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Research Article

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Evaluation of clinical changes after use of tetracycline fibers in chronic periodontitis patients

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ABSTRACT

To evaluate the clinical changes following non surgical periodontal therapy alone versus tetracycline fiber therapy used adjunctively with scaling and root planning in the treatment of chronic periodontitis patients.

Key words: Periodontitis, Dental plaque, Tetracycline fibers, Probing pocket depth

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INTRODUCTION

Periodontal diseases are chronic inflammatory in nature, in which microbial factors, host factors, environmental and genetic factors play a significant role in causing the disease. Dental plaque is considered as the primary etiologic agent and it exists in a state of biofilm[1]. Periodontitis is one of the most prevalent diseases affecting nearly one third of the adult population. It is characterized by loss of connective tissue attachment of the tooth and pathological migration of the junctional epithelium apically, which leads to pocket formation, tooth mobility and finally loss of tooth[2]. The pathogenic bacteria that cause periodontitis are mainly gram negative anaerobic or microaerophillic bacteria and the main organisms implicated are actinobacillus actinomycetemcomitans , Porphyromonas gingivalis and prevotella intermed [3].

Eliminating these infections, thereby preventing disease progression, is a goal of periodontal therapy [4]. Putative pathogens associated with periodontal disease are susceptible to a variety of antiseptics and antibiotics[5].The variety of topical systemic agent have been used which can block the pathway and progression of periodontal disease. But systemic antibiotic therapy has certain disadvantages such as inability to achieve high GCF concentration. Increased risk of adverse drug reaction. Increased selection or multiple antibiotic resistant microorganisms and uncertain patient compliance. To overcome these shortcoming of antibiotic therapy, local drug delivery system was developed.

For mild to moderate periodontitis non surgical methods are preferred [5]. method employed to convey antimicrobial agents into periodontal pockets include rinsing, irrigation, systemic administration and local application using sustained and controlled delivery devices [6]. These local drug delivery have been used either alone or as adjunct with SRP. These antimicrobial agents are aimed directly into the site of infection, and therapeutic levels can be established and maintained for days to weeks using this approach. The total effectiveness of these antimicrobial agents is probably due to decrease in gingival inflammation by modulating the inflammatory responses and suppression of the pathogenic macrobiota [7]. The use of locally delivered antimicrobials is a relatively new addition

in the management of periodontitis. The treatment method is primarily the result of more than 20 years of research pioneered by Goodson of forsyth's Dental Research Center. The commonly used drug delivery systems are: - Tetracycline fiber, Metronidazole gel, Chlorhexidine chip, Minocycline gel and Doxycycline polymer [8]. The Tetracyclines are a group of broadspectrum bacteriostatic antibiotics, that have been used extensively in the treatment of numerous and varied infections.

Tetracyclines have four cyclic rings in their nucleus and differ structurally with regard to different chemical moieties attached at different positions of these four rings. These are group of antibiotics, produced by the genus Streptomyces, having similar antibacterial spectrum, but with differing pharmacokinetic properties resulting from such chemical substitutions in their four ringed nucleus [9]. there are four main mechanisms by which a bacteria develops resistance to tetracyclines. These are a) decreased cell permeability of the drug. b) increased drug efflux from bacterial cell by an energy- dependent process, c) ribosomal protection and d) enzymatic inactivation of the drug. Among these , the drug efflux is the most important mechanism , as there are atleast 300 different active efflux proteins capable of extruding tetracyclines from the bacterial cell.

In the present study the role of tetracycline fiber in periodontal therapy is assessed as tetracycline are broad spectrum antibiotics capable of achieving high concentration.

EXPERIMENTAL SECTION

A total of 30 patients age range between 35-55 years were randomly selected at our private dental clinic (Teeth care and orthodontic clinic) in jaipur, with a diagnosis of chronic periodontitis **.**the periodontal status was assessed having chronic generalized periodontitis with periodontal pockets of 5-7mm.

Patients with any of the following conditions were excluded from the study:

- Patient requiring premedication
- Prophylactic drug regime
- Patient having systemic infection/ diseases
- Patient with chronic smoking , alcoholism
- Pregnant or lactating women

Clinical parameters assessed were:

- Plaque index: by Silness and Loe, 1967
- Gingival index: by Loe and Silness, 1963
- Probing depth : measured by Willliams graduated periodontal probe

All clinical parameters are recorded in both groups: control and test. The control group (15 patients) were treated with SRP without using tetracycline – impregnated collagen fibers

The test group (15 patients) treated by SRP plus tetracycline – impregnated collagen fibers.

The values were taken as baseline values. Full mouth scaling using Gracey curettes was done for the test and control group in a single sitting. Patients were directed to report in our private dental clinic after interval of 3 months. Patients were re-evaluated for clinical parameters like Plaque index, Gingival index, and Probing Pocket depth.
The tetracycline fiber marketed as periodontal plus AB is available as vials with tetracycline impregnated collagen fibers. These fibers soaked in saline and packed into the periodontal pockets with a cotton forceps or curette until the pocket is filled upto or slightly below the gingival margin. To avoid dislodging of the fiber patients were instructed not to brush or floss the treated areas and were placed on twice a day 0.2% chlorhexidine rinses. The clinical parameters including pocket depth were recorded on day 0, and 90 days.

Statistical analysis:
The results are given as mean and standard deviation values. To compare the two groups, t paired and t unpaired test was used.

RESULTS

Clinical parameters (Plaque index, Gingival index, Probing pocket depth)

The mean Plaque index, Gingival index, Probing pocket depth scores for the test group, at baseline values were 1.31±0.34, 1.36±0.28, 2.94±1.31 and after 3 months the value were 0.68±0.28, 0.72±0.26, 1.49±1.05 respectively. The mean changes in plaque index, Gingival index, and probing pocket depth in the test group were 0.62±0.36, 0.55±0.26, 1.52±0.69, which are highly significant, i.e.($p<0.001$) {table 1}

The mean Plaque index, Gingival index, Probing pocket depth scores for the control group, at baseline values were 1.53±0.46, 1.30±0.18, 3.53±1.51 and after 3 months the values were 0.80±0.28, 0.56±0.12, 1.70±1.04, respectively. The mean changes in Plaque index, Gingival index, Probing pocket depth in the control group were 0.85±0.50, 0.64±0.26, 1.83±0.78, which are highly significant i.e. ($p<0.001$) {table 2}

Table 1: **Comparison of mean values of various parameters (PI, GI, and PD) at baseline and at 3 months in test group (SRP + Tetracycline fibers)**

Parameters	Mean±SD		Mean Change±SD	*P* value	Significance
	Baseline	At 3 month			
Gingival Index	1.36±0.28	0.72±0.26	0.55±0.26	<0.001	Highly Significant
Plaque Index	1.31±0.34	0.68±0.28	0.62±0.36	<0.001	Highly Significant
Probing depth	2.94±1.31	1.49±1.05	1.52±0.69	<0.001	Highly Significant

Table 2: Comparison of mean values of various parameters (PI, GI, and PD) at baseline and at 3 months in control group (SRP)

Parameters	Mean±SD		Mean Change±SD	*P* value	Significance
	Baseline	At 3 month			
Gingival Index	1.30±0.18	0.56±0.12	0.64±0.26	<0.001	Highly Significant
Plaque Index	1.53±0.46	0.80±0.28	0.85±0.50	<0.001	Highly Significant
Probing depth	3.53±1.51	1.70±1.04	1.83±0.78	<0.001	Highly Significant

DISCUSSION

Dental plaque which is primary etiological factor for periodontal disease is composed of bacterial aggregates that are adherent to one another and to surfaces and interfaces. These bacteria's form a highly resistant biofilm with an expolysaccharide matrix protection which prevent drug penetration. Mechanical therapy which disrupts plaque biofilm is effective for the majority of patients with mild to moderate periodontitis. But mechanotherapy has its own limitations as it is blind procedure performed in a closed environment and instruments may not the reach the base of deeper pocket due to tooth or pocket morphology. Hence antimicrobial agents can be used as an adjunct to conventional therapy. Although research on the development and clinical testing of subgingivally placed pharmacological agents for the treatment of periodontitis has been in progress for almost 20 years. It is only recently that these agents have been made generally available to the dental community as part of their armamentarium for treating patients. Advances in understanding the etiology and pathogenesis of periodontal diseases have led to the innovation and subsequent acceptance of the use of these pharmacological agents in their management.

Most widely used local drug delivery systems reports in periodontal literature are of tetracycline as reported by Goodson [10] and Metronidazole by Addy et al [11] Chlorhexidine by Addy et al and Ofloxacin by Hoffler at al [12] . In the present study collagen impregnated tetracycline fibers were used which were found to be advantageous among other drug.

Tetracycline fibers, which not only have antimicrobial actions but a number of additional properties, have been identified. These include collagen inhibition, anti-inflammatory actions, inhibition of bone resorption and their ability to promote the attachment of fibroblasts to root surfaces as reported by golub et al [13] . Pitcher et al observed that mouth rinses and agent used during supragingival irrigation do not predictably reach beyond 5mm into the periodontal pocket [14].

Thomas et al compared the effects of tetracycline fibers plus scaling and root planning versus scaling and root planning alone. It was observed that the use of fibers provided no significant advantage with regard to probing depth reduction or clinical attachment gain.

Scaglione et al [15] in an in vitro study concluded that many type of periodontal cells accumulate high intracellular levels of tetracycline, suggesting that the agent is actively transported and better suited for periodontal infections. Lindhe et al demonstrated that use of tetracycline filled hollow fiber devices markedly changes the composition of the sub gingival flora of initially decreased periodontal sites [16].

Tetracycline was found to be accumulated in a large number of periodontal cells, such as phagocytes, monocytes, fibroblasts, polymorphonuclear cells, macrophages, and lymphocytes. Since these cells are abundant at periodontal disease sites, it is reasonable to expect high efficacy of tetracycline for periodontal infections.

Pavia et al showed that tetracycline and its derivatives strongly absorb to tooth surfaces retaining their antibacterial activity and are quite effective in treating chronic periodontitis[17]. Hence, basis of the clinical findings from this study, tetracycline fiber therapy enhances the benefits of SRP in the treatment of chronic periodontitis. The adjunctive benefit of the fiber was maintained for 3 months following therapy without additional fiber treatment.

CONCLUSION

In this study the majority of improvement in the group treated could be ascribed to Scaling and Root Planning. Scaling and root planning and locally delivered tetracycline therapy are completely different treatment modalities that work by different mechanisms. Tetracycline does not remove any calculus deposits, scaling removes some of the bacteria but provides no antibacterial activity. Therefore, neither is the ideal control of the other. Locally delivered tetracycline therapy has a specific purpose, to control localized infection, whereas scaling is utilized to remove calculus and other deposits.

Hence, a combination of scaling and local drug delivery results in added benefits in the control of periodontal disease.

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