Evaluation on the effect of locally delivered 2% curcumin gel (curcuma longa) as an adjunct toscaling and root planing in chronic periodontitis

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Abstract

Treatment of the periodontal disease is routinely based on mechanical debridement such as scaling and root planing. The present study was aimed to evaluate the effectiveness of locally delivered 2% curcumin gel used as an adjunct to scaling and root planing in chronic periodontitis. Thirty four chronic localized moderate periodontitis subjects (35- 50 years of age) having pocket depth 4- 6 mm were randomly selected and divided into control and study groups. The control group received scaling and root planing alone whereas the study group received 2% curcumin gel along with scaling and root planing. Plaque index, bleeding on probing, gingival index, pocket depth and clinical attachment level were measured in each patient at baseline, 2ndweek and 4thweek after treatment. Although both groups demonstrated statistically significant reduction in PI, BOP, GI, PD and gain in CAL after treatment when compared to the baseline, curcumin gel group showed greater reduction in BOP and GI scores and statistically significant change in PD and CAL when compared to control group. This study supports that locally delivered 2% curcumin gel can besafely and effectively used as an adjunct to non-surgical periodontal therapy and is more effective than scaling and root planing alone in the treatment of chronic periodontitis with 4-6 mm pocket depth.

Introduction

Periodontal disease is an infectious, inflammatory disease and its initiation and progression is significantly associated with overgrowth of certain pathogenic bacteria, liberation of bacterial toxins and inflammatory response of the host [1]. Among the periodontal diseases, chronic periodontitis is the most common form of periodontitis [2].Treatment of the periodontal disease is routinely based on mechanical debridement of the tooth surface and appropriate and meticulous maintenance of oral hygiene. During periodontal management, scaling and root planing are carried out as the basic treatment procedures for mechanical debridement. These are the two primary types of treatment aimed to eliminate bacteria from the tooth surface by means of professional instrumentations [3].

However, comprehensive mechanical

debridement of sites with deep periodontal pockets is difficult to accomplish [4]. The American Academy of Periodontology stated that the use of locally delivered agents may be of value when probing depths greater than 5mm with inflammation are still present after conventional therapy [5]. This study was planned to evaluate the effect of curcumin, the extract of turmeric (Curcuma longa) which is commonly used in traditional medicine of Myanmar. Turmeric has proven properties like anti-inflammatory, antioxidant, antimicrobial, hepatoprotective, immunostimulant, antiseptic, antimutagenic, and it also accelerates wound healing [6]. A study also showed the antibacterial activity of turmeric made significant reduction in the trypsin-like enzyme activity of periopathogenic bacteria," red complex" microorganisms[7]. The turmeric (Curcuma longa) is easily accessible and economically acceptable to be used as locally delivered agent while other locally delivered agents like PerioChip (subgingival chlorhexidine), and Artidox (10% doxycycline gel) are expensive and difficult to purchase in our country.

Material and methods

This randomized control clinical trial was carried out from September 2015 to August 2016 at the Department of Periodontology, University of Dental Medicine- Mandalay with the approval from Ethical and Research Committee. Thirty four patients (35- 50 years of age) with chronic localized moderate periodontitis having pocket depth 4- 6 mm were collected from Department of Periodontology clinic. All participants were explained about the need, design of the study and its potential risks and benefits. Informed written consent was obtained. Then they were chosen into control and study groups by using

block randomization method [8]. The control group was treated by scaling and root planing alone whereas the study group was treated by scaling and root planing together with locally delivered 2% curcumin gel. Clinical parameters- plaque index (PI), bleeding on probing (BOP), gingival index (GI), pocket depth (PD) and clinical attachment level (CAL) were measured in each patient at baseline, 2ndweek and 4thweek after treatment. FAME Pharmaceuticals Industry Co., Ltd, Yangon, Myanmar provided 2% curcumin gel. The composition of 2% curcumin gel was - Curcumin 2%, Carbomer 1%, Hydroxylpropyl methylcellulose (HPMC) 1%, Propylene glycol 5%, Sodium benzoate 0.1% ,Triethanolamine (TEA) q.s., Distilled Water q.s. to 100%. The clinical parameters were assessed at the baseline at selected sites, followed by thorough scalingand root planning (SRP). On completion of SRP, control sites were covered with Coe-Pak. The experimental site was isolated with cotton rolls to prevent contamination from saliva. Then theexperimental local drug-delivery system, 2%curcumin gel was placed into pocket with syringe (DiaflexTM multiple use syringe). The pocket openingwas covered with Coe-Pak to retain the material in the pocket,as well as to prevent the ingress of oral fluids. Patients were recalled after 7 days for removal of the periodontal dressing and for oral hygiene maintenance. Recall visits were againscheduled after 2 weeks and 4 weeks of placement of localexperimental drug for measuring the clinical parameters. The clinical periodontal parameters (PI, BOP, GI, PD and CAL) were recorded at baseline, 2nd week and 4th week after treatment. Statistical analysis of the data was done with the help of statistician, p-value lower than 0.05 was considered statistically significant and

confidence interval was 95%. The result was shown in mean (mean ± SD) for clinical periodontal parameters (PI, BOP, GI, PD and CAL) at baseline, 2nd week and 4th week after treatment. The Mann-Whitney test was used to compare the statistical significance between two groups.**[Figure.1] [Figure. 2] [Figure. 3]**

Figure 1: Application of 2% curcumin gel by using DiaflexTM multiple use syringe

Figure 2: Periodontal dressing (Coe-Pak) covering over the study site

Figure3: Measuring of pocket depth after treatment

Results

In the present study, both groups had statistically significant reduction in the mean plaque index, gingival index, bleeding on probing, probing pocket depth; and also statistically significant gain inclinical attachment level after study period compared to baseline data. (table 1 & 2)

Intergroup comparisons showed that study group had greater reduction in BoP and GI scores at 4th week after treatment and statistically significant change in PPD and CAL than that of control group. (table 3)

Discussion

In this study,among the 34 subjects of study population, 16 (47%) were male and 18 (53%) were female with the mean age of 41 years old and the minimum and maximum ages were 35 and 50 respectively.

Clinical observations proved that all parameters improved better in study group than control group and these results are in accordance with some studies which also used turmeric and curcumin as locally delivered gel [7. 9].

By measuring the plaque score, both groups showed marked reduction at 2nd week after treatment but slight increase at 4th week which indicated that there were redeposition of bacteria plaque at the study sites and it might be the result of inadequacy of oral hygiene instruction and/or patient compliance.

As the bleeding index and gingival index scores are the indicators of inflammation, the reductions of these index scores in the study group could be attributed to the antinflammatory and antioxidant property of curcumin like inhibition of NF kβ activation (Baldwin, 2001)and down regulation of pro-

inflammatory enzyme cyclooxygenase-2 (Plummer et al., 1999) (Chen et al., 1999) by reducing the inflammatory mediators generated via arachiodonic acid pathway [12, 13].

The reduction of periodontal pocket depth and the CAL gain are the important outcomes to determine the improvement of periodontal conditions after periodontal therapy. As there were significant reduction of pocket depth and maked CAL gain in study group than in control group might be due to the efficacy of curcumin which can promote wound healing. Curcumin enhances wound healing by causing an increase in fibronectin and promotes migration of epithelial cells to wounded sites by promoting localization of TGF-β1thus helping re-epithelization due to the diverse range of actions, curcumin-treated sites showed faster resolution of inflammatory signs and greater reduction in probing depth than other treated sites [10].

In terms of taste and discomfort, the experimental drug, 2% curcumin gel seem to be acceptable by most of all the subjects in the study with the exception of one subject who complained that the drug had mild bitter taste. Furthermore the drug might have good biologcal acceptability, as evidence by the absence of ulcer formation, staining of teeth, dryness and burning sensation.

Conclusion

According to the results of the present study, locally delivered 2% curcumin gel can be safely and effectively used as an adjunct to scaling and root planing and is more effective than scaling and root planing alone in the treatment of chronic periodontitis with 4-6 mm pocket depth .The local drug-delivery system used in the present study is simple and easy to use. Its suitability for use with a syringe allows easy insertion of drug into the pocket. The system is also a non- invasive technique and requires less chair side time. However, as the curcumin has many known properties like anti-inflammatory, anti-oxidant,effect on human fibroblast, antibacterial activity of against oral and periodontopathic bacteria, further studies with larger study population, longer duration, microbiological parameters, biochemical and immunohistochemical parameters may need to be carried out to obtain the maximum beneficial therapeutic effects of the drug to be used as a locally delivered agent in the treatment of periodontitis.

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Control group (n=17) Clinical parameters	Baseline Mean ± SD	2nd week Mean ± SD	4th week Mean ± SD
PI	2.35±0.49	0.70±0.47	1±0.00
BOP	1.29±0.47	0.12±0.33	0.29±0.47
GI	2.06±0.24	1.12±0.33	1.12±0.33
PPD	4.62±0.60	3.76±0.66	3.41±0.71
CAL	4.79±0.50	4.06±0.50	3.74±0.66

Table 1. Clinical periodontal parameters of control group at baseline, 2nd week and 4th week

Study group (n=17) Clinical parameters	Baseline Mean ± SD	2nd week Mean ± SD	4th week Mean ± SD
PI	2.35±0.49	0.76±0.56	1±0.00
BOP	1.52±0.51	0.59±0.79	0.12±0.33
GI	2.12±0.33	1.41±0.51	1.00±0.5
PPD	4.71±0.59	3.41±0.94	2.79±0.88
CAL	4.74±0.62	3.64±0.89	3.44±0.79

Table 2. Clinical periodontal parameters of study group at baseline, 2nd week and 4th week

Time interval	Control Mean ± SD	Study Mean ± SD	P value*
PI reduction from baseline to 2nd week	1.65±0.79	1.59±0.87	0.84
PI reductionfrom baseline to 4th week	1.35±0.49	1.35±0.49	1.00
BOP reduction from baseline to 2nd week	1.18±0.53	0.94±0.75	0.30
BOP reduction from baseline to 4th week	1.00±0.71	1.41±0.51	0.06
GI reduction from baseline to 2nd week	0.94±0.43	0.71±0.47	0.14
GI reduction from baseline to 4th week	0.94±0.24	1.12±0.60	0.27
PPD reduction from baseline to 2nd week	0.85±0.39	1.29±0.56	0.01
PPD reduction from baseline to 4th week	1.21±0.47	1.91±0.54	< 0.001
CAL gain from baseline to 2nd week	0.74±0.31	1.09±0.59	0.04
CAL gain from baseline to 4th week	1.06±0.43	1.29±0.61	0.20

Table 3. Intergroup comparison of clinical parameters changes at differenttime intervals

*Mann-Whitney Test; p value < 0.05= significant