



ORIGINAL ARTICLE

Comparative efficacy assessment of doxycycline and metronidazole gel in managing periodontitis among patients from Hyderabad, Sindh Pakistan.

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ABSTRACT... Objectives: To evaluate the comparative effect of 0.4 % Doxycycline gel and 1% Metronidazole gel as an adjunct to scaling and root planning in the treatment of chronic periodontitis. **Study Design:** Interventional study. **Setting:** Department of Periodontology at Isra Dental College, Isra University Hyderabad. **Period:** October 2017 to April 2018. **Material & Methods:** A sample of 60 patients of chronic Periodontitis were selected according to inclusion and exclusion criteria through non probability convenience sampling technique. Subjects were divided into 3 groups; GROUP A: Scaling and Root Planning (SRP) + 0.4 % doxycycline gel was applied sub-gingival, GROUP B: Scaling and root planning (SRP) + 1 % metronidazole gel was applied sub-gingival, GROUP C: Scaling and root planning (SRP) alone was performed. Data was recorded on proforma and was analyzed by using SPSS version 22.0. P value significance was taken \leq or equal to 0.05. **Results:** Pocket depth at baseline in group A was 4.39 ± 0.20 which was reduced to 3.78 ± 0.53 and 3.30 ± 0.17 millimeters at day 10 and after one month respectively. Pocket depth at baseline in group B was 4.45 ± 0.19 which was reduced to 3.89 ± 0.51 and 3.34 ± 0.17 millimeters at day 10 and after one month respectively. Pocket depth at baseline in group C was 4.45 ± 0.18 which was reduced to 4.10 ± 0.20 and 4.06 ± 0.27 millimeters at day 10 and after one month respectively. Pocket depth at Day 10 in groups A, B and C showed statistically significant. **Conclusion:** Both Doxycycline and Metronidazole gel proved same efficacy when compared to control group. Since there is no difference in efficacy of doxycycline and metronidazole gels when applied in patients having periodontitis.

Key words: Doxycycline, Metronidazole, Periodontitis.

INTRODUCTION

Periodontitis is an inflammatory disorder of supporting tissues of a tooth caused by microorganisms, characterized by the progressive destruction of periodontium and alveolar bone with pocket formation or recession. Most often reported microorganisms are the Gram negative bacteria which reside in dental plaque and initiate damage by inducing inflammation.¹ Plaque exists as a thin biofilm where microorganisms can easily proliferate and form colonies. Biofilm provides protection and nutrition for microorganisms to proliferate.² Plaque biofilm and inflammatory response of host contribute equally in the pathogenesis of periodontitis.^{3,4} Approximate prevalence of periodontitis is 15% in

adults (age 21- 50 years). The prevalence rises to 30% in adults with age > 50 years of life.⁵ Periodontal treatment is meant to reduce the load of pathogenic microorganisms by different treatment modalities. Mechanical therapy alone fails to eliminate the pathogenic bacteria because they are located deep inside the soft tissues. Hence they are inaccessible to periodontal instruments. Bacteria residing near the furcation area and root depression are not accessible by mechanical instrumentation.^{6,7} The scaling and root planning (SRP) are limited in certain degrees of periodontal disease, hence use of antibiotics as adjunctive therapy adds much to eradicating the bacteria. The antibiotics may be used locally or systematically for better clinical responses.⁸

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Depending upon the severity of infection in periodontitis, the systemic use is more yielding than local use. However, locally administered anti-microbial offers good efficacy compared to systemic use as it causes less side effects.⁹ Systemic antibiotic therapy has many drawbacks when used as adjunctive to scaling and root planning. Systemic use increases the chances of antibiotic drug resistance. Antibiotics induce adverse reactions such as nausea, gastritis, diarrhea, hypersensitivity reactions, and pseudo membranous colitis. Systemic use does not make the drug available at the site for a sufficient period of time.¹⁰ Local administration of antibiotic yields higher concentrations at the site of infection even with single application without causing systemic side effects. Patient's compliance is comparatively higher.¹¹ Different therapeutic agents used for local drug delivery include the tetracyclines (Doxycycline, minocycline), Metronidazole and Chlorhexidine. These drugs are made as gels, films, polymer chips, paste and fibers.¹² Doxycycline gel is very safe and reaches deep into tissue spaces, it achieves high drug concentrations in the dental pockets compared to other antibiotics.¹³ Doxycycline remains in the pockets for 7 – 10 days without changing its concentration.¹⁴ Doxycycline possess antibiotic and anti-inflammatory efficacy.¹⁵ Doxycycline inhibits supra gingival plaques¹⁶ and reduces the depth of periodontal pockets.¹⁷ Doxycycline offers excellent sustaintivity, and excellent penetrating effect into the root surfaces.¹⁸

Metronidazole is a nitroimidazole drug compound. Metronidazole is effective agent when used as an adjunct to SRP in eradication of periodontal disease. Various studies had reported therapeutic efficacy of metronidazole and tetracyclines separately, but comparative analysis of metronidazole & Doxycycline have not been studied extensively, infact these are the two most common drugs prescribed for treatment of periodontal disease.¹⁹

As the periodontal disease is prevalent in our society and new cases are presenting at our tertiary care hospital on daily basis, hence there is need to evaluate efficacy of Metronidazole and

Doxycycline in periodontal disease. The present study evaluated the efficacy of Doxycycline gel and Metronidazole gel as an adjunct to scaling and root planning in the Periodontal disease.

MATERIAL & METHODS

The present interventional study was conducted in the Department of Periodontology at Isra Dental College, Isra University Hyderabad from October 2017 to April 2018. A sample of 60 patients of chronic Periodontitis were selected according to inclusion and exclusion criteria through non probability convenience sampling technique.

Subjects were divided into 3 groups; GROUP A: Scaling and Root Planning (SRP) + 0.4 % doxycycline gel was applied subgingivally, GROUP B: Scaling and root planning (SRP) + 1 % metronidazole gel was applied subgingivally, GROUP C: Scaling and root planning (SRP) alone was performed. A case history along with a clinical periodontal examination was performed for all individuals. Participants were informed about advantages, disadvantages, and or loss. Patient's informed consent was taken before procedure.

Clinical parameters were assessed using a manual CPITN probe. Scoring was done for 6 surfaces of all the teeth mesiobuccal, midbuccal, distobuccal, mesiolingual, midlingual and distolingual. After basic periodontal examinations, supra and subgingival scaling and root planning was performed to remove plaque and calculus. All of the patients received initial periodontal therapy including motivation and instruction in oral hygiene methods. Subgingival delivery of drug was performed with a plastic disposable syringe and curved thin plastic needle. The clinical parameter of each patient was recorded at baseline, after 10 days and after 1 month. Data was recorded on proforma and was analyzed by using SPSS version 22.0. P value significance was taken \leq or equal to 0.05.

RESULTS

The present interventional study was conducted to evaluate the comparative effects of 0.4 % Doxycycline gel and 1% Metronidazole gel as an

adjunct to scaling and root planning (SRP) in the treatment of chronic periodontitis. A sample of 60 subjects of chronic periodontitis was divided into 3 groups. Mean \pm SD age of study population is shown in Table-I. Mean \pm SD age in groups A, B and C was noted as 35.6 ± 8.9 , 38.10 ± 9.6 and 37.30 ± 8.3 years (F value 1.38, $p = 0.56$). Non-significant p value of age shows the study subjects were age matched. Similarly, the study population was gender matched as shown in Table-II. The age and gender matched population overcomes the research bias. Male and female in groups A, B and C were noted as 14 and 6, 15 and 5, and 13 and 7 respectively.

3.1. Pocket Depth

Pocket depth at baseline is summarized in Table-III. Pocket depth among 3 groups A, B and C was matching at baseline as indicated by F value of 1.63 and non-significant p value of 0.68.

3.2. Group A. SRP + 0.4% Doxycycline gel

Pocket depth at baseline in group A was 4.39 ± 0.20 which was reduced to 3.78 ± 0.53 and 3.30 ± 0.17 millimeters at day 10 and after one month respectively.

3.3. Group B. SRP+ 1.0% Metronidazole gel

Pocket depth at baseline in group B was 4.45 ± 0.19 which was reduced to 3.89 ± 0.51 and 3.34 ± 0.17 millimeters at day 10 and after one month respectively.

3.4. Group C. SRP (scaling and root planning) alone

Pocket depth at baseline in group C was 4.45 ± 0.18 which was reduced to 4.10 ± 0.20 and 4.06 ± 0.27 millimeters at day 10 and after one month respectively.

3.5. Intra Group Comparison

3.5.1. At Baseline

Pocket depth at baseline is groups A, B and C was similar among 3 groups as shown in Table-III.

3.5.2. At Day 10

Pocket depth at Day 10 in groups A, B and C showed statistically significant difference. Pocket depth was found decreased in group A (Doxycycline) and B (Metronidazole) compared to group C (SRP alone). Group C showed insignificant improvement compared to baseline. P value was found statistically significant ($p = 0.049$) and F value of 5.2 as shown in Table-IV.

Pocket depth at Day 10 in Groups A and B showed statistically Non-significant difference (p-value of 0.61). Hence There is no difference in efficacy wise b/w groups A & B as shown in Table-V.

3.5.3. At One Month

Pocket depth at one month showed more reduction in group A (Doxycycline) and B (Metronidazole) compared to baseline, day 10 and to group C (SRP alone). Difference was found statistically significant ($p = 0.033$) and F-value of 3.7 as shown in Table-VI. Pocket depth at one month in Groups A and B showed statistically Non-significant difference (p-value of 0.067).

Hence there is no difference in efficacy wise b/w group A & B as shown in Table-VII. The cumulative results of baseline, day 10 and at one month. Doxycycline and Metronidazole showed similar efficacy in healing and reducing the size of Pocket depth.

Groups	Mean	SD	F- Value	P- Value
Group A. SRP + 0.4% Doxycycline gel	35.6	8.9	1.38	0.56
Group B. SRP+ 1.0% Metronidazole gel	38.10	9.6		
Group C. SRP alone	37.30	8.3		

Table-I. Age distribution of study population (n=60)

Groups	Male	Percentage%	Female	Percentage %
Group A. SRP + 0.4% Doxycycline gel	14	70%	06	30%
Group B. SRP+ 1.0% Metronidazole gel	15	75%	05	25%
Group C. SRP alone	13	65%	07	35%

Table-II. Gender distribution of study population (n=60).

Groups	Mean	SD	F-Value	P-Value
Group A. SRP + 0.4% Doxycycline gel	4.39	0.20	1.63	0.68
Group B. SRP+ 1.0% Metronidazole gel	4.45	0.19		
Group C. SRP alone	4.45	0.18		

Table-III. Pocket depth at baseline (n=60)

Groups	Mean	SD	F-Value	P-Value
Group A. SRP + 0.4% Doxycycline gel	3.78	0.53	5.2	0.049
Group B. SRP+ 1.0% Metronidazole gel	3.89	0.51		
Group C. SRP alone	4.10	0.20		

Table-IV. Pocket depth after 10th Day of experiment (n=60)

Groups	Mean	SD±2	T-Value	P-Value
Group A. SRP + 0.4% Doxycycline gel	3.75	0.53	1.6	0.61
Group B. SRP+ 1.0% Metronidazole gel	3.89	0.51		

Table-V. Group A v/s Group B after 10 days

Groups	Mean	SD	F-Value	P-Value
Group A. SRP + 0.4% Doxycycline gel	3.30	0.17	3.7	0.033
Group B. SRP+ 1.0% Metronidazole gel	3.34	0.17		
Group C. SRP alone	4.06	0.27		

Table-VI. Pocket depth at one month (n=60)

Groups	Mean	SD±2	T-Value	P-Value
Group A. SRP + 0.4% Doxycycline gel	3.30	0.17	0.91	0.067
Group B. SRP+ 1.0% Metronidazole gel	3.34	0.17		

Table-VII. Group A v/s Group B after 1 month.

DISCUSSION

Different preparations of metronidazole, Chlorhexidine, minocycline, and doxycycline are now available in the market for oral use.²⁰ In vitro studies have shown doxycycline hyclate and metronidazole as clinically effective antibiotics in chronic periodontitis. Doxycycline is preferred over other tetracyclines (minocycline) due to lipid solubility and least side effects. Various studies had reported on the efficacy of locally used antibiotics as an adjunct to SRP in the treatment of chronic periodontitis.²¹⁻²² Another study²³ had also reported on the minocycline being more effective compared to SRP in chronic periodontitis.

Farahmand et al in 2016 in Iran evaluated the clinical effects of localized doxycycline 3% + ketoprofen 2.5% (Dox+Keto) gel as an adjunct to scaling and root planning (SRP) in the treatment of periodontitis. Farahmand et al observed the extra benefit of topical application of doxycycline + ketoprofen as an adjunct to scaling and root planning in patients is convincing and exhibited clinical results with statistically significant

differences. The study of Farahmand et al is in accordance with present study that topical application of doxycycline as an adjunct to Scaling and Root Planning showed additional benefit in the treatment of chronic periodontitis however they used higher concentration of doxycycline but same therapeutic benefit achieved with lesser concentration in our study.²⁴ Pardeep et al in 2012 presented his study in India where he evaluated the efficacy of four topical gels in the treatment of chronic periodontitis. He randomly divided subjects into four groups. Group 1- placebo gel, Group 2 Chlorhexidiene gel, & Group 3 Metronidazole gel & Group 4 Chlorhexidiene gel and Metronidazole gel.²⁵ The study of Pardeep et al is in agreement with present study that topical application of Metronidazole gel may have a role in the management of periodontitis. Tonetti et al in 2012 evaluated the efficacy of slow release doxycycline gel adjunctively administered to non-surgical therapy in patients with periodontitis. Tonetti et al reported that slow release doxycycline gel may provide benefits in controlling inflammation and deep periodontal

pockets.²⁶ Although Tonetti et al did not use metronidazole but the study of Tonetti et al is in accordance with the present study as regards to doxycycline. The above mentioned studies and evidence based results of the present study point towards a positive and better effect of topical antibiotics use in chronic periodontitis compared to SRP alone.

CONCLUSION

Doxycycline and Metronidazole were found highly effective in reducing pocket depth in chronic periodontitis compared to scaling and root planning alone. Since there is no difference in efficacy of doxycycline and metronidazole gels when applied in patients having periodontitis.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

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2	Arsalan Ahmed	Study design, Questionnaire design, Literature search.	
3	Khurram Anwar	Data analysis, suggestions, data interpretation.	
4	Saima Salman	Patient selection, experiments and patient follow-up, data acquisition.	
5	Aasiya Kazi	Drafting, Discussion chapter.	
6	Ameet Kumar Maheshwari	Review and proof reading.	