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Effect of Locally delivered Tetracycline Fibers on Fusobacterium and Bacteroides Species Isolated from Chronic Periodontitis Patients.

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ABSTRACT

Periodontal diseases are prevalent human diseases defined by the signs and symptoms of gingival inflammation and periodontal tissue destruction. The role of microorganisms in the etiology and progression of periodontitis is now well documented. The microbiota responsible for these destructive periodontal diseases are complex, with 10-15 species considered important in pathogenesis of destruction which includes *Actinobacillus actinomycetemcomitans*, *Fusobacterium nucleatum*, *Porphyromonas gingivalis*, *Prevotella intermedia*, *Tannerella forsythensis*, etc. The main modalities of treatment of these diseases include mechanical therapy and adjunctive systemic and local antimicrobial therapy. In the current study, a local drug delivery system containing Type1, fibrillar Sterile Collagen of fish origin of approximately 25 mg, impregnated with approximately 2.0mg of Tetracycline Hydrochloride was used to control anaerobic bacteria viz. Bacteroides and Fusobacterium. Results showed that there was a significant reduction in the growth of fusobacterium and bacteroides, both at 3 months and 6 months recall from the baseline parameters. Also there was a significant reduction in probing pocket depth from baseline values both at 3 and 6 months. Thus it can be concluded that Tetracycline Hydrochloride 2 mg impregnated with Type-1, fibrillar Sterile Collagen of fish origin proved an useful adjunct to mechanical therapy in management of chronic periodontitis.

Keywords: Tetracycline, Collagen, Chronic Periodontitis, Anaerobic bacteria

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INTRODUCTION

Periodontal diseases are prevalent human diseases defined by the signs and symptoms of gingival inflammation and periodontal tissue destruction and caused by a variety of microbial species, including the major pathogens such as *Actinobacillus actinomycetemcomitans*, *Fusobacterium nucleatum*, *Porphyromonas gingivalis*, *Prevotella intermedia*, *Tannerella forsythensis* [1, 2]. The main modalities of treatment of these diseases include mechanical therapy (using specialized instruments), and adjunctive systemic and local antimicrobial therapy [3, 4]. Recently new biodegradable local drug delivery system PerioCol- TC which is a vial containing Type1, fibrillar Sterile Collagen of fish origin of approximately 25 mg, impregnated with approximately 2.0 mg of Tetracycline Hydrochloride has been introduced. Thus the present study was conducted to evaluate clinically and microbiologically the efficacy of topical subgingival application of PerioCol-TC used as a combination therapy with scaling and root planing and scaling and root planing alone in the management of chronic periodontitis.

MATERIALS AND METHODS

The present study included 20 patients (i.e. 40 sites) patients selected from the outpatient department of Periodontics, Sri Siddhartha Dental College, Tumkur and who were having moderate to severe chronic periodontitis.

Subjects and Sites

All the subjects participating in the study were in the age group of 25-75 years. 40 sites were selected in patients with chronic periodontitis and were divided into experimental site (n=20) which received scaling and root planing + subgingivally delivered tetracycline hydrochloride (PerioCol-TC) into the periodontal pocket and control site (n=20) which received only scaling and root planing. After placement of the drug in the experimental site, the site was covered with a periodontal pack. Each patient was evaluated for the presence of *Fusobacteria* and *Bacteroides* at baseline, 3 and 6 months. Subgingival plaque samples were obtained using sterile curette which was inserted gently into the pocket and was held in position for 10 seconds.

Figure 1: *Fusobacteria* seen on Gram stain



Figure 2: *Bacteroides* seen on Gram stain



The samples were transferred in Robertson’s Cooked Meat broth to the department of microbiology, Sri Siddhartha Medical College, Tumkur for culture. Each specimen was cultured on two blood agar plates; one incubated aerobically at 37°C for 24 hours and the other anaerobically for 48 hours. Anaerobic condition was maintained using gas packs. Selective media used was Brucella agar base for isolation of anaerobes viz Fusobacterium and Bacteroides. Colonies on anaerobic blood agar and Brucella agar base were identified as Bacteroides or Fusobacteria based on colony morphology and Gram stain and were reported as heavy, moderate or scanty growth. (Figure 1,2) Growth of the organisms were recorded at baseline, 3 and 6 months post therapy. Statistical analysis was carried out using Mann Whitney U test and Chi square test. P value <0.05 was considered as significant.

RESULTS AND DISCUSSION

The treatment showed significant reductions in the number of sites showing heavy growth of Fusobacteria and Bacteroides at 3 and 6 months when compared to baseline values (p<0.05). At 6 months, experimental group showed significantly greater improvement than control group. (Table-1,2) Also there was a significant reduction in probing pocket depth from baseline values both at 3 and 6 months. Similar results have been seen in other studies [5-7]. Heavy growth of Fusobacteria and Bacteroides was seen in both the groups at one site even after 6 months of treatment.

Table 1: Comparison of Fusobacterium between the test and control group

Time interval	Fusobacterium	Test Group		Control Group		Total	χ ²	P-Value
		N	%	N	%			
Baseline	Light	1	5%	6	30%	7	10.98	0.09 (N.S.)
	Moderate	5	25%	6	30%	11		
	Heavy	14	70%	8	40%	22		
3 Months	Light	5	25%	11	55%	17	7.32	0.04 (H.S.)
	Moderate	12	60%	5	25%	17		
	Heavy	3	15%	4	20%	7		
6 Months	Light	16	80%	18	90%	34	2.01	0.014 (H.S.)
	Moderate	3	15%	1	5%	4		
	Heavy	1	5%	1	5%	2		

N.S.-No significant association, H.S.-Highly significant association

Table 2: Comparison of Bacteroides between the test and control group

Time interval	Bacteroides	Test Group		Control Group		Total	χ ²	P-Value
		n	%	N	%			
Baseline	Light	1	5%	5	25%	6	10.06	0.07 (N.S.)
	Moderate	5	25%	10	50%	15		
	Heavy	14	70%	5	25%	19		
3 Months	Light	4	20%	10	50%	14	6.756	0.034 (H.S.)
	Moderate	14	70%	7	35%	21		
	Heavy	2	10%	3	15%	5		
6 Months	Light	18	90%	16	80%	34	2.123	0.048 (H.S.)
	Moderate	1	5%	3	15%	4		
	Heavy	1	5%	1	5%	2		

N.S.-No significant association, H.S.-Highly significant association

In the current study the number of sites exhibiting heavy growth of Fusobacteria and Bacteriodes reduced from baseline to 3 months and 6 months for both the experimental and the control group. However the adjunctive use of 2mg tetracycline Hydrochloride fibers (PerioCol-TC) showed statistically significant reductions when compared with scaling and root planing alone. Similar results were seen in other studies, where it was observed that statistically significant reductions of Fusobacterium and Bacteroides were seen from baseline to 3 months and 6 months post therapy with tetracycline fibers [8, 9]. There was no reduction in the growth of Fusobacteria and Bacteroides at one site even on using PerioCol-Tc which probably may be due to the organisms being resistant to tetracycline.

CONCLUSION

The findings of our study suggest that the outcome of the initial periodontal therapy may benefit from the adjunctive subgingival administration of Tetracycline hydrochloride fibers. It is also important to emphasize that meticulous scaling and root planing remains of primordial importance for treatment of chronic periodontitis. Further studies are needed to evaluate the long term clinical advantage of this adjunctive therapy in the management of chronic periodontitis.

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