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EFFECT OF A CONTROLLED – RELEASE DEVICE CONTAINING DOXYCYCLINE HYCLATE IN THE TREATMENT OF CHRONIC PERIODONTITIS - A CLINICAL AND MICROBIOLOGICAL STUDY

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ABSTRACT

The primary objective of periodontal therapy is to stop disease progression. Increasing knowledge of anaerobic bacteria as pre-dominant agents in the development of periodontal diseases has led to new treatment strategies aiming primarily at the suppression or elimination of specific periodontal pathogens. The present study is to evaluate the clinical and microbiological effects of topical subgingival application of a biodegradeable 10% doxycycline polymer adjuctive to non-surgical periodontal therapy. **Materials and Methodology:** 10 patients aged more than 35 years suffering from moderate to severe chronic periodontitis. Patients choosen for the study had at least 3 pockets, 5 to 8 mm in that which bleed on probing in each of the two maxillary quadrants. The range between the probing pocket depth at the control sites of the study Teeth Within patient was not to exceed 2mm. Evaluations at the baseline visit and at the follow up evaluation at 1 week 1 month 3 month and 6 months rounded to the nearest mm. Following 10 days of incubation the total number of colony forming units were counted. **Statistical Analysis:** Mean and standard deviation where estimate for the sample for each study group mean values were compared by using student's paired T test. In the present study p < be less than 0.05 was considered as a level of significance. **Results:** In this study, the split mouth study design was used. the present study indicated that the total anaerobic bacterial cell count was significantly reduced in the group receiving local delivered doxycycline adjunctive to SRP compared to the group receiving SRP alone at 1 week, 1 month, 3 months and 6 months after baseline the total anaerobic bacterial cell count had not returned to the baseline value even at 6 months in the doxycycline SRB group.

KEYWORDS: Chronic Periodontitis, Atridox, Local Drug Delivery.

INTRODUCTION

Periodontitis in humans is considered to be caused by destructive effects from a large number of oral Microorganisms or from a few specific organisms only. Microbiological studies of adult periodontitis have shown the involvement of gram negative bacteria of which the majority are obligate anaerobes.[1]

The primary objective of periodontal therapy is to stop disease progression.[2] Mechanical therapy however may fail to eliminate the pathogenic bacteria because of their location within the gingival tissues or in other areas inaccessible to periodontal instruments. This may lead to their recurrence of the periodontal inflammation.[1]

Increasing knowledge of anaerobic bacteria as pre-dominant agents in the development of periodontal diseases has led to new treatment strategies aiming primarily at the suppression or elimination of specific periodontal pathogens. These strategies are based on systemic or local administration of antimicrobial agents.[3] Systemic antibiotics have proved to be effective in certain forms of chronic inflammatory periodontal disease such as juvenile periodontitis and refractory periodontitis.[4]

To obtain an effective concentration of the antimicrobial drug in the periodontal pocket after systemic administration, repeated in takes over after a prolonged

period of time are required. however when broad-spectrum antibiotics are used there is always a risk of inducing bacterial resistance and distortion of the commensal flora.[1]

These well known unwanted effects associated with the systemic use of antibiotics preclude the use of these agents as the sole or adjunctive treatment for untreated periodontal lesions as a routine procedure.[2]

For these reasons, the local delivery of antibiotics into the periodontal pocket is considered to have excellent potential as an adjunct to traditional Periodontal therapy. When a chemical agent is applied topically instead of being administered systemically, a lower dose is required. Thus any adverse side effects can be minimized. Consequently in recent years, several agents have been placed directly into periodontal pockets and tested for that effectiveness in the treatment of periodontal disease. Local delivery of antibacterial agents to the sites of periodontal disease has principally been by mouth rinses, lozenges, dentrifices, local irrigation devices and to a lesser extent by topical application in an adhesive carrier.

Of great interest today for controlling subgingival bacteria is the use of controlled release devices for subgingival delivery of antimicrobial agents their specific advantage being their ability to deliver the required drug at a desired rate and for a desired duration to a specific target site.[5]

Various devices are used to deliver and release drugs such as tetracycline, metronidazole, minocycline, chlorhexidine and doxycycline in the periodontal pocket. They include vinyl acetate fibres, acrylic strips, films, membranes, bioresorbable polymers and so on.

The present study is to evaluate the clinical and microbiological effects of topical subgingival application of a biodegradeable 10% doxycycline polymer adjuctive to non-surgical periodontal therapy.

Doxycycline polymer (Atridox®)

Doxycycline is an antimicrobial agent. It is so broad spectrum semi synthetic tetracycline. In this study the controlled release delivery system used is doxycycline hycylate (Atridox®). Delivered subgingivally in a biodegradable polymer. Doxycycline polymer (Atridox®) 10% (Fig 1) is indicated for use in treatment of chronic adult periodontitis to gain clinical attachment and reduce probing pocket depth and bleeding on probing. Atridox® is a controlled release product for subgingival use composed of two syringe mixing system.

Syringe A contains 450 mg of Atrigel delivery system which is a bioabsorbable, flowable polymeric formula composed of 36.7% poly (DL- lactide) dissolved in 63.3% N-methyl- 2-Pyrrolidone. Syringe B contains doxycycline hyclate that is equivalent to 42.5 mg of doxycycline.[6]

MODE OF ADMINISTRATION

The pouch containing the syringes and the blunt cannula is removed from the refrigerator 15 minutes prior to use. The syringes are then coupled together and mixed for 100 cycles. When finished, the contents should rest in syringe indicated by a purple strip the blunt cannula is attached to syringe A and Atridox®® is expressed in to the periodontal pocket. Any overflow material is packed into the pocket with the moist curette. Retention of Atridox®® can be enhanced by using a periodontal dressing (Coe pack®) or 2-octyl cyanoacrylate (Octyldent ®).

The constituted product, which ranges in colour from pale yellow to yellow, is a viscous liquid with a concentration of 10% doxycycline hyclate. Upon contact with the crevicular fluid, the liquid products solidifies, allowing for the controlled release of the drugs for a period of 7 days.

PHARMACOKINETICS

Doxycycline levels in GCF (gingival crevicular fluid) peaked 2 hours following treatment with Atridox®® (1500mcg/ml and 2000mcg/ml for the Coe pack® and Octyldent ®) groups respectively. These levels remained about 1000 Mcg/ml throughout 18 hours at which time the level began to decline gradually. However, the local level of doxycycline remained well above the minimum inhibitory concentration (MIC_{90}) for periodontal pathogens through day 7.[6] In contrast subjects receiving the oral doxycycline had peak GCF levels of 2.5 mcg/ ml at 12 hours following the initial oral dosing with levels declining 2.2 mcg/ml by day 7.

The maximum concentration of doxycycline in saliva was achieved at 2 hours after both treatment with Atridox® with the mean of 4.05 mcg/ml and 8.78 mcg/ ml and decreased 2.36 mcg/ ml and. 0.23 mcg/ml at day 7 Coe pack® and Octyldent® group respectively.

The concentration of the doxycycline in serum following the treatment of Atridox® never exceed 0.1mcg/ ml.[7]

MECHANISM OF ACTION

Doxycycline is bacteriostatic. it is thought to inhibit the bacterial Protein synthesis by binding to the 30 S bacterial ribosomes and preventing the access of aminoacyl tRNA to the acceptor (A) site on mRNA ribosome complex. at least two processes appears to be required for it to gain access to the ribosomes of Gram Negative bacteria: passive diffusion through the hydrophilic channels formed by the porin proteins of the outer cell membrane, and active transport by the energy dependent system that pumps it through the inner cytoplasmic membrane. Although permeation of these drugs into a Gram Positive Bacteria is less well understood, it to requires an energy dependent system.

Doxycycline has selective action of the bacterial cells, and not on mammalian cells because mammalian cells lacks the active transport system found in bacteria and in addition there are presumed differences in sensitivity at the ribosomal level between bacterial and the mammalian cells.[8]

Tetracycline have been widely used in the treatment of periodontal diseases tetracycline have the ability to concentrate in the periodontal tissue and inhibit the growth of Actinobacillus actinomycetemcomitans. in vitro testing has been shown that Porphyromonas gingivalis and Prevotella intermedia, Campylobacter rectus and Fusobacterium nucleatum which are associated with the periodontal disease are susceptible to doxycycline at the concentration $\leq$ 6 mcg ml.[9]

In addition they exert an anticollagenase effect that can inhibit the tissue destruction and may aid in bone regeneration.[10] Doxycycline is substantive to Dentin and cementum,[11] suggesting the potential role for the root surface acting as a reservoir of subsequent release of the doxycycline.[12]

MATERIALS AND METHODS

PATIENT SELECTION

10 patients aged more than 35 years suffering from moderate to severe chronic periodontitis and in good General Health was elected for the study from the division of periodontics faculty of dentistry. The two quadrants of the upper jaw where randomised to the two treatment arms. Patients choosen for the study had at least 3 pockets, 5 to 8 mm in that which bleed on probing in each of the two maxillary quadrants. The range between the probing pocket depth at the test sites of the study Teeth Within patient was not to exceed 2mm.

The patients were divided into two groups and the split mouth study design was used so that each portion acted as his/ her own control.
Group 1 (experimental site):- SRP + Atridox®®.
Group 2 (control site):-SRP alone.

INCLUSION CRITERIA

1. Patient of at least 35 years of age and in good General Health according to the medical history pulse rate blood pressure and clinical judgement.
2. Patient suffering from untreated moderate-to-severe periodontal disease or recurrent periodontitis without periodontal surgery for atleast the last 24 months.
3. Periodontal pockets 5 to 8 mm that bleed on probing.

EXCLUSION CRITERIA

1. Local / systemic antibiotic therapy within the last 6 months of the baseline examination.
2. Subgingival instrumentation less than 2 months prior to the baseline examination.
3. History of oral Candidiasis or allergies to doxycycline Hyclate or other tetracycline.
4. Compromised heart or medical condition requiring prophylactic antibiotic coverage.
5. Liver disease.
6. Pregnancy and lactation period.
7. Smokers.

EXPERIMENTAL DESIGN

At the initial screening visit after completion of the supra -gingival scaling, probing pocket depth was measured at 6 site for every tooth if the patient fulfilled inclusion criteria, the study protocol, risks, benefits and the procedures were explained and informed consent was obtained. Impressions were taken for the fabrication of the acrylic stents.no subgingival instrumentation was carried out at this visit.

At the baseline visit, which was scheduled 14 days after the screening visits microbial sampling was done probing pocket depth was measured to the nearest point 0.5 mm at 6 sites around each tooth included in the study with the straight periodontal probe (Williams periodontal probe), plaque index, gingival index, sulcus bleeding Index were recorded for the same. Three sites in each of the quadrant that qualified for the study was selected for the clinical attachment level measurement using acrylics stents.

Scaling and root planing be done using ultrasonic and hand instruments. root planing was performed under local anaesthesia. Mechanical debridement of 1 test tooth was limited to 10 minutes. After completion of the scaling and root planing doxycycline Polymers were inserted into the periodontal pocket under the experimental group as follows.

1. Atridox® is composed of Two syringe mixing system.
2. The Pouch containing the syringes and the blend cannula was removed from the refrigerator 15 minutes prior to use.
3. Then the Syringes were couples together and mix for 100 cycles. When finished the contents rested in syringe A (fig 2).
4. The blunt Cannula was attached to syringe A and ATRIDOX® was expressed into the periodontal pocket (fig 3).
5. Any Overflow material was packed into the pocket with the moist curette.
6. Periodontal pack was placed over the treated area for one week.

Patients were instructed not to perform the oral hygiene on the quadrants that received SRP + doxycycline polymer for one week after treatment. They were instructed to brush using the bass technique and received no further treatment other than oral hygiene after baseline till the end of this study period.

Post-treatment evaluation of the clinical parameters was done at 3 months and 6 months. Post treatment

evaluation of the microbial parameters were done at 1 week 1 month 3 month and 6 months.

Evaluations

At the baseline visit and at the follow up evaluation at 1 week 1 month 3 month and 6 months.

All periodontal measurements were made using a periodontal probe graduated in 1 mm increment. Reading was rounded to the nearest mm.

Experimental parameters

Clinical parameters

1. Plaque Index (P L I) (Silness and Loe; 1964)[10]
2. Gingival Index (GI) (Loe and Silness;1963)[10]
3. Sulcus Bleeding Index (SBI) (Muhlemann And Son; 1971)[13]
4. Probing Pocket Depth (PPD).[10] (Fig 4)
5. Clinical Attachment Level (CAL)[14]: Clinical attachment level was measured at three sites one site for tooth in each quadrant which qualified for the study, using and endodontic spreader with the stopper from the margin of the stent to the base of the pocketing (Fig.5).

Microbiological parameters

Total anaerobic bacterial cell

Microbial Sampling and anaerobic culturing

Supragingival plaque was removed and the tooth carefully drive with a sterile cotton pellets. Three sterile paper points where then inserted into the base of the pocket(Fig.6), left for 15 seconds removed and rapidly transferred to a vial containing 1ml of transport medium (thioglycolate medium).[15,16] The samples were vortexed for 60 seconds and then serially diluted in the transport medium (1 :10,1:100,1:1000).

A sample from each dilution was inoculated on the plates containing blood agar[17] with the help of a 0.001 mm calibrated wire loop this place was kept in an anaerobic jar (MacIntosh field anaerobic jar) and incubated at 37^0C for 10 days. Gas Pack system was used to produce an aerobic condition inside the jar.

Following 10 days of incubation the total number of colony forming units were counted (Fig.7) and then the mean value of the count from 3 dilutions were calculated for each sample. In most instances the number of colony forming the units grown from the lower dilution were too dense to count in which case, the mean of the other two dilutions were calculated. Using this value the total anaerobic bacterial count was estimated.

Statistical analysis

For clinical parameters, means were calculated using the sum of the treated site measurement for a subject divided by the number of treated sites. The subject mean was the basis of the statistical analysis not the sides alone.[18]

The total anaerobic bacterial cell counts was expressed as % reduction from baseline values are the various post treatment intervals (Fig.8).[5]

Mean and standard deviation where estimate for the sample for each study group mean values were compared by using student's paired T test. In the present study $p \leq$ be less than 0.05 was considered as a level of significance.

RESULTS

The table 1 shows the mean (histogram-1), standard deviation and the test of significance of the plaque scores at baseline 3 months and 6 months for both experimental and control groups. The reduction in the plaque score between the experimental and the control groups at 3 months and 6 months was statically insignificant at the level of $p = 0.27$ and 3 months and $p = 0.44$ at 6 months, when analysed by Student's Paired t Test. It can be inferred from that the reduction in the plaque index of the 3 months and 6 months was statistic insignificant after adjunctive treatment with doxycycline polymer compared to SRP alone.

The table 2 shows the mean(histogram-2), standard deviation and the test of significance of the gingival scores at baseline 3 months 6 months for both experimental and the control groups.

There was a statistically significant reduction in the gingival scores in the experimental group compared to the control group at 3 months at the level of p= 0.02. The reduction in the gingival scores between the experimental and the control groups at 6 months was statistically insignificant at the level of p= 0.34, when analysed by the Student's Paired t Test.it can be inferred that there was a statistic least significant reduction in the gingival index at 3 months but not as 6 months after adjective treatment with doxycycline Polymer compare to SRP alone.

The table 3 shows the mean(histogram-3), standard deviation and the test of significance of bleeding on probing at baseline 3 months and 6 month for both experimental and control group the reduction in bleeding on probing between the experimental and the control groups at 3 months and 6 months was statistical e in significant at the level of p= 0.44 at 3 months and p= 0.34 at 6 months when analysed by the Student's Paired t Test.it can be inferred that the reduction in the sulcus bleeding index at 3 months and 6 months was statistically insignificant after an adjunctive treatment with doxycycline polymer compare to SRP alone.

The table 4 shows the mean(histogram-4), standard deviation on the test of significance of probing pocket depth at baseline 3 months and 6 months for both experimental and control groups. There was a statistically significant reduction in the probing pocket depth in the experimental group (1.56mm) compared to

the control group (1.04mm) 3 months and 6 months at the level of p = 0.01 at 3 months and 6 months when analysed by the Student's Paired t Test. It was informed that there was a statistically significant reduction in the probing pocket depth at 3 months and 6 months after adjunctive treatment with doxycycline polymer compared to SRP alone.

The table 5 shows the mean (histogram-5), standard deviation and the test of significance of the clinical attachment level at basement Line, 3 months and 6 months for both experimental and the control group. There was a statistically significant gain in the clinical attachment level in the experimental group compared to the control group at 3 months (mean gain: experimental: 1.01 mm, control 0.55 mm) and 6months (mean gain: experimental: 0.98 mm, control:0.57 mm) at a level of p = 0.03 at 3 months and p= 0.04 at 6 months when analysed by the Student's Paired t Test.it can be inferred that there was a statistically significant gain in the clinical attachment level at 3 months and 6 months after adjunctive treatment with doxycycline polymer compared to SRP alone

The table 6 shows the mean(histogram-6), standard deviation and the test of significance of the percent reduction of the total anaerobic bacterial cell count from baseline for both experimental and control groups. There was statistically significant decrease in the % reduction of the total anaerobic bacteria cell count in the experimental group compare to the control group at 1 week, 1 month, 3 months and 6 months from baseline at a level of p= 0.0001, when analysed by the Student's Paired t Test. In the experimental group the total anaerobic bacterial cell count has not returned to the baseline value after 6 months whereas in the control group the count was greater than the baseline value at both 3 months and 6 months. It can be inferred that there was a statistically significant reduction in the total anaerobic bacterial cell count at 1 week, 1 month, 3 months and 6 months after adjunctive treatment with doxycycline Polymer compared to SRP alone.

Table 1: Mean, Standard Deviation And Test Of Significance Of Plaque Scores Between Experimental And Control Groups.

TIME POINT	EXPERIMENTAL (n=10) mean ± SD	CONTROL (n=10) mean + SD	p- value
Baseline	1.00 ± 0.00	1.00 ± 0.00	1.00(NS)
3 months	0.58 ± 0.05	0.55 ± 0.04	0.27(NS)
6 months	0.36 ± 0.04	0.35± 0.03	0.44(NS)

Table 2: Mean, Standard Deviation And Test Of Significance Of Gingival Scores Between Experimental And Control Groups.

TIME POINT	EXPERIMENTAL (n=10) mean ± SD	CONTROL (n=10) mean + SD	p- value
Baseline	1.60 ± 0.18	1.60 ± 0.13	1.00(NS)
3 months	0.45 ± 0.07	0.57 ± 0.13	0.02(NS)
6 months	0.00 ± 0.00	0.00± 0.00	0.34(NS)

Table 3: Mean, Standard Deviation And Test Of Significance Of Bleeding On Probing Between Experimental And Control Groups.

TIME POINT	EXPERIMENTAL (n=10) mean ± SD	CONTROL (n=10) mean + SD	p- value
Baseline	2.57 ± 0.16	2.54 ± 0.15	0.63(NS)
3 months	1.45 ± 0.07	1.50 ± 0.19	0.44(NS)
6 months	0.29 ± 0.06	0.32 ± 0.07	0.34(NS)

Table 4: mean, standard deviation and test of significance of probing pocket depth between experimental and control groups.

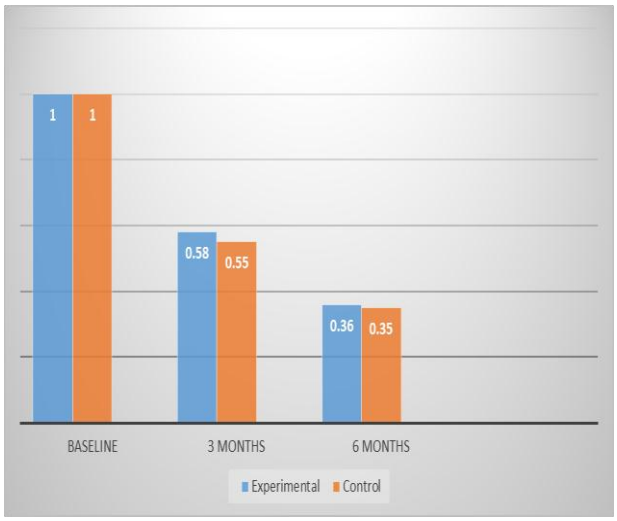
TIME POINT	EXPERIMENTAL (n=10) mean ± SD	CONTROL (n=10) mean + SD	p- value
Baseline	5.73 ± 0.66	5.68 ± 0.72	0.80(NS)
3 months	4.17 ± 0.62	4.64 ± 0.68	0.01(SIG)
6 months	4.17 ± 0.62	4.64 + 0.68	0.01(SIG)

Table 5: Mean, Standard Deviation And Test of Significance Of Clinical Attachment Level Between Experimental And Control Groups.

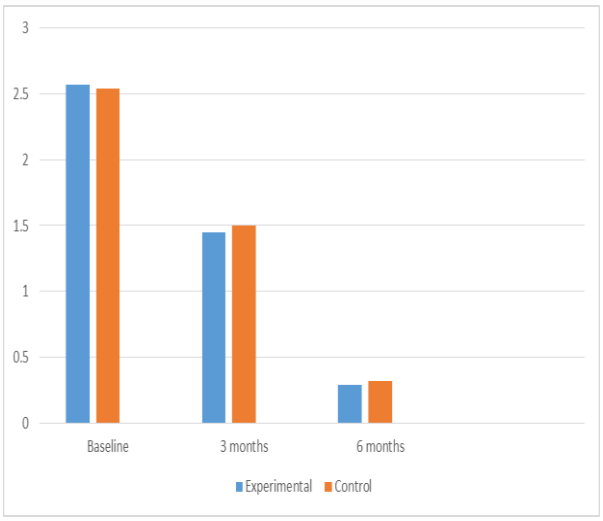
TIME POINT	EXPERIMENTAL (n=10) mean ± SD	CONTROL (n=10) mean + SD	p- value
Baseline	11.46 ± 0.97	11.43 ± 0.74	0.84(NS)
3 months	10.45 ± 0.93	10.88 ± 0.71	0.03(SIG)
6 months	10.48 ± 0.94	10.86 + 0.74	0.04(SIG)

Table 6: Mean, Standard Deviation and Test of Significance of % Reduction of the Total Anaerobic Bacterial Cell coUnt from Baselinebetween Experimental and Control Groups.

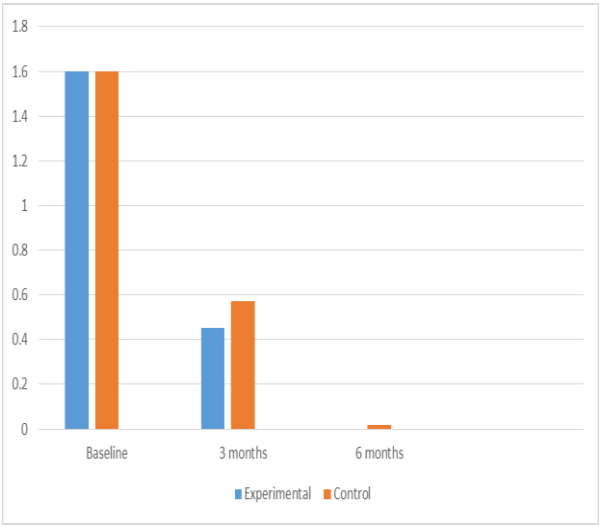
TIME POINT	EXPERIMENTAL (n=10) mean ± SD	CONTROL (n=10) mean + SD	p- value
1 week	91.3 ± 1.3	5.68 ± 0.72	0.0001(SIG)
1 months	74.0 ± 3.7	64.1 ± 3.2	0.0001(SIG)
3 months	16.6 ± 5.0	-3.1 ± 2.4	0.0001(SIG)
6 months	5.1 ± 2.5	-0.5± 2.6	0.0001(SIG)



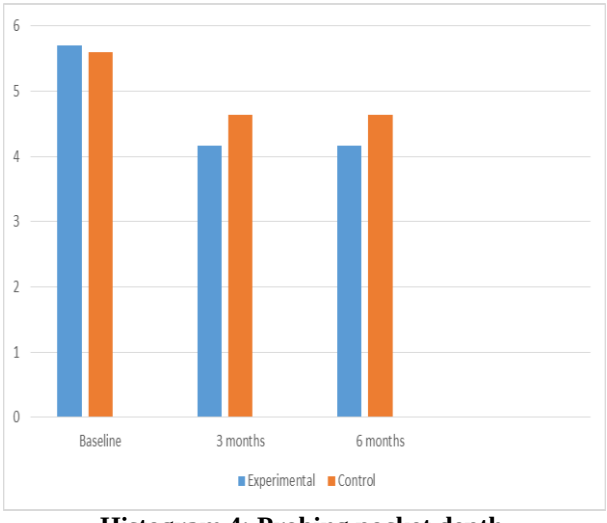
Histogram-1: Plaque Index.



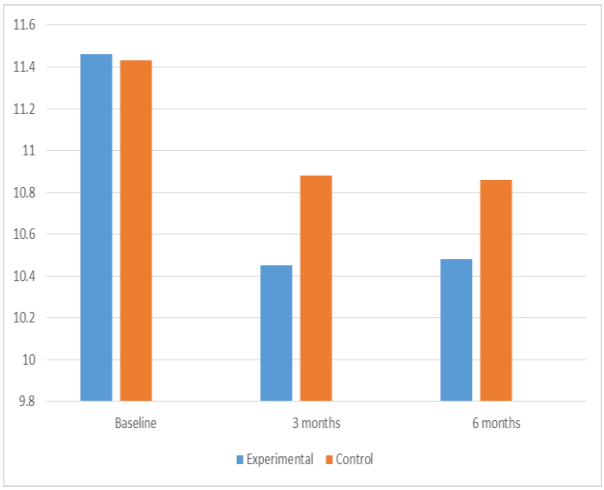
Histogram -3: Bleeding on probing.



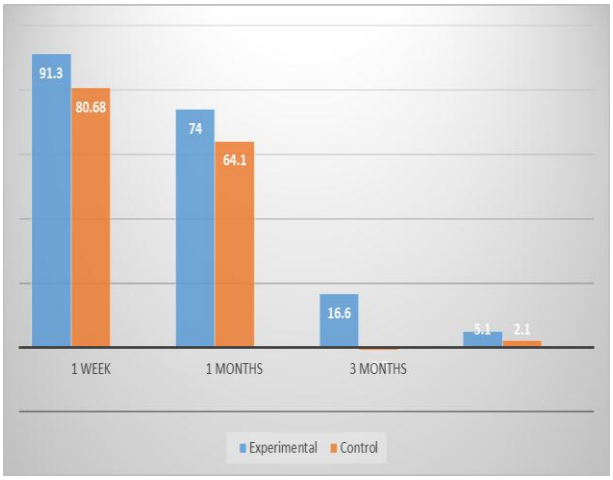
Histogram 2: Gingival index.



Histogram 4: Probing pocket depth.



Histogram 5: Clinical Attachment level.



Histogram 6: % Reduction of The Total Anaerobic Bacterial Cell Count From Baseline.

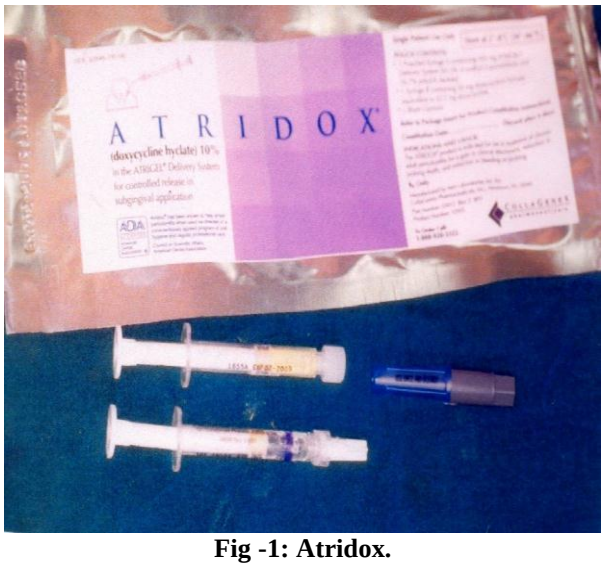


Fig -1: Atridox.

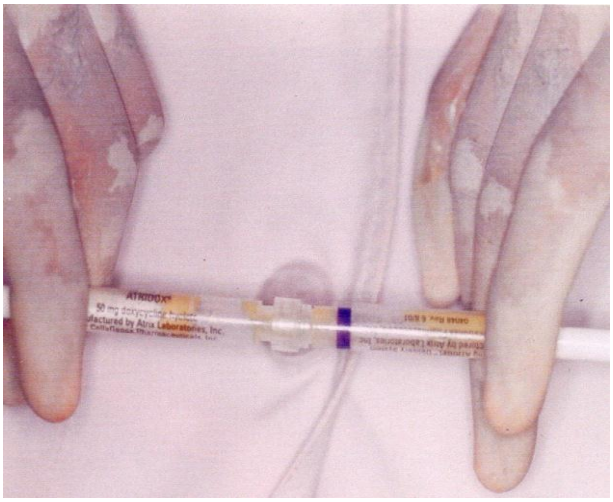


Fig – 2: Mixing Syringes A & B.

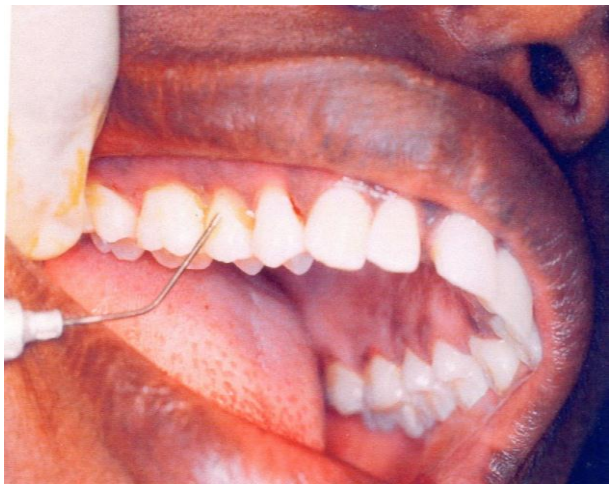


Fig- 3: Atridox Application.

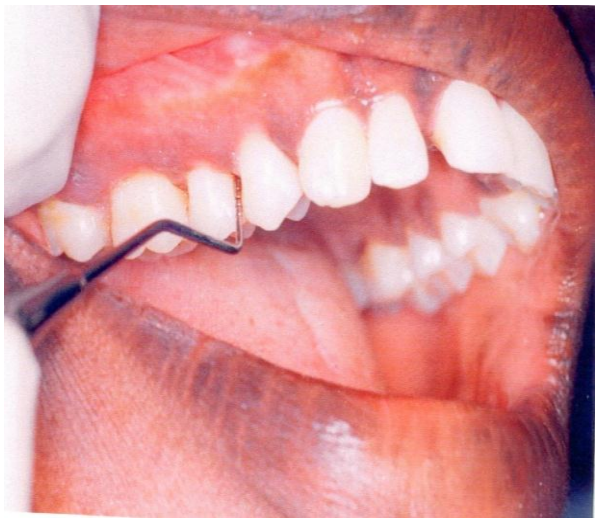


Fig – 4: Probing Pocket Depth.

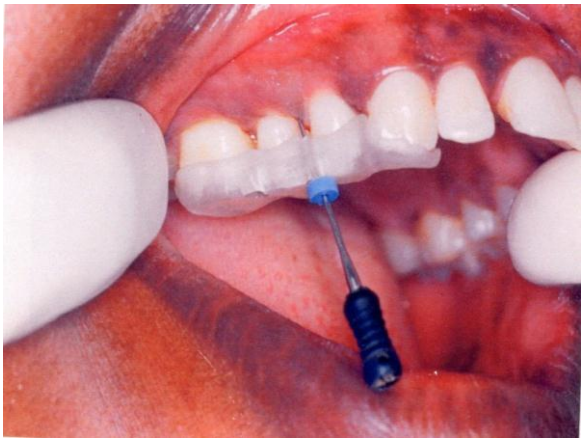


Fig- 5: Clinical Attachment Level.

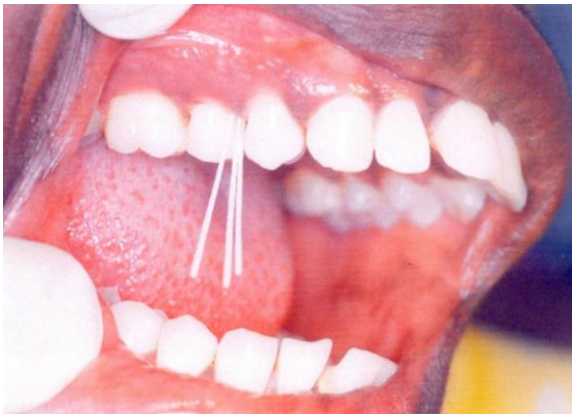


Fig- 5: Plaque Sample Collection.

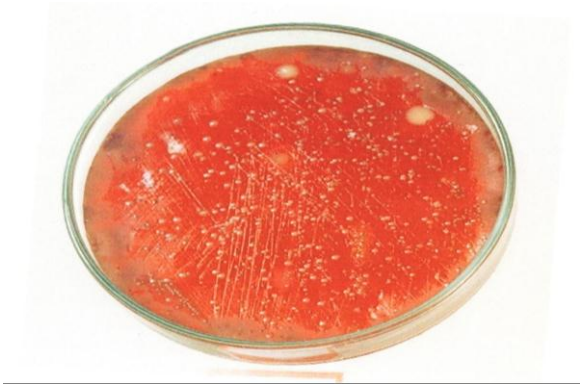


Fig-7: Experimental Site (Pre Operative).

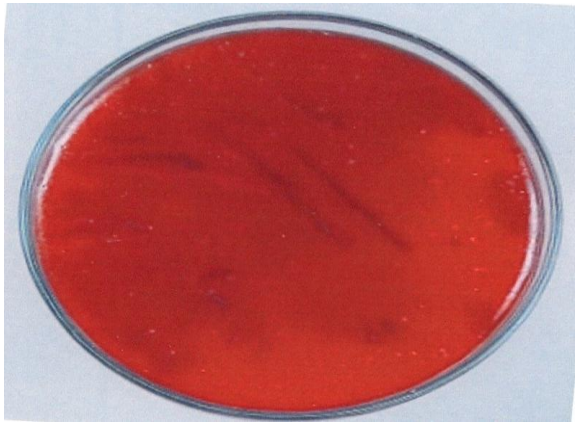


Fig – 8: Experimental Site (Post Operative).

DISCUSSION

The elimination and alteration of the bacterial pathogens in subgingival plaque is the primary objective of the periodontal therapy. The primary non surgical approach in walls mechanical scaling and root planning(SRP).[13] Meticulous scaling and root planing in conjunction with patient's proper plaque control can arrest periodontitis, but this therapy occasionally fails and therefore adjunctive forms of therapy need to be considered.[19]

Another approach is to control the suspected bacterial pathogens by administering an antibacterial agent into the periodontal pocket. The present study was plan to evaluate the clinical and the microbial effect of the controlled release device containing 10% doxycycline hyclate when used as an adjunct to scaling and root planning in the treatment of chronic periodontitis. In this study Atridox® was used as a vehicle for intra pocket delivery of doxycycline. Atridrox is a controlled release biodegradable local delivery system that delivers the antibiotic doxycycline and can maintain effective level of drug in the periodontal pocket while simultaneously bio degrading. A number of periodontal pathogen are susceptible to doxycycline at the concentrations $\leq$ 6 mcg/ ml[60]. with Atridox®, local levels of doxycycline in GCF remains at a mean concentration of 309 mcg/ ml for 7 days, which is well above the MIC_{90} for periodontal pathogens (< 6 mcg/ ml).[18]

In this study, the split mouth study design was used. Split mouth study designs have been used for the evaluation of the topical subgingival antimicrobials in periodontics successfully.[4,20,21] However when comparing different treatment methods within the same dentition, so call carry-across or spill -over effects may occur.[21,22,23] The sub gingivally delivered agent may be partially observed and thereby have systemic effects on the other test teeth. Further, amounts of sub gingivally delivered agent may leave the pocket via sulcus fluid and affect the other test teeth. It in the present study the provision was made the the experimental and the corresponding control site should be in a contralateral jaw quadrants, separated by at least one tooth, thus minimizing the interaction between the therapy modes.

In the present study the reduction in the plaque index between the experimental and the control group was not significant. This is consistent with the studies by Eickholz et al (2002)[11], who compared local drug delivery doxycycline + SRP to SRP alone in a split mouth design study. There also was a significant reduction in the gingival index in the experimental group compared to the control group at 3 months but not at 6 months in the present study. The results of the present study showed that the reduction of the sulcus bleeding index between the experimental and the control groups was not significant it also shows there was a significant greater improvement in the probing pocket then compared to the improvement obtained with the scaling and root planning alone at the baseline the probing

pocket that was similar for both the treatment groups there was a statistically significant reduction in the probing pocket depth in the experimental group at 3 months which was maintained through 6 months with adjunctive use of the locally delivered doxycycline to SRP seems to provide better reduction of probing pocket depth than local deliver doxycycline alone when compared to SRP alone the reduction in the probing pocket depth reported.

The study shows significant gain in CAL from baseline to 3 months and further 6 months. Thus, the use of local deliver doxycycline as an adjunct to SRP seems to provide better gain of CAL when compared to SRP alone.

Result of the present study indicated that the total anaerobic bacterial cell count was significantly reduced in the group receiving local delivered doxycycline adjunctive to SRP compared to the group receiving SRP alone at 1 week, 1 month, 3 months and 6 months after baseline the total anaerobic bacterial cell count had not returned to the baseline value even at 6 months in the doxycycline SRB group. However in the SRP group there was a rebound in the total anaerobic bacterial cell count to the Baseline value at 3 months and 6 months and more. At present however no studies are available showing the additional microbial benefit of the sub gingival application of the doxycycline in combination with the route planning the extended suppression of the bacterial flora in the present study might have been as a result of the increased amount of doxycycline and the time to which the bacteria where exposed in addition doxycycline has been shown to be substantive to cementum and Dentin and this may also have influenced its effect by virtue of the potential role for the roots surface acting as a Reservoir for subsequent release of doxycycline.

The result of this study show the locally delivered controlled release device containing 10% doxycycline hyclate in a biodegradable polymer used in the study to be an effective agent to scaling and root planning in the treatment of the periodontal disease it provides us safe easily applied single dose means of achieving significantly better clinical and microbial results than scaling and root planning alone.

CONCLUSION

This study demonstrated that doxycycline hyclate 10% gel ($^{Atridox®}$) is as effective as SRP in reducing the clinical signs of periodontitis.

The study is with limited number of patients and with good number of sites were treated based on site specific entity of periodontal disease. No attempt was made to compare aggressive v/s chronic periodontitis cases. Further, Randomized clinical trials (RCTs) with larger number of patients with microbial evaluation could provide better results. The use of doxycycline hyclate for treatment of periodontal patients is a good recommended considering the results of the study.

However, further studies are needed to determine which type of patients and lesions will benefit most from the incorporation of locally delivered controlled release doxycycline as an adjunct to non surgical periodontal therapy.

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