

Efficacy of Isolated and Combined Application of Topical Metronidazole and Chlorhexidine in the Treatment of Periodontal Inflammation a Randomized Controlled Trial

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ABSTRACT

Purpose: To evaluate the effectiveness of Metronidazole (MTZ) and Chlorhexidine (CHX) gels if used alone or in combination in the treatment of periodontal inflammation

Materials and Methods: A Randomized clinical trial, was conducted at the Department of Periodontology, Liaquat University of Medical and Health Sciences, in which patient having moderate to severe periodontitis, assessed by using CPTIN community periodontal index, and bleeding index. Participants were randomly allocated to one of the three groups, **Group A** -CHX gel **Group B** – MTZ gel **Group C** - MTZ gel, and CHX gel both (MTZ –CHX). Furthermore, these indexes were assessed at the 4th, 8th and 12th weeks, and questions were recorded for any adverse effects. Data was analyzed using (SPSS) ANOVA– test used for comparison within groups and finally Repeated measure ANOVA-test was used for intergroup evaluation.

Results: A significant improvement in the periodontal status and bleeding index was observed in all treatment groups from the treatment groups when compare baseline scores to all follow-up weeks, mean periodontal status of CHX (baseline:2.7776, 4th week:1.2463, 8th week:2.230, 12th week 0.848) MTZ (baseline: 2.548, 4th week:1.7120, 8th week:1.988, 12th week:1.109) CHX+MTZ (baseline: 2.333, 4th week 1.2432, 8th week 1.482, 12th week:0.524 with p-value 0.0001, However bleeding index showed significant results at the 12th week (CHX:0.825, MTZ:0.125, CHX+MTZ:0.124) with the p-value 0.005

Conclusion: Adjunctive use of topical gels showed significant improvements in clinical and numerical parameters in periodontitis.

Keywords: Localized; Metronidazole, Chlorhexidine, Periodontium; inflammation.

INTRODUCTION

Globally about 85% of people are affected by periodontitis⁽¹⁾, which become as world's prime inflammatory disease. Mechanical instrumentation may not be as efficient as with the assistance of various medicinal medicines in upsetting bacterial colonisation to get over this illness process due to anatomical aspects of the tooth and the invasive character of infections.⁽²⁾

The most performed procedure for managing periodontal problems is maintaining oral hygiene at home⁽³⁾. Due to the infectious nature of periodontal diseases, the attributive use of antimicrobial therapies is for reducing or eliminating the bacteria deeper in pockets, narrow concavities and root fractions as these areas were not accessible to any type of mechanical removal either by power-driven or hand instruments⁽⁴⁾.

Several side effects have been reported from the systemic antimicrobial therapy, that includes nausea, gastrointestinal discomfort, and severe life treating bacterial resistance, for that, it has been recommended to be administrated with caution⁽⁵⁾. Whereas the use of topical antibiotics has greatly developed an interest for clinicians because it will always be site-specific and better treat infections and periodontal problems. Another important outcome of these topical anti-microbial agents is, it has fewer side effects and a higher concentration of dose of a particular drug that can straight forwarded inside subgingival tissue regeneration^(6,7).

Metronidazole (MZ) is mostly used among the antibiotics as recommended adjunctive treatment for periodontal inflammation. It is a well-known anaerobic broad-spectrum antibiotic agent which is genuinely effective in various types of bacterial species including gram negative rods, fusobacterium, fusobacterium, anaerobes i.e. Prevotella intermedia, Porphyromonas gingivalis, Tannerella forsythia and spirochetes i.e. Treponema denticola, Treponema vincentii, these all are usually considered as a main pathogenic organism linked with periodontitis⁽⁸⁾. The use of antimicrobial agents along with mechanical approaches can result in better curing of particular disease problem.³

The use of chlorhexidine for the reduction of inflammatory parameters such as plaque index gingival index and bleeding on

probing (BOP), and in adjunctive therapy after scaling in periodontally compromised patients, is also considered the gold standard⁽⁹⁾

This research compared the topical application of metronidazole (MTZ) and chlorhexidine (CHX) alone as well as in mixture over a period of 12 weeks in subjects with moderate to severe periodontal inflammation. The research also concentrated on the enhanced local therapy elements with antimicrobial and anti-inflammatory properties.

MATERIALS AND METHODS

The study trial was done at the Department of Periodontology LUMHS Jamshoro/Hyderabad, Institute of Dentistry, Inclusion criteria: Participants were aged between 40 to 60, with moderate to severe periodontitis, (with least 2 sites interproximal with CAL 5mm and 1 site interproximal having PD_ 5mm) and for moderate at least within the range of CAL 3.5mm and with PD 5mm were included. This is in accordance to the page and Eke classification (2007). Exclusion criteria included: usage of antibiotics or anti-inflammatory drugs in past 6 months, individuals having an allergy to any ingredients used in the trial, having any systemic diseases, and habit of chain smoking, patients having appliances orthodontic/prosthetics that could be cause interference with evaluation.

Ethical guidelines: The study was carried out after the acceptance form Ethical committee of Liaquat University of Medical Health Sciences Jamshoro, with letter number (NO. LUMHS/REC/-782).

An information consent sheet was provided to select participates that was written in three different languages i.e., Sindhi, Urdu and English. That completely describes the purpose and procedure was given to all the study participants. Only volunteering/ eligible individuals were requested to read and sign a consent form in accordance with the declaration of Helsinki.

Data Collection: It was double blind randomized trial. Single examiner collected the following clinical parameters GI, PI and bleeding index at the beginning and also the different intervals of

study duration. Total 99 patients were selected for the trial; it was conducted from 1st March 2021 to December 2021.

At the beginning of study after the assessed for gingival inflammation, plaque debris, and bleeding on probing, every study participant were gone through full-mouth supra- and sub gingival scaling with ultrasonic scalar and also irrigated with normal saline to wash out any remnants.

After this all of the subjects were randomly selected by a computer-generated numbering sequence to one of the three different study groups, 33 participants in each group

Group A: CHX gel

Group B: Metronidazole gel

Group C: Metronidazole gel in addition with CHX gel combination

Following the application of various gels to each of the three groups, further recording and scoring were conducted. Participants were told to practise good dental hygiene and to gently rub a pea-sized dollop of gel over their gums twice day after brushing for around 30 minutes. The expert, who was unaware of the gels, oversaw testing and scoring at intervals of the fourth, eighth, and twelfth weeks. Apart from the clinical evaluation, a subjective evaluation was also taken at each Interval of visits By Using Questionnaire Regarding Taste, Comfort and Remarks.

Statistical Analysis: Statistical Package for the Social Sciences (SPSS) version 21 Chicago, IL, USA) was used to analyse the data. Three different groups, gingival, plaque, and bleeding scoring were completed at various follow-ups. Descriptive data were calculated using means, percentages, and standard deviation (SD), with the ANOVA test being used for comparisons within groups and the repeated measure ANOVA test being used for intergroup evaluation. Results observed statistically significant when $P < 0.05$ along with clinical improvements within each group.

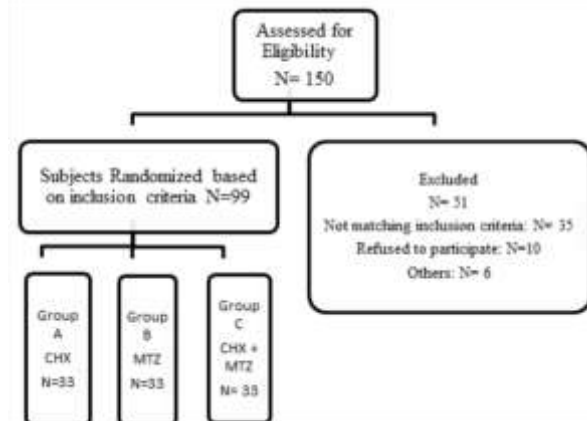


Figure 1:

Table 3: Periodontal Status and Bleeding Index

Parameter	Treatment group	Baseline	4 th week	8 th week	12 th week	P-value
Mean periodontal index	CHZ	2.776	1.2463	2.230	0.848	0.0001
	MTZ	2.548	1.7120	1.988	1.109	
	CHZ+MTZ	2.333	1.2432	1.482	0.524	
Mean bleeding index	CHZ	2.553	1.4875	1.900	0.825	0.005
	MTZ	2.345	1.4534	1.951	0.125	
	CHZ+MTZ	2.475	1.4723	1.931	0.124	

DISCUSSION

The present trial was based on the hypothesis that comparison of adjunctive use of different topical antimicrobial agents along with scaling, can able to give improvement on clinical periodontal parameters, in reduction of gingival bleeding patient's comfort and acceptance were also recorded. The present trial showed a significant difference in usage of adjunctive topical antimicrobial agents in the management of patients having periodontal inflammation.

RESULTS

Trial included 99 patients. Mean age of the patients was 35.09 \pm (SD=8.189) as shown in (Table-01). All treatments groups were divided equally in three different study groups, six patients did not complete the study shown in (Figure-01). There were equal male and female participants in treatment groups. None of the participant from three groups reported adverse effects, as shown in (Table-02). Side effects or any mishaps were evaluated at every follow-up in all test groups.

Periodontal status: A significant improvement in periodontal status was observed in all treatment groups from baseline, to 12th week CHX (0.848) MTZ (1.109) CHX+MTZ (0.524) which showed the statistically significant (P-value= 0.001) difference among groups as shown in (Table-03).

Bleeding index: This also showed significant reduction in the mean score at 12th week CHX (0.825) MTZ(0.125) CHX+MTZ(0.124) with (P-value= 0.005) as shown in (Table-03)

Table 1: Statistics of Age of Patients

Mean	35.09
St: Deviation	8.189
Range	38
Maximum	32
Minimum	55

Table 2: Side Effects Remarks of Treatment Group

Soft tissue Irritation	NO
Soreness of Mouth	NO
Mouth burning Sensation	NO
Dryness of Mouth	NO
Hard tissue Brown Spots	NO
Loss of Taste	

Treatment option for periodontal problems starts by the removal of bacterial deposits by supra- and sub gingival scaling and root planning (SRP)⁽¹⁰⁾. There is also a well-known fact that SRP may not efficaciously removal of sub gingival debris, where there is barrier to access such as deep pockets and root fraction's⁽¹¹⁾. It may be assumed that chemical agents having the ability to reach deeper structures on probing resulting in greater improvement,⁽¹²⁾ an advantage of this is that a concentrated amount of drug is incorporated deeper on sub gingival site⁽¹³⁾, with having no adverse effect on micro flora of the mouth⁽¹⁴⁾.

However, adjective use of antibiotics along with a mechanical treatment support showed remarkable improvements in clinical outcomes, studies done in past, but at the same time their adverse effects were also observed⁽¹⁵⁾. To overcome these unwanted effects, researcher had suggested different types of local drug delivery systems. Whereas the usage of topical anti-infective therapy will be depended on clinical observations and individual decision.

Researches done in the past years had proven that locally administered antimicrobial agents if used in along with scaling and curettage will gives better reduction in periodontal disease⁽¹⁶⁾.

In this study all of the study groups showed improvements in terms of clinical outcomes and as well as statistically. Another advantage of this study was that there were repeated meetings were arranged with dental health care and frequently oral examination, and furthermore medicated gels were also distributed free in this trial, this motivated all participants towards good oral hygiene.

The results of this research were shows similar results in contrast to other studies where were where same things were followed non-surgical treatment done by scaling, then treatment followed by antimicrobial agents⁽¹⁷⁾.

Antimicrobial agents given topically application, applied in combination with metronidazole gel and chlorhexidine gel had showed, greater reduction from baseline to final examination in comparison with other groups (mean reduction in periodontal index 0.525) this is primarily explaining the effects of both antibacterial/antiseptic.

Metronidazole is effective against bacterial infection of both gram- negative and positive, it also good for periodontium as it is well known for preventing connective tissue destruction, these outcomes were observed even when administrated within lower dose⁽¹⁸⁾ Metronidazole, compound, were made for bacterial infections, as its is very effective in aerobic and anaerobic bacteria⁽¹⁹⁾. Due to this specific action, its mostly use in deep periodontal pockets.

Finding of this research is somehow similar found in previous study, done in Dental College and Research Institute, of India where metronidazole gel, and chlorhexidine gel were used in periodontal problems⁽²⁰⁾, another trial was also taken as a reference for this research which demonstrated the effectiveness of usage of metronidazole gel, on overgrowth of gingiva due to cyclosporine⁽²¹⁾.

However, this study shows clinically and statically significant reductions of periodontal inflammation in all three treatment groups from baseline to 12th week.

In present trial focus was on to find effectiveness of metronidazole gel on clinical parameters and statically significant, of periodontal inflammation within the period of 12th weeks of treatment intervals, during this procedure, main focus was on minimizing adverse effects cause by usage of antibiotics systematically.

Outcomes of this research were commend that commonly usage of locally delivered agents contains antibacterial and anti-inflammatory in combination with conventional therapy, is providing a better efficacy for a long term effects in inflame tissue, when compare with conventional treatment options.⁽²²⁾

Till the date, there were few studies done on site specific agent in cooperated to infected tissue, here in this research comparison is done on the topical effects of CHX gel, MTZ gel and also when used in the combination of CHX and MTZ gel in management of periodontal inflammation. Although various studies done to know the effects of systemic usage of metronidazole use of a topical antibiotic on inflamed tissue along with scaling, as these were knowledgeable for this present study as if the significant improvements were observed on the clinical and numerical aspect it will reduce the need of surgical assistance for reduction of inflammation of supporting tooth structures. Form this trial innovative idea came up as the use of topical gel containing chlorhexidine, metronidazole and both in combination, applied to

site specific of pathogen which results in concentration of drug agent into inflamed tissue in higher amount along with minimal side effects, that is considered as more convenient to clinicians and patients.

CONCLUSIONS

Overall results by this trial showed remarkable significant reduction three of treatment groups for the management of periodontal inflammation.

At the end of the research, it was concluded that all of the participants were well cooperating by using of medicated gel on their affected inflamed gingival tissue, instead of taking oral antibiotic, subjective and objective assessment showed that this new treatment method is more healthy and friendly in terms of long-term effects.

Recommendation: Clinical trial by this study has come up with recommendations for clinical practitioners, public health care providers, and patients that approach of antibiotics when used by Locally drug Delivery, it will be resultant in Site-Specific for managing any inflammations.

Conflict of interest: No any conflict of interest regarding this research.

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