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Research Article

EFFICACY OF QUERCETIN GELAS AN ADJUNCT TO SCALING AND ROOT PLANING IN CHRONIC PERIODONTITIS PATIENTS: A CLINICO-MICROBIOLOGICAL STUDY

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A B S T R A C T

Aim: To evaluate effect of quercetin gel delivered subgingivally as an adjunct to scaling and root planing in treatment of chronic periodontitis**.**

Material and Methods: 30 patients with chronic periodontitis were selected and randomly divided into 3 groups. After scaling and root planing as an adjunct, group A and group B were delivered with quercetin and chlorhexidine gel respectively subgingivally while group C was SRP alone. Clinical parameters recorded were Plaque Index, Gingival Index, Probing Pocket Depth and Clinical Attachment Loss and for microbiological evaluation, colony forming units were counted. All the parameters were evaluated at baseline and after one month.

Results and Conclusion: The study showed that quercetin gel as an adjunct to scaling and root planing showed significant improvement in both clinical and microbiological parameters.

INTRODUCTION

Chronic periodontitis is an infectious and inflammatory disease of periodontium and one of one most prevalent in humans[1]. The cause and progression is due to colonization of microorganisms, chiefly Actinobacillus actinomycetemcomitans, Porphyromonas gingivalis, and Prevotella intermedia.[2]

Being a 'gold standard' for mechanical therapy, scaling and root planing (SRP) is the most important approach for treatment of chronic periodontitis.[3] But SRP alone without adjunctive use of chemotherapy is often found to be insufficient to reduce bacterial load. Adjunctive chemotherapies can enhance the outcome of mechanical therapy. Systemic drugs have been administered along with SRP but they need to be given in higher dosage to attain optimum concentration in GCF, so local drug delivery has a crucial role in treatment of chronic periodontitis.[4]

For local drug delivery as an adjunct to SRP, some of the agents used are tetracyclines, metronidazole and chlorhexidine. But in search for natural and cheaper agents, a variety of herbal extracts containing desirable properties to treat periodontal disease are under research. Flavonoids are one such natural phenolic compounds seen in fruits and vegetables exhibiting anti-inflammatory, antimicrobial and antioxidant properties.[5] Quercetin is one of such important flavonoid. Quercetin is present in apples, black and green tea, onions, red wine, red grapes, citrus fruit, broccoli and other leafy green vegetables, cherries, and a number of berries including raspberry, lingonberry and cranberry.[6] It has shown beneficial effects to treat diseases of cardiovascular, prostate, joints and allergic origin. Quercetin inhibited Human Gingival Fibroblasts (HGF)-mediated collagen degradation at 0.005, 0.01 and 0.02%, and MMP-2 activity in a dose-dependent manner.[7] Quercitrin, a glycoside formed from the flavonoid quercetin, is not toxic for Human Gingival Fibroblasts (HGFs), increased collagen IIIa1 and decorin levels, down regulated interleukin-6 messenger RNA levels, decreased the expression of profibrotic markers during wound healing, decreased ROS levels in basal and stimulated conditions; and decreased the MMP1/TIMP1 ratio. Also it has antimicrobial and osteogenic effects and improves immune function. Its antimicrobial activity against Actinobacillus actinomycetemcomitans (Aa) and Porphyromonas gingival is (Pg) was studied by determining minimum inhibitory concentration (MIC) .Results showed that Aa and Pg were significantly inhibited at concentration of 0.1g/mL of quercetin.[8] Taking into consideration the properties of quercetin and advantages of local drug delivery, this study aims at evaluating effect of local drug delivery of quercetin gel as an adjunct to SRP in treatment of chronic periodontitis.

MATERIAL AND METHODS

Gel preparation

Quercetin extract was purchased in the form of gelatin capsules. Gel was prepared under guidance of Pharmacy College of the institution. Resorbable HPMC (Hydroxy

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polymethyl cellulose) was used to prepare gel. 0.1g/mL. of quercetin was used on the basis of Minimum Inhibitory Concentration test. The weighed quercetin and HPMC was taken in a beaker. With a dropper, water was added in increments of 1 ml in the beaker with constant stirring till a gel like consistency was formed. After that the beaker was placed in a sonicator for even dispersion of quercetin particles. This gel was then loaded in a 5 ml syringe and stored in refrigerator in aseptic conditions.(Figure 1)

Figure 1 Quercetin gel

Ethical Clearance

The ethical clearance was obtained from the institutional ethical committee.

Informed Consent

All the procedure to be carried out was explained to the patients in language they will understand. The informed consent was taken from patients.

Clinical evaluation

Total 30 patients were selected for the study from outpatient department of Periodontology which fulfilled the inclusion criteria.

Inclusion criteria

- Patients with chronic periodontitis with isolated pockets and depth of 5-7mm at baseline.
- Patients willing to take part in the study within age 35 to 58 years without any systemic disease.
- Patients who have teeth with both mesial and distal neighboring teeth.
- Patient with more than 20 natural teeth.

Exclusion criteria

- Pregnant woman and lactating mothers.
- Teeth with both endo-perio lesion.
- Patient with use of tobacco or tobacco related products.
- Patient on antibiotics within 3 months prior to study. Patients who have had periodontal treatment in last 6 months.
- Long-term therapy with medications within a month prior to enrollment that could affect periodontal status or healing.

Study protocol

Patients meeting the inclusion criteria were randomly divided into three groups of 10 each. Scaling and root planing was done in all the patients followed by Group A -Quercetin gel, Group B- chlorhexidine gel and Group C- Scaling and root planing alone.

After scaling and root planing the experimental sites was isolated with cotton rolls to prevent contamination from saliva. The experimental material (quercetin gel) in group A and chlorhexidine in group B was delivered subgingivally in the periodontal pocket as an adjunct.

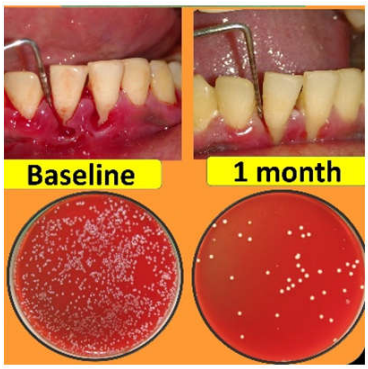

Figure 2 Quercetin group

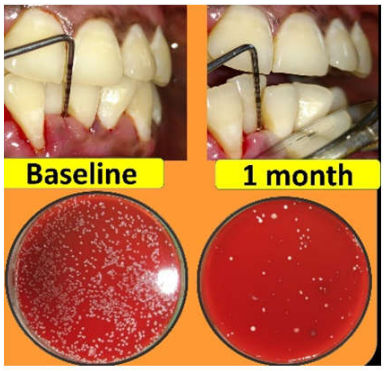

Figure 3 Chlorhexidine group

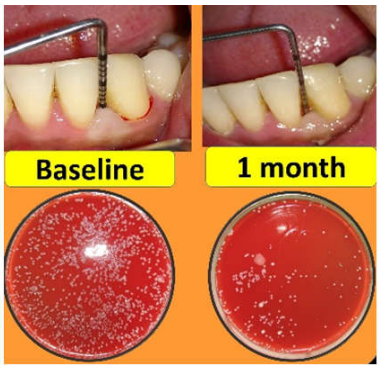

Figure 4 SRP group

Table 1 Clinical and microbiological parameters at baseline, 1 month and 3 months

Parameters	Group A (SRP+Quercetin)		Group B(SRP+ Chlorhexidine)		Group C (SRP alone)	
	Baseline Mean ±S.D	1 month Mean ±S.D	Baseline Mean ±S.D	1 month Mean ±S.D	Baseline Mean ±S.D	1 month Mean ±S.D
PI	2.31±0.41	1.28±0.35	2.04±0.31	1.2±0.19	2.22±0.13	1.17±0.008
p value	p=0.001		p=0.002		p=0.002	
GI	2.24±0.36	1.26±0.19	1.94±0.28	1.23±0.18	2.23±0.37	1.08±0.11
p value	p=0.001		p=0.002		p-=0.004	
PPD	4.08±1.43	3.62±1.34	4.44±1.54	3.22±1.16	4.32±1.77	3.22±1.16
p value	p=0.01		p=0.03		p=0.045	
CAL	4.08±1.31	4.15±1.23	5.7±0.67	4.09±0.71	4.4±1.83	3.1±1.33
p value	p=0.05		p=0.03		p-=0.07	
CFU	810±0.24	48±1.24	760±0.21	70±0.82	714±0.35	159±1.86
p value	p<0.001		p<0.001		p<0.001	

The pocket opening was covered with Coe-Pak to retain the material in the pocket, as well as to prevent the ingress of oral fluids. Subjects were recalled after 7 days for removal of the periodontal dressing and for oral hygiene maintenance instructions.

Clinical parameters

Proforma sheet was made to record relevant data. UNC 15 probe was used to determine pocket depth. The parameters recorded at baseline and one month were-

1. Plaque index (PI)-(Turesky-Gilmore-Glickman modification of the Quigley- Hein, 1970).
2. Gingival index (GI)-(Loe and Silness, 1963).
3. Probing pocket depthc(PPD)
4. Clinical attachment loss (CAL)

Microbiological parameters

Subgingival plaque sample was taken at baseline and one month using Gracey curette placed parallel to long axis of tooth and inserted into deepest portion of periodontal pocket and pulled coronally by scraping along root surface of test site. The plaque sample was then inserted in test tube containing normal saline and inoculated on blood agar. Dilutions were made till countable colonies were seen on blood agar and was then incubated for 48 hours at 37°C in anaerobic gas pack placed in incubator. Colony forming units (CFU) were counted after 48 hrs.

Statistical analysis

Clinical and microbiological parameters were statistically evaluated from baseline and 1 month using paired t-test by SPSS software. P value of <0.05 was considered statistically significant.

RESULTS

This study consisted of 30 patients randomly divided into 3 groups. There was a significant reduction in all clinical and microbiological parameters in all the 3 groups from baseline to 1 month.(Figure 1, figure 2, figure 3). The results are tabulated in table no.1

DISCUSSION

The treatment for chronic periodontitis focuses mainly on mechanical elimination of local etiological factors which disturbs the biofilm and reduces the bacterial load. Being the most important etiology, periodontopathogenic organisms should be eliminated for improved periodontal healing[9]. Oral rinses are prescribed as an adjunct to mechanical debridement, but their limitations to reach subgingival areas have led to usage of local drug delivery system.[10]

The present study was done to evaluate Quercetin gel as an adjunct to scaling and root planing in treatment of chronic periodontitis. Results showed that there was a statistically significant reduction in both clinical and microbiological parameters in all the three groups. This may be due to elimination of etiology (plaque) and predisposing factor (calculus) after scaling and root planing. This was in accordance with studies done by Paolantonio *et al*[11] and Cugini *et al*. Scaling and root planing leads to decrease in inflammatory infiltrate and lays down new collagen which reflects in improved clinical parameters.[12] The microbial flora also alters post mechanical elimination of local etiological factors.[13,14] Oral hygiene instructions advised after SRP may have contributed for the improvement in periodontal health.

All the clinical parameters in Quercetin group, though statistically significant in other two groups, were more significant in comparison (except for CAL in group B). This might be due to suppression of cytokines including IL-12, INF-γ, INF-α, IL-8, cyclo-oxygenase 2, and prostaglandin E by quercetin. Also it can inhibit free radicals, nitric oxide, lipid peroxidation, reactive oxygen metabolites and neutrophil infiltration resulting in antioxidant action.[15] Quercetin decreasesthe expression of tumor necrosisfactor-a (TNF-a), interleukin-b (IL-1b), IL-6 and IL-8 in phorbol 12-myristate13-acetate and calcium ionophore-stimulated human mastcells.[16] Matrix metalloproteinases (MMPs) such as MMP-1, MMP-2 and MMP-9 are also suppressed by quercetin. The microbiological parameters were significantly inhibited in all groups but as compared to other two groups, quercetin group showed more improvement. This was in accordance with the study done by Gómez‐Florit M *et al* (2014). Which showed that quercitrin showed antibacterial properties against *S.Epidermis* which is one of the primary colonizers in plaque formation and implant biofilm formation.

CONCLUSION

The study showed that Quercetin gel as an adjunct to scaling and root planing showed promising results in reduction of both clinical and microbiological parameters in treatment of chronic periodontitis as compared to scaling and root planing alone. The experimental drug showed no side effects on gingival tissues. The study can be further validated by using advanced diagnostic aids at a molecular level with larger sample size.

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