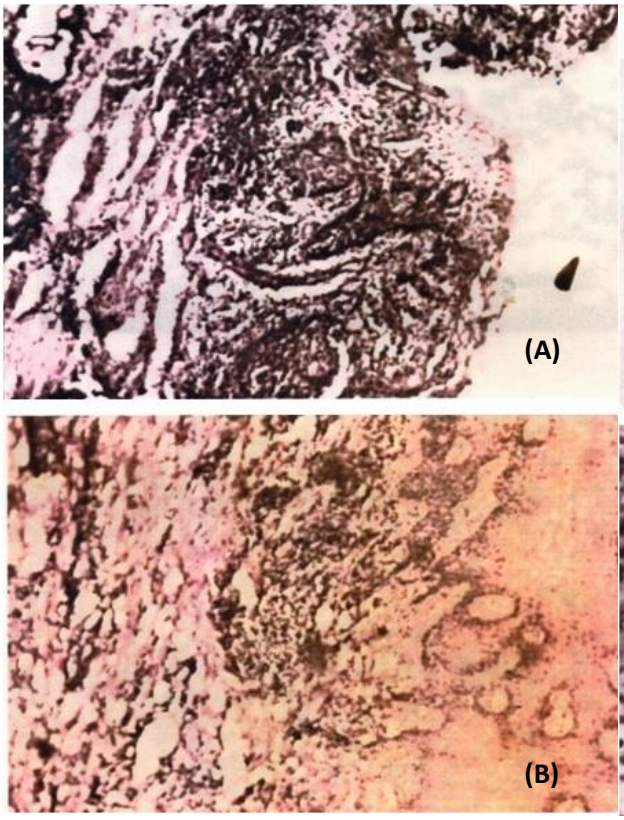

Fig 14. Histopathology of group IIa (metronidazole only)

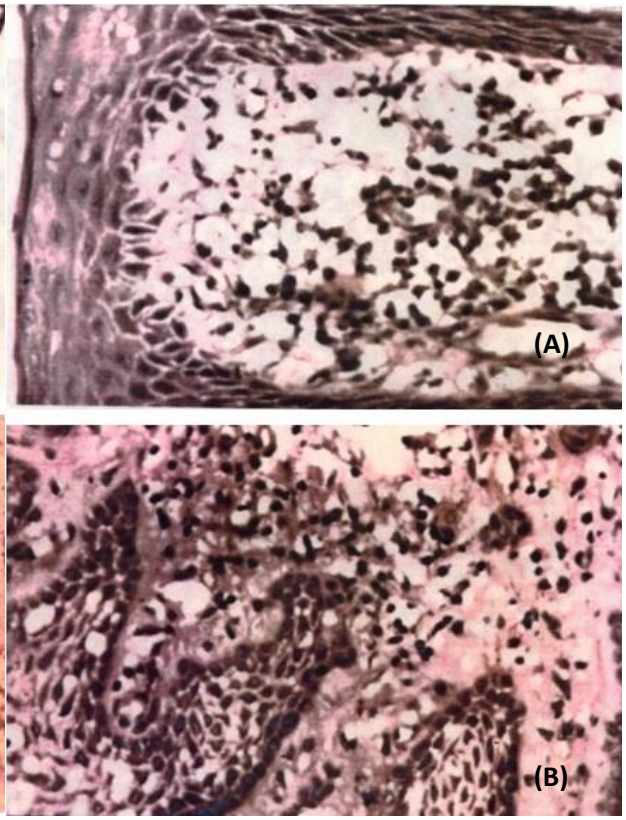

Fig 15. Histopathology of group IIb (ornidazole only)

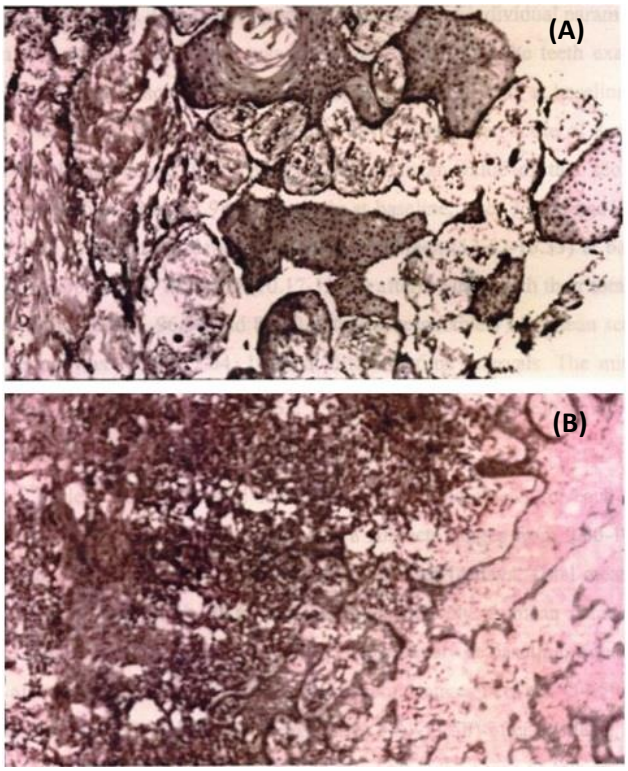

Fig 16. Histopathology of group III (SRP only)

DISCUSSION

Literature suggest that bacterial specificity that especially incriminates anaerobic bacteria and thus suggests a role for anaerobically-directed antimicrobial therapy. The drug so far used to treat periodontal disease include tetracycline, clindamycin, erythromycin, metronidazole, tinidazole, ornidazole and others. The group nitroimidazole (metronidazole, ornidazole etc.) is specifically anti-anaerobically directed and is therefore, indicated as anaerobes are implicated in the pathogenesis of periodontitis. But, the role of ornidazole is not well documented. Therefore, in the present study, the efforts were made to evaluate clinical, microbiologicalnand histopathological aspects of ornidazole and to compare its efficacy with the most widely used drug metronidazole as an adjunct to conventional therapy.

To make evaluations more reliable, a double blind format was used and documentation of the disease activity was done before the administration of drugs. Systemically compromised individuals were avoided as their disease state was likely to alter the host response to both the disease and drug, thus, introducing an added element of variability among the participants. The drug was not given to the persons with a history of intolerance to nitroimidazole group. Only 6 teeth as advocated by Ramfjord were considered for the study. The criteria for taking 6 teeth was firstly that different population of teeth (incisors, premolars and molars) are included, thus, giving an overall status of periodontal condition. Microbiological samples were collected by using the paper point technique. Before sampling the site, the gingival area was isolated from saliva by applying cotton rolls and sampling area dried gently with compressed air. To observe the tissue changes in various treatment modalities histopathological examination was carried under the light microscope. The three clinical parameters used to guage the efficacy of various modalities of therapy were gingival score, pocket depth and bleeding on probing.

Clinical Parameters

Gingival Score

The perusal of the observational data revealed that there was consistent significant decrease in the mean gingival score from baseline to the end of the study period i.e. 14 days in all the five groups. The gingival score was significantly reduced in subjects receiving both metronidazole and ornidazole along with SRP (group Ia and Ib) as compared to subjects in whom only SRP was done. The effect of both metronidazole and ornidazole on the gingival status was nearly same. The data revealed that SRP did bring about reduction in gingival score when compared from baseline to the end of the study period. This finding of the present study is in conformity with that of Mosques et al. (1980)[11], who also found that the SRP reduced the gingival inflammation significantly during 1st four weeks. The contention that inflammation decreases after SRP has also been observed by the Axelsson and Lindhe (1981)[12] and Lavanchy et al. (1987). [13]

Pocket Depth Score

Although the mean reduction in pocket depth at different time intervals in all the groups were significant, but, pocket depth was maximally decreased (5.09) in subjects in whom the drug ornidazole was given in conjunction with SRP. The results suggest that SRP decreased the mean pocket depth score throughout the study period. Similar results have been reported by Bardesten *et al.* (1984)[14] and Loesche *et al.* (1981).[6] These results are also in the conformity to van Winkelhoff *et al.* (1988)[15] and Sato *et al.* (1993).[16] On intergroup comparison, both groups Ia and Ib were superior to group III at both time intervals. Similar effects have been reported by Giedrys-Leeper *et al.* (1985)[17] and Watts *et al.* (1986).[7]

BOP Score

The intergroup comparision reveals that ornidazole or metronidazole as an adjunct to mechanical debridement is undoubtedly superior to the mechanical debridement alone.

Microbiological Investigations

There was a slight variation observed in Gram –ve bacilli in groups II and III, where their number increased at 14 days from the baseline. No difference in their count was observed in subjects treated with either mtronidazole or ornidazole alongwith SRP or in subjects only on drug regimen metronidazole or ornidazole. But, when metronidazole + SRP and ornidazole + SRP groups were compared with only SRP group,spirochaete count was significantly increased in SRP or placebo group. Similarily, Gram – ve cocci

count was at a much higher level (21.75%) in SRP group after 7 days and (17%) after 14 days when compared to the metronidazole + SRP (12.25% and 2.88%) after 7 and 14 days, respectively. The number of Gram – ve bacilli again increased in the placebo or SRP group as compared to metronidazole or ornidazole + SRP group after 7 days post treatment. Although, the number of this microorganism was more in SRP as compared to the metronidazole or ornidazole + SRP. The data suggest that the drugs, metronidazole and ornidazole offered beneficial effect on clinical parameters as well as on the count of spirochaete, Gram – ve cocci and Gram – ve bacilli over SRP alone. The complete reverse scenario was present in case of Gram + ve cocci and Gram + ve bacilli. An increase in the number of microorganism was observed from the baseline onwards till the end of the therapy.

Histopathological Examination

Treatment of metronidazole + SRP (group Ia) for 7 days has revealed a significant reversal of inflammation of gingival tissue confirmrd by formation of deep rete pegs and homogenized basal lining of epithelium with good connectivity with the connective tissue (Fig 12 B). Whereas, pre-treatment tissue represents a drastic damage with large number of inflammatory cells (Fig 12 A). In group Ib of untreated pathologically compromised patient tissue clearly shows a thick epithelial lining, loose connections with highly disrupted connective tissue and intervascular spaces (Fig 13 A). Treatment of ornidazole + SRP for 7 days have shown a significant recovery in the histological damages confirmed by initiation of rete pegs with regular linings and homogenized thickness, well organized highly bounded connective tissue with occasional occurrence of vacuoles are highlyindicative of recovery phase (Fig 13 B). Fig 14 B (group IIa, post treatment) shows a recovery in the damage of both epithelium and connective tissue, with the presence of focal granulona and small rete pegs formation. The connective tissue area shows the formation of collagen fibers and few vacuolar spaces. In group IIb subjects, where, only ornidazole was given, shows almost the same results as of group IIa. In group II (control group) after SRP, there is tissue aggregation and shows uniformity with the deep rete pegs and compact proliferating connective tissue (Fig 16 B). The overall recovery in group IIa and IIb as compared to group Ia and Ib was less. This might be due to the persistence of the irritating factor i.e. plaque. These results are in conformity to the Frank, 1980 and Sanz 1986. The clinical and microbiological examination shows ornidazole + SRP to be slightly better than metronidazole + SRP, but, the difference was insignificant. Similar results were also observed histopathologically.

The study pointed usefulness of systemic ornidazole and metronidazole as an adjunt to the mechanical debridment. Effects were made examine the efficacy of the drug using clinical, microbiological and histopathological approaches. But the superiority of the drug i.e. which drug is better metronidazole or ornidazole, no conclusive results were obtained. This might be due to the reason the study was a short term clinical trial and the number of study subjects were also less. Based on the study results long term clinical trials with larger population group are recommended for these drugs.

CONCLUSION

The study was conducted to evaluate the efficacy of five different treatment modalities on adult periodontiitis subjects over a period of 14 days. A significant improvement was noted in all the five treatment modalities in treating gingival inflammation, pocket depth and bleeding on probing. During the microbiological examination, both the drugs were equally effective when used alone and with SRP in reducing spirocheates, Gram –ve cocci, and Gram –ve bacilli. The microbiological investigation results concluded that, for a shorter period, ornidazole showed better results. Best histopathological results were obtained with ornidazole + SRP therapy.

DECLARATION OF INTEREST

It is hereby declared that this paper does not have any conflict of interest.

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