



A COMPARATIVE EVALUATION OF EFFICACY OF SUBGINGIVAL IRRIGATION BETWEEN 10MG/ML TETRACYCLINE HCL AND 0.2% CHLORHEXIDINE - A RANDOMIZED CLINICAL STUDY

Medical Science

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ABSTRACT

Aim-Evaluate the efficacy of subgingival irrigation between 10mg/ml concentration tetracycline HCL and 0.2% chlorhexidine digluconate. **Materials and methods**- The study was designed with 40 patients and randomly assigned to two groups, each receiving one out of the two irrigants. Solutions used were Tetracycline HCL 10 mg/ml concentration and 0.2% Chlorhexidine gluconate. At the baseline the clinical parameters recorded were BOP, GI, PI, Pocket Depth and CAL and SRP was followed by one time subgingival irrigation. The subjects were recalled at 7th day, 1st and 3rd month post irrigation and clinical parameters were recorded.

Results- The value of all the clinical parameters at 3 months after the single episode application of subgingival irrigation in both the groups showed statistical improvement in the clinical parameters compared to the baseline.

Conclusion-Both the agents showed an efficacious result at 1st month and 3rd month after the subgingival irrigation with the agents.

KEYWORDS

Introduction

Periodontitis is an infectious disease characterized by bone loss and pocket formation.¹ The progression of periodontal disease is a result of the direct effects of bacterial virulence factors on host tissues as well as the self-damaging host responses to the colonizing bacteria.²

Periodontitis can be treated by non surgical treatment which includes SRP, systemic antibiotics, local drug delivery (LDD). LDD has been used along with SRP to have high concentration of drug in localized site which has shown to be effective in the treatment of periodontal disease.

Many adjuncts like doxycycline, tetracycline, chlorhexidine, minocycline have been used. Chlorhexidine (CHX), a bisbiguanide compound, is known to be the gold standard in chemical plaque control. It is this property, in addition to the safety, effectiveness, substantivity, lack of serious side effects and lack of toxicity that has allowed it to be used extensively in dentistry, usually as a mouthrinse. The combined use of irrigators and CHX appears to be more effective than when used as a mouthrinse at altering the subgingival microflora.³

The tetracyclines are a group of bacteriostatic antimicrobials effective against a wide range of organisms and successfully tested in both animal models and clinical studies. Preliminary data indicate that tetracycline HCL (TRC) may be retained in the subgingival environment and is slowly released to the gingival crevicular fluid in clinically meaningful concentrations following an irrigation procedure.⁴

Aim

With this background the aim of the present study was to compare and evaluate the efficacy of subgingival irrigation between 10mg/ml tetracycline HCL and 0.2% chlorhexidine.

Materials and methods

This was a randomized clinical trial which consisted of a total of 40 patients, 20 in each group.

The study was conducted in the Department of Periodontics, The Oxford Dental College and Hospital, Bangalore from September 2017 to November 2017.

Eligibility criteria for participants

Inclusion criteria

1. The patients should belong to the age group ranging from 20-55 years.
2. Healthy subjects with chronic periodontitis with the deepest probing depth on any site will be considered in each quadrant.

Exclusion criteria

1. Patients afflicted with serious, uncontrolled medical disorders.
2. Patients who had undergone periodontal procedure within the past six months.
3. Patients who had taken or still on antibiotics within the past six months and other medications that might influence subgingival flora.
4. Patients sensitive to chlorhexidine and tetracycline.
5. Pregnant or lactating mothers.
6. Teeth with furcation involvement, recession and non vital teeth.

Case history was recorded and the procedures was explained to each individual and written consent was obtained.

Solutions used for subgingival irrigation were -

- Tetracycline HCL 10 mg/ml concentration
- 0.2% Chlorhexidine gluconate

Preparation of the solution-

- Tetracycline (TRC) solutions were prepared by dissolving the content of three 500 mg TTL capsules into 150 ml distilled sterile water (TRC at 10 mg/ml concentration) at approximately 60°C in group II. Magnetic Stirrer was used for dissolving particles. Any capsule filler particles were filtered away.
- 0.2% chlorhexidine was used for irrigation in group I

Subgingival irrigation

Initially scaling and root planing was performed for all the patients, later the deepest pocket sites were isolated with cotton rolls, each selected site was subjected to subgingival irrigation of the allocated solution using 5 ml syringe Excess irrigant solution was continuously aspirated. The irrigation was carried out for an approximate period of 5 min for each selected site.⁵ Following the irrigation protocol, the patients were reinforced in their oral hygiene instructions. They were subsequently recalled at days 7, 1 month, and 3 months post-irrigation, and the clinical parameters were recorded at the selected sites.

Parameters recorded

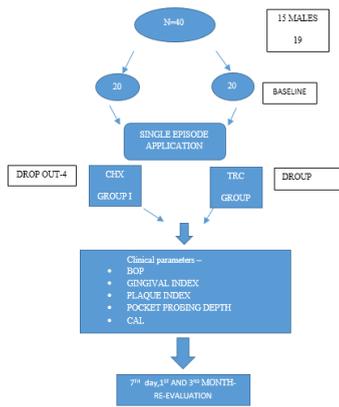
Gingival status

- Bleeding on probing (BOP)
- Gingival index (Loe and Sillness, 1963)
- Plaque index (Sillness and Loe, 1964)

Periodontal status

- Pocket probing depth
- Clinical attachment level (CAL)

Study design



Result

Statistical tests were performed using software IBM-Statistical Package for Social Sciences (SPSS, version 20). Clinical parameters such as plaque index (PI), gingival index (GI), pocket probing depth (PPD), and clinical attachment level (CAL) were calculated per group. Interpatient systemic differences (e.g., age, gender) are known to significantly confound the effect of periodontal treatment (independent variable).

Intragroup comparison of parameters at baseline and 1st month and at 3rd month recall interval was done using Paired *t*-test.

Intergroup comparison of clinical parameters such as PI, GI, PPD, and CAL was done using analysis of variance (ANOVA). The repeated measures ANOVA model complete block design, with the patients constituting the blocks, was used. When the results indicated that a significant difference existed between irrigation groups, *post hoc* multiple comparison tests (Bonferroni test and Dunnett's test) were used to determine which pairs were actually different. The results were considered statistically significant when *P* < 0.05.

Table 1 shows the values of all the clinical parameters ie PI, GI,PD and CAL between the two groups at baseline before the scaling and root planning.

Parameter	Group	N	Mean	SD	Mean Diff	t	P-Value
PI	CHX	15	1.89	0.60	0.05	0.215	0.83
	TRC	15	1.84	0.73			
GI	CHX	15	1.75	0.64	0.02	0.115	0.91
	TRC	15	1.73	0.46			
PD	CHX	15	6.20	1.52	0.33	0.682	0.51
	TRC	15	5.87	1.13			
CAL	CHX	15	6.53	2.07	0.07	0.088	0.93
	TRC	15	6.47	2.07			

Table 2 the value of all the clinical parameters at 3rd month after the single episode application of subgingival irrigation. both the groups showed statistical improvement in the clinical parameters compared to the baseline

Parameter	Group	N	Mean	SD	Mean Diff	t	P-Value
PI	CHX	15	1.04	0.38	-0.32	-1.856	0.07
	TRC	15	1.35	0.54			
GI	CHX	15	0.98	0.50	-0.22	-1.269	0.22
	TRC	15	1.19	0.44			
PD	CHX	15	3.60	1.12	-0.53	-1.427	0.17
	TRC	15	4.13	0.92			
CAL	CHX	15	3.87	1.68	-0.87	-1.319	0.20
	TRC	15	4.73	1.91			

Table 3 shows the plaque index parameter values at baseline,1 and 3 months and explains no statistical significant result between the chlorhexidine and tetracycline group.

Group	Time	N	Mean	SD	P-Value	Sig. Diff	P-Value
CHX	BL	15	1.89	0.60	<0.001*	T0 Vs T1	<0.001*
	1m	15	1.22	0.44		T0 Vs T2	<0.001*
	3m	15	1.04	0.38		T1 Vs T3	0.03*
TRC	BL	15	1.84	0.73	0.001*	T0 Vs T1	0.002*
	1m	15	1.49	0.59		T0 Vs T2	0.006*
	3m	15	1.35	0.54		T1 Vs T3	0.16

Discussion

The efficacy of locally applied antimicrobial agents in periodontal therapy depends on obtaining adequate subgingival delivery of the agent, attaining sufficient contact time between the antimicrobial agent and the target microorganisms, and achieving effective concentrations of the antimicrobial agent. Failure to properly account for one or more of these parameters is the reason for the relative ineffectiveness of many local antimicrobial regimens in periodontics.

Chlorhexidine activity in the oral cavity is promoted by binding to plaque, salivary pellicle, oral mucosa, and hard structures and its release for up to 12 hours makes it a highly substantive product. Reversible side effects that can occur with prolonged use of chlorhexidine in the oral cavity include staining of hard tissues and some dental materials, altered taste sensation, supragingival calculus accumulations, and less commonly, a mild mucositis. Minimum inhibitory concentration (MIC) of CHX was tested against a range of 52 bacteria commonly isolated from subgingival plaque and was reported to be between 8 and 500 mg/ml.⁹

Using 10% tetracycline-HCl Christersson et al¹⁸ conducted a classic 6-month study to determine the substantivity of tetracycline-HCl and the effects of irrigation with tetracycline-HCl or saline following a single session of scaling and root planing. They reported that 10% tetracycline-HCl irrigation of root surfaces for long periods of time (5 minutes) results in a subsequent release of active antibiotic into the gingival fluid at therapeutic levels for at least 1 week. They also reported that the irrigation resulted in significantly greater attachment gain as compared to SRP alone over at least a 6-month period of healing. The substantive properties of tetracycline HCl, in addition to its antimicrobial and anticollagenase activities, make it promising as an adjunct to mechanical therapy through local application. In a study by Staboltz et al They concluded that 5% tetracycline (50 mg/ml) exhibited significantly greater antimicrobial activity than either 0.12% CHX digluconate for 12 days or saline for 16 days. The 1% tetracycline-HCl (10 mg/ml) exhibited significantly greater antimicrobial activity than 0.12% CHX digluconate and saline for 4 days. Thus, the amount of antimicrobial activity retained is proportional to the concentration of the tetracycline used for irrigation. Staboltz et al⁵ irrigated subgingivally one time with 0.12% CHX solution prior to extraction and tested the tooth root for any residual antimicrobial activity. No antimicrobial activity was found. In contrast, when teeth irrigated with 50 mg/ml (5%) of tetracycline hydrochloride were compared to 0.12% CHX or saline irrigated teeth, tetracycline revealed significantly greater residual antimicrobial activity for 12 days than the 0.12% CHX treated teeth, and significantly more activity for 16 days than the saline irrigated teeth. A similar study done by Krishna et al⁶ evaluated the results of a single episode irrigation with tetracycline 10 mg/ml and 50 mg/ml in the presence of SRP in the experimental sites and according to their study, the amount of antimicrobial activity retained is proportional to the concentration of tetracycline HCl used for irrigation, so 10 mg/ml tetracycline was not sufficient to bring significant clinical results.

The results of the present study reveals that both the groups showed a statistical significant improvement in all the clinical parameters from baseline to 1st and 3rd month but there was no statistical difference between 0.2% CHX and 10mg/ml TRC from baseline to 3rd month.

Jolkovsky et al¹⁶ and Flemmig et al.¹⁹ also found an improvement of the gingival index after 3 months regardless of the irrigant used. The implication of these studies and other studies is that the physiologic flushing of the pocket itself may comprise the primary therapeutic effect of irrigation, regardless of the irrigant used. The different reasons for improvement in groups could be that subgingival irrigation alters the population of key pathogens, thereby reducing gingival inflammation.

There is also the possibility that beneficial action of a syringe is at least partly because of the removal of loosely adherent soft deposits interfering with plaque maturation and stimulation of the immune response. Other explanations could be a mechanical stimulation of the gingiva or a combination of the above-mentioned factors. Furthermore, irrigation may reduce the thickness of the plaque.

In the present study, it suggests that the value of all the clinical parameters at 3month after the single episode application of subgingival irrigation in both the groups showed statistical improvement

in the clinical parameters compared to the baseline.

Conclusion

It can be concluded that sub gingival irrigation with the 0.2% chlorhexidine and 10mg/ml tetracycline HCL has shown equivalent results and has shown improvement in all clinical parameters at 1st month and 3rd month compared to baseline.

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