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Research Article

COMPARATIVE EVALUATION OF CHLORHEXIDINE GEL ALONE AND COMBINATION OF METRONIDAZOLE AND CHLORHEXIDINE GEL IN TREATMENT OF PERIODONTITIS

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ABSTRACT

The present study was done on fifty adult patients with chronic periodontitis to assess the effect of locally applied gel containing Chlorhexidine alone and combination of metronidazole and Chlorhexidine as an adjunctive to non-surgical therapy in patient with pocket depth ≤ 7 mm. Following baseline parameters were examined including plaque index (PI), probable probing depth (PPD), Gingival index (GI). The patients were randomly assigned to two groups: Group 1 (Chlorhexidine alone) and Group 2 (Chlorhexidine plus metronidazole). Scaling and root planning was done one week before investigation. Clinical re-examination was performed at the end of two weeks after application of gel. Results shows that combination of Chlorhexidine plus metronidazole in gel composition could be more effective than Chlorhexidine alone. This study concluded that combined treatment Group 2 showed more improvement in PI, GI and PPD in comparison to Group 1.

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INTRODUCTION

Two major forms of inflammatory diseases affecting the periodontium are gingivitis and periodontitis. Gingivitis is inflammation of the gingiva that does not result in clinical attachment loss. Periodontal diseases are infectious diseases with different levels of periodontal destruction that lead to several kinds of clinical manifestations with different etiological factors (Johnson. N. W 1989). It is accepted that a variety of suspected pathogens have played one of the most important etiological roles in breakdown of deep periodontal tissues. These pathogens include obligately anaerobic gram-negative species such as *Porphyromonas gingivalis*, *Prevotella intermedia*, *Bacteriodes forsythus*, *Fusobacterium nucleatum*, *Selenomonas* and *Campylobacter* species and facultatively anaerobic gram-negative rods such as *Actinobacillus actinomycetemcomitans*, *Capnocytophaga* species and *Eikenella corrodens* (Tanner *et al.*, 1979, Slots *et al.* 1986, Dzink *et al.* 1988).

Therapy is aimed primarily at removal of etiologic factors to reduce or eliminate inflammation, thereby allowing gingival tissues to heal (Mousques *et al.* 1980, Hinrichs *et al.* 1985). Therapeutic approaches for periodontitis fall into two major categories: 1) anti-infective treatment, which is designed to halt the progression of periodontal attachment loss by removing

etiologic factors; and 2) regenerative therapy, which includes anti-infective treatment and is intended to restore structures destroyed by disease.

The antimicrobial therapeutic rationales depend on systemic and local administration of antibiotics (Slots and Rams 1990), penetrated into the tissues in the entire dental area. On the other hand, to obtain an effective concentration of the antimicrobial drug in the periodontal pocket after systemic administration, repeated intakes over a prolonged period of time were required (Loesche *et al.* 1993). Furthermore when broad spectrum antibiotics are used there is always a risk of inducing bacterial resistance (Fiehn & Westergaard 1990) and distortion of commensal flora (Rams *et al.*, 1990), With the local route higher therapeutic microbiological efficacy in periodontal diseases.

Among the antibiotics that are being considered for periodontal treatment, metronidazole is particularly attractive due to its selective efficacy against obligate anaerobes (Jones *et al.* 1985) the flora associated with intact health. In several studies, treatment with metronidazole has been found to improve clinical parameters and reduce the number of disease related bacteria (Lekovic *et al.* 1983, Lindhe *et al.* 1983, Walsh *et al.* 1986, Gusberti *et al.* 1988, Wade *et al.* 1992).

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Application of antibiotics in pocket, provide an effective concentration of active agent in the involved site with low risk of systemic administration side effect (Henke *et al.*, 2001; Quirynen *et al.*, 2000; Standford, 2001). After the initial peak of Chlorhexidine (CHX) in crevicular fluid (Soskolne *et al.*, 1998), there is a 9 day minimum inhibitory concentration for more than 99% of periodontal pocket (Cetin *et al.*, 2004). Among the other locally administered adjunctive antimicrobials for periodontitis one of the most effective agent is metronidazole (MTZ) (Bonito *et al.*, 2005; Ehmke *et al.*, 2005).

MATERIALS AND METHODS

Study design

The study group comprised of 50 patients, of age group ranging from 20-50 years, reporting to Department of Periodontia, GDCH Ahmedabad. They were then divided into 2 groups (25 each).

Group 1: Chlorhexidine gel (0.2% CHX)

Group 2: Chlorhexidine + Metronidazole gel (0.2% CHX + 1% MTZ)

The exclusion criteria were

1. Habitual tobacco smoking or alcohol consumption;
2. Completely edentulous status;
3. Presence of other disorders including acquired immune deficiency syndrome, cardiovascular disorders, renal disease, and hepatitis B or C infection, Hematological disorders
4. Current or recent use of corticosteroid, antibiotic, or non-steroidal anti-inflammatory medications.
5. Pregnant and lactating women
6. Aggressive periodontitis & Significant oral tissue pathology
7. Grade II or Grade III mobility
8. Allergy to Chlorhexidine and metronidazole
9. Scaling or rootplaning during 3 months prior to the baseline

Inclusion criteria

1. Signed consent form after verbal communication and minimum of 10 natural uncrowned tooth
2. Present at least 8 periodontally involved site with minimum one probing pocket depth(PPD) of ≤ 7 mm and
3. Bleeding and probing

Gel preparation

Gel containing 0.2% CHX (Chlorhexidine hydrochloride) and 1% MTZ (Metronidazole) were prepared. Two series of gel were made. These included: gel containing 0.2% CHX, gel containing 1% MTZ + 0.2% CHX as a combined preparation. All preparation were made in the lab and were separately encoded and packaged in a special boxes at pharmacology department.

Treatments

A supragingival scaling were performed for all teeth before starting the investigation and all target sites were root planed under local anaesthesia. One week before starting the

investigation all subjects underwent scaling and rootplaning procedure. Clinical examination were Plaque index(PI), Gingival index(GI), and Probable probing depth(PPD). Careful oral hygiene instruction was given. The patients were randomly assigned to two groups; 0.2% CHX and combined gel 1% MTZ + 0.2% CHX. Clinical reexamination was performed at the end of 2-4 week after application of gel.

As show in Figure 1 pre-operative probable probing pocket depth on distal aspect of first quadrant of premolar was about 5 mm.



Fig 1 Probing depth at baseline



Fig 2 Gel application



Fig 3 Periodontal pack application



Fig 4 Probing depth at 2 weeks

Figure 2 shows gel application in that pocket site. Figure 3 shows application of periodontal pack for the retention purpose of applied gel in that particular pocket. Figure 4 shows reevaluation of probable probing pocket depth at that site which become 3 mm after 2 weeks.

Clinical parameters recorded

- Plaque index(silness & loe 1964)
- Gingival index(loe & silness 1963)
- Probable probing depth (ppd)

RESULT

All the 50 subject completed study. Base line data of both the drug groups were taken & analyzed, the results of which has been shown in table 1 & 2. These data confine PI, GI, PPD which measure in both drug group & found no significant difference at base line.

Table 1 showing significant difference in 0.2% CHX group between base line to end of 2 week.

| | Mean | N | Std. Deviation | Std. Error Mean | Mean Difference | P Value |
|--------------|------|----|----------------|-----------------|-----------------|---------|
| PI Baseline | 2.11 | 25 | 0.41 | 0.083 | | |
| PI 2 Weeks | 1.40 | 25 | 0.20 | 0.041 | -0.71 | <0.001 |
| GI Baseline | 1.50 | 25 | 0.16 | 0.032 | | |
| GI 2 Weeks | 1.09 | 25 | 0.16 | 0.033 | -0.41 | <0.001 |
| PPD Baseline | 5.48 | 25 | 0.59 | 0.117 | | |
| PPD 2 Weeks | 4.36 | 25 | 0.70 | 0.140 | -1.12 | <0.001 |

PI (Plaque Index):- As showed in table 1 & 2 there was no significant difference between 2 group at base line. But there was significant differences between PI_{baseline} and PI_{2week}.

GI (Gingival Index):- GI evaluation between 2 group show significant difference between at the end of 2 week from the baseline. Group containing CHX +MTZ gel (Table 2) improved GI at end of 2 week than group containing CHX gel alone (Table 1).

Table 2 showing significant difference in 0.2% CHX + 1% MTZ group between base line to end of 2 week.

| | Mean | N | Std. Deviation | Std. Error Mean | Mean Difference | P Value |
|--------------|------|----|----------------|-----------------|-----------------|---------|
| PI Baseline | 1.92 | 25 | 0.35 | 0.070 | | |
| PI 2 Weeks | 1.38 | 25 | 0.14 | 0.029 | -0.53 | <0.001 |
| GI Baseline | 1.69 | 25 | 0.22 | 0.044 | | |
| GI 2 Weeks | 1.13 | 25 | 0.10 | 0.021 | -0.56 | <0.001 |
| PPD Baseline | 5.68 | 25 | 0.80 | 0.160 | | |
| PPD 2 Weeks | 3.88 | 25 | 0.88 | 0.176 | -1.80 | <0.001 |

PPD (Probing Pocket Depth):- Baseline Mean ±SD of PPD in CHX and CHX +MTZ treatment sites were 5.48±0.59 and 5.68±0.80 respectively. At the end of 2 week PPD in CHX +MTZ group(3.88±0.88)(Table 2) showed more reduction than group containing CHX alone(4.36±0.70)(Table 1).

DISCUSSION

This randomized clinical study examine the effect of CHX gel alone and combination of CHX +MTZ gel as antiplaque and antimicrobial efficacy. The aim of this study was to evaluate whether the application of Chlorhexidine gel and

Chlorhexidine + metronidazole gel could enhance the results obtained by scaling and root planing in maintenance patients.

Patient selected in this study were on maintenance phase and had history of chronic periodontitis with pocket depth of ≤7, SRP had been done 1 week prior to baseline. There was no significant change in PPD after non surgical treatment.

This study showed that group in which combined gel MTZ+CHX was used provide beneficial anti-plaque action as adjunct to the SRP. Combined therapies for periodontal infection treatment have been applied successfully by Lindhe *et al.* 1983, Greenstein 1992, Giris *et al.* 2002. In this study subject who were treated with combined gel MTZ+CHX showed better improvement in clinical parameter PI, GI, PPD than the subject treated with CHX gel alone. The differences in clinical parameters between these 2 groups were statistically significant but difference in PPD clinical was relatively less small. The use of CHX as an effective anti-plaque agent has been established (Cosyn and verelst, 2006).

Members of the subgingival flora differ widely in their susceptibility to metronidazole (Sutter *et al.* 1983. Moutonet *et al.* 1984, Walker *et al.* 1985, Jousimies- Sorner *et al.* 1988). It was therefore reasonable to expect that local release of metronidazole resulting in concentrations exceeding 128 pg/ml for at least 8 hours after application of the gel (Stoke 1992) would result in a shift in the composition of the subgingival microflora. The observed significant increase in the proportions of streptococci and the decrease in the proportions of black pigmented gram negative rods and the number of spirochetes are compatible with this hypothesis. It is remarkable that the compositional changes persisted throughout the 24- week observation period.

However, the periodontal tissues and the dentin tubuli might serve as reservoir for periodontal pathogens (Slots & Genco 1984, Adriaens *et al.* 1988, Greenstein & Caton 1990). To reach the remaining bacteria, locally delivered antibiotics applied directly into the periodontal pocket have been used. (Goodson *et al.* 1985, Pedrazzoli *et al.* 1992).

The effect of CHX is dose related. These results are in agreement with the other study that confirm the efficacy of CHX on controlling supragingival plaque control (Addy and Moran 1983).

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