Efficacy of Tetracycline Fibre as Local Drug Delivery over scaling and root planing in Nonsurgical Management of Chronic Periodontitis

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Abstract
Background- Periodontal disease is primarily caused by specific group of microorganisms which colonizes tooth surfaces in the form of a biofilm called dental plaque. Periodontal diseases include conditions such as chronic periodontitis, aggressive periodontitis and necrotizing periodontitis. Aim- To evaluate the efficacy of tetracycline fibres with scaling and root planing in reducing the clinical signs of periodontitis Materials and Methods- Study consisted of 60 sites of periodontal pocket of age group 25 – 55 years with chronic periodontitis. The selected sites were randomly divided into 2 groups: Group I (SRP alone) and Group II (SRP + tetracycline fibres) Plaque index, Gingival index, Sulcular bleeding index, Probing depth (PD) and Relative Attachment Level (RAL). After recording the clinical parameters from each site at baseline, a thorough scaling and root planing was done, using hand instruments and ultrasonic scaler in all groups. The clinical parameters were assessed at baseline, after 1 month & 3 months after receiving the treatment. Result- The development of sustained release delivery devices as tetracycline fibre as an adjunct to SRP showed greater improvement in respect to decreased probing depth and gain in clinical attachment level followed by scaling and root planing alone. There was significant improvement with respect to reduced gingival bleeding, minimal plaque accumulation from baseline to 3 months. Thus, tetracycline fibres as an adjunct to SRP proved to be efficient, safe, and cost effective for maintenance of periodontal disease than SRP alone.
Keywords- Tetracycline fibre, Chronic Periodontitis, Scaling, Root planing, Local Drug Delivery
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I. Introduction

Chronic periodontal disease describes a group of related inflammatory reactions resulting in destruction of the tissues that support tooth in its socket. It results usually from extension of the inflammatory process initiated in the gingiva to the supporting periodontal tissues. The clinical findings include increased probing depth (PD), bleeding on gentle probing (BOP), loss of clinical attachment level (CAL) and alteration in the physiologic contour of the gingiva. Unfortunately, periodontitis cannot be cured, but it can be arrested. Traditional therapies for periodontal disease have included mechanical debridement to disrupt the subgingival flora and provide clean, smooth and biologically compatible root surfaces [1]. Various agents have been used to prevent further progression of periodontal disease either as monotherapy or as an adjunct to scaling and root planing procedure. These include tetracycline, doxycycline, minocycline, chlorhexidine, metronidazole, enzymes and quaternary ammonium compounds, which have been administered topically in pure forms by their incorporation in chewing gums, dentifrices, acrylic strips, hollow fibres, films, ointments, gel etc. It is clear that for local antimicrobial therapy to be clinically effective, successful mechanisms to deliver sustained and adequate concentration of the active agent to the periodontal pocket are required [2]. In order make use of tetracycline as local antimicrobial therapy, this study planned to evaluate efficacy of the drug.

AIM
To evaluate the efficacy of tetracycline fibres with scaling and root planing in reducing the clinical signs of periodontitis.

II. Materials And Methods

- Mouth mirror
- Explorer
- UNC-15 periodontal probe (Hu-Freidy. USA)
- Straight probe
- Tweezer
- Scalers
- Gracey curettes (Hu-Freidy no. 1-18)
- Self cured acrylic occlusal stent
- **TETRACYCLINE FIBRES (Periocol -TC)** The product contains 25mg fibrillar collagen, containing approximately 2mg of evenly impregnated tetracycline HCl. (EUCARE PHARMACEUTICALS, CHENNAI). Periocol- TC, release tetracycline at a rate of approx. 2 mcg/mg-hr in the periodontal pocket.
- Periodontal dressing
- Cheek retractor
- Kidney tray
- Cotton rolls
- Dappen dish

METHOD: The study consisted of 60 sites of periodontal pocket with a probing depth 5-8 in mm, within age group 25 – 55 years patients of chronic periodontitis. Written consent obtained from patients involved. Approval from Institutional Ethical committee was taken. Patients were divided in two groups in which Group I was treated by scaling and root planing alone and Group II by scaling and root planing and tetracycline fibres . The clinical parameters included were at baseline and 1ˢᵗ month and 3ʳᵈ month, Statistical analysis was done with

"One way Anova analysis".
The selected sites were randomly divided into 2 groups:
- Group I (SRP alone) - included 20 sites treated with scaling & root planing alone.
- Group II (SRP + tetracycline fibres) - included 20 sites treated by scaling & root planing with tetracycline fibres.

CLINICAL PARAMETERS RECORDED-
1. Plaque index (Silness and Loe, 1964)[3]
2. Gingival index (Loe and Silness, I963)[3]
3. Sulcular bleeding index (Muhlemann and Son,1971) [3,4]
4. Probing depth (PD) using UNC-15 periodontal probe (Hu-friedy, USA)
5. Relative Attachment Level (RAL) using acrylic stent and UNC-15 periodontal probe (Hu-friedy, USA)
After recording the clinical parameters from each site at baseline, a thorough scaling and root planing was done, using hand instruments and ultrasonic scaler in all groups. The clinical parameters were assessed at baseline, at 1 month & 3 month after receiving the treatment.

III. Results And Observations

PLAQUE INDEX :
One way ANOVA was used to find out the significant difference in gain scores at 1 month in two study groups. The calculated $F_{(df2, 57)} = 0.06$, p value .933 is statistically not significant. The difference in mean gain at 3 month between study groups is statistically not significant with $F_{(df2, 57)} = 0.213$, p value = .809.

Table I: Mean percentage gain in plaque index:

Groups		1 Month	3 Month
Group I	SRP	-51.39	-53.78%
Group II	SRP+Tetracycline Fibers	-49.22%	-56.20%

SULCULAR BLEEDING INDEX – Table II
One way ANOVA was used to find out the significant difference in gain scores at 1 month in two study groups. The calculated $F_{(df2, 57)} = 1.37$, p value 0.261 is statistically not significant. The mean gain percentage Col TC and SRP are not significantly different with each other. The difference in mean gain at 3 month between study groups is statistically not significant with $F_{(df2, 57)} = 38.15$, p value = 0.0. The mean gain percentage of two groups i.e. Col TC and SRP are significantly different with each other. The maximum percentage decrease was observed in Col TC group followed by SRP without statistical significance.

Table II: Mean percentage gain in sulcular bleeding index:

Groups		1 Month	3 Month
Group I	SRP	-56.81%	-64.05%
Group II	SRP+Tetracycline Fibers	-55.89%	-66.30%

GINGIVAL INDEX

One way ANOVA was used to find out the significant difference in gain scores at 1 month in two study groups. The calculated $F_{(df2, 57)} = 0.10$, p value 0.902 is statistically not significant because calculated value is less than table value of F. The mean gain percentage of two groups i.e. Col TC and SRP are not significantly different with each other. The difference in mean gain at 3 month between study groups is statistically not significant with $F_{(df2, 57)} = 0.08$, p value = 0.919. The mean gain percentage of two groups' i.e. Col TC and SRP are not significantly different with each other. The maximum percentage decrease was observed in Col TC followed by SRP group.

Table III: Mean percentage gain in gingival index:

Group		1 Month	3 Month
Group I	SRP	-48.98%	-54.03%
Group II	SRP+Tetracycline Fibers	-47.60%	-54.36%

PROBING DEPTH:

One way ANOVA was used to find out the significant difference in gain scores at 1 month in two study groups. The calculated $F_{(df2, 57)} = 1.68$, p value .195 is statistically not significant. The difference in mean gain at 3 month between study groups is statistically not significant with $F_{(df2, 57)} = 38.15$, p value = .00. The mean gain percentage of two groups i.e. Col TC and SRP are significantly different with each other. The maximum percentage decrease was observed in Col TC followed by SRP group and with statistical significance.

Table IV: Mean percentage gain in probing depth:

Group		1 Month	3 Month
Group I	SRP	-20.37%	-25%
Group II	SRP+Tetracycline Fibers	-21.31%	-42.47%

RELATIVE ATTACHMENT LEVEL:

One way ANOVA was used to find out the significant difference in gain scores on clinical attachment level at 1 month in two study groups. The calculated $F_{(df 2,57)} = 2.42$, p value .096 is statistically not significant. The mean gain percentage of two groups i.e. Col TC and SRP are not significantly different with each other. The difference in mean gain at 3 month between study groups is statistically significant with $F_{(df 2, 57)} = 35.89$, p value = 0.0. Since calculated F value of 35.89 is more than the table value at $F_{(df2, 57)}$ p value is statistically significant at 0.01 level. The mean gain percentage of two groups i.e. Col TC and SRP are significantly different with each other. The maximum percentage decrease was observed in Col CG group followed by Col TC and lastly SRP group.

Table V: Mean percentage gain in relative attachment level:

Group		1 Month	3 Month
Group I	SRP	-15.40%	-16.89%
Group II	SRP+Tetracycline Fibers	-17.19%	-31.21%

The crux of the present study clearly shows that, the locally delivered tetracycline fibres along with SRP resulted in a clinically meaningful improvement in all the clinical parameters and was significant throughout the study of 3 months duration.

IV. Discussion

Haesman et al[5], Goodson et al.[6], Addy et al[7] reported statistically significant changes in accumulation of plaque. In the present study mean percentage reduction in plaque index from baseline to 1 month and 3 months is maximum in Group II (SRP+Tetracycline fibres) 56.20% as shown in table I whereas minimum in Group I (SRP alone). In this study overall sulcular bleeding index improves from baseline to 3 months similar to another studies by Ritu Jain et al[8],Aimetti al [9].

Slow release of therapeutic effect in oral cavity of tetracycline an anti-inflammatory action by using gingival inflammatory action by reducing gingival inflammation, Thus this study reports there is marked reduction in gingival index score from baseline to 3 months, Group I (SRP alone), Group II (SRP+Tetracycline fibre) in accordance to study by Goodson et al[10]. The mean percentage reduction was highly significant in Group II (42.47%) as compared to Group I (25 %) as shown in Table IV. Changes in level of attachment can be caused only by gain or loss of attachment and thus provide a better indication of the degree of periodontal destruction. In the present study, it was observed that there was highly significant gain in SRP, SRP+Tetracycline at the end of 3 month from baseline. Thus mean percentage gain Group II (31.21%) and group I (16.89%) as shown in table V. Similarly in accordance to studies by Goodson et al[6], Purucker et al [11].

V. Summary And Conclusion

The development of sustained release delivery devices has added a new dimension to the incorporation of adjunctive pharmacotherapy in management of periodontal disease. Thus the present study was conducted, evaluated and compared for the efficacy of commercially available Periocol-TC (tetracycline fibre) with SRP alone and SRP alone.

The conclusion which can be drawn from study:

1) On clinical evaluation data showed statistically significant result in periodontal pocket depth reduction and gain in clinical attachment level.

2) There was significant improvement with respect to reduced gingival bleeding, minimal plaque accumulation from baseline to 3 months.

Thus, tetracycline fibres as an adjunct to SRP proved to be efficient, safe, and cost effective for maintenance of periodontal disease than SRP alone.

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