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Research Article

USE OF CURCUMIN AND ORNIDAZOLE GEL AS LOCAL APPLICATION IN THE TREATMENT OF CHRONIC PERIODONTITIS PATIENTS

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ABSTRACT

Objective: To evaluate the comparative effect of curcumin and ornidazole in treating chronic periodontitis.

Materials and Methods: Twenty individuals of both sexes aged between 27 and 53 years diagnosed with chronic periodontitis and having pocket depths >5 mm bilaterally were selected for this study, in a split-mouth design. Examination of plaque index, probing pocket depth, and clinical attachment level was measured for each patient. The patients received a complete prophylaxis including scaling and root planing after which, both test gels were injected into the two experimental sites chosen, that had probing depth (PD) >5 mm and were located in symmetric quadrants. Pocket depth PD, clinical attachment loss, and plaque index were recorded at days 0 and 30.

Results: At 1-month evaluation, curcumin group showed a significant decrease in pocket PD, plaque index, and clinical attachment loss when compared to the ornidazole group.

Conclusion: The results show a more favorable outcome with curcumin than ornidazole gel, thus curcumin can be used as an adjunct to nonsurgical periodontal therapy.

INTRODUCTION

Periodontal diseases are caused by bacteria associated with dental plaque. The nature of the periodontal disease depend on the interaction among the bacterial agent, the environment, and the response of the host's defense mechanisms to the bacterial assault mainly composed of gram negative anaerobic bacteria.[1] The most common form of periodontitis is chronic periodontitis and it can be localized or generalized (more than 30% of the teeth) depending on the amount of clinical attachment loss.[2] The primary etiologic factor of periodontitis is dental plaque and the microorganisms that are present in it.[3] The biofilm nature of dental plaque provides a specialized environment for the microorganisms thereby ensuring its vitality and pathogenicity.[4,5] The aim of current periodontal therapy is to remove the bacterial deposits from the tooth surface and to shift the pathogenic microbiota to one compatible with periodontal health.The routine therapeutic modality of periodontitis is scaling and root planing (SRP). This involves the removal of supra and subgingival plaque and calculus, thereby returning the tissues to a state of health.[6] However, the recolonization of the treated sites can occur, and pharmacological agents are nowadays used as adjuncts to mechanical therapy. Locally delivered agents are routinely used to control the re-growth of bacteria following SRP.[7] The administration of local drug delivery is associated with less systemic side-effects, less drug resistance and enhanced penetration of the drug in the diseased site resulting in the elimination of harmful pathogens.[8] The common agents used include subgingival chlorhexidine, tetracycline fibers, subgingival minocycline, subgingival doxycycline, and subgingival metronidazole. Nitroimidazole (Ornidazole) compound acts by inhibiting DNA synthesis. It works on the principle that inactive form passively diffuses into cell where it is activated by chemical reduction. The nitro group gets reduced into anion radicals which causes oxidation of DNA leading to strand breakage and cell death. Hence, it has both antimicrobial and mutagenic effects. This effect is primarily seen on obligate Gram-negative anaerobes such as *Porphyromonas gingivalis*, *Prevotella intermedia*, *Fusobacterium*, *Selenomonas sputigina*, *Bacteroides forsythus,* and the Grampositive anaerobes such as *Peptostreptococcus* and *Campylobacter rectus*, which are implicated in periodontal disease.[9]

Currently, the use of herbal products in dentistry is ever increasing. This can be attributed to their easy availability, low cost and lesser side effects.[10] One such herbal product is curcumin. Turmeric (haldi) is the rhizome of Curcuma longa belongs to Zingiberaceae family has been traditionally used in Indian medicine for several decades. It has several components,

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which are collectively known as "curcumin."[11] The proven properties of curcumin include anti‐inflammatory, antioxidant, antimicrobial, antiseptic, antimutagenic.[12] Anti‐inflammatory properties of curcumin is by inhibiting the prostaglandin biosynthesis from arachidonic acid and also by reducing the function of neutrophils during inflammation. Antioxidant property of curcumin is due to its ability to inhibit free radical formation. Antimicrobial effect of curcumin is due to its ability to inhibit the growth of various microorganisms.[13]

Hence, the aim of this study was to evaluate the comparative effect of natural curcumin in the management of chronic periodontitis as local drug delivery in comparison to ornidazole.

MATERIALS AND METHODS

Single‐blind, randomized study was performed to assess and compare the clinical healing following single intrasulcular applications of commercially available curcumin gel (*C. longa* extract‐10 mg) (Curenext, Abbott healthcare limited, Mumbai, India) and ornidazole gel (1.0% ornidazole gel, chlorhexidine gluconate solution – 0.25% as preservative (Ornigreat, Mankind Pharma Limited, New Delhi, India) in periodontal pockets previously treated by scaling and root planing (SRP). 20 patients (14 males and 6 females) aged 27–53 years diagnosed with chronic periodontitis and having pocket depth >5 mm were selected for the study from patients who visited the Department of Periodontics, Government Dental College and Hospital, Srinagar, Jammu and kashmir. Informed consent was obtained from all the patients. The study protocol was reviewed and approved by the Board of Ethical Committee.

Inclusion Criteria

- ✓ Patients with a pocket depth of 5–7 mm in at least three nonadjacent sites in different quadrants of the mouth.
- ✓ Systemically heathy controlls
- ✓ Cooperative patients who could be motivated for further oral hygiene instructions
- ✓ Patients with ≥20 teeth
- ✓ Patients who consented to participate in the study.

Exclusion Criteria

- ✓ Patients on antibiotic therapy from the past 1 month
- ✓ Pregnant or lactating women
- ✓ Patients smoking tobacco.

All the participants selected in the present study received supragingival scaling and were given oral hygiene instructions before the commencement of the study. Customized acrylic stents were made for the test sites where the drug was to be placed for the standardization of the clinical parameters. In this clinical trial, 20 patients (14 males, 6 females) were enrolled in the study. A total of 60 sites among the enrolled participants were selected for the study. Each patient had at least three teeth with probing pocket depth of 5–8 mm that bled on probing at the initial visit. Before starting the trial, all the patients underwent full mouth supra and subgingival scaling and root planing.[14] After isolating with cotton rolls and drying the sites, both test gels were injected into the periodontal pocket, and periodontal dressing was given. For each participant, two experimental sites were chosen that had probing depth (PD) >5 mm and were located in symmetric quadrants, and after SRP, the two sites were randomized at split‐mouth level by flip of a coin and divided into two groups:

Group I: Curcumin gel was placed into the periodontal pocket until the pocket was filled.

Group II: Ornidazole gel was applied directly from the syringe into the pocket, and 60 periodontal pockets were randomized into two groups before baseline. Recording of clinical parameters was carried at baseline and 1 month. Subgingival delivery was performed with a 2ml disposable syringe with a blunt needle bent at its shank by 130°.[15]This procedure continued until the pocket was completely filled. Care was taken to apply the gel without traumatizing or damaging the periodontal tissues. After insertion of the local drug delivery system, the region was secured with a periodontal pack, and the patients were advised not to eat hard food that could traumatize the gingiva. They were also advised not to brush the treated areas for 12 h or floss or use interproximal cleaning devices for 10 days. They were instructed not to use any mouthwash during the study. Patients were called for the removal of periodontal dressing on 7th day. The two groups were again examined on the 30th day. Clinical parameters such as plaque index, probing pocket depth, and relative attachment level were recorded by single examiner who was unaware of the treatments performed on each subject. No noted adverse reactions such as pain and discomfort were observed in any participant, and healing was uneventful.

Statistical Analysis

The data obtained was tabulated and analyzed statistically. The intragroup comparisons were made using paired *t*‐test, and intergroup comparison was done with unpaired Student's *t*‐test using SPSS 19.0 version software.

RESULTS

All the clinical parameters were evaluated at baseline and 1 month after the nonsurgical therapy. An intragroup and intergroup comparison were made using paired *t*‐test and unpaired *t*‐test. Results were statistically analyzed. Table 1 shows intragroup comparison of curcumin at baseline and 1 month using paired *t*‐test. There was a significant ($P < 0.001$) decrease in PD and CAL from 6.71 0.79 to 3.25 0.60 and 8.01 + 0.62 to 4.42 + 1.01, respectively. Table 2 shows intragroup comparison of curcumin at baseline and 1 month using paired *t*‐test. There was a significant ($P < 0.001$) decrease in PD and clinical attachment level (CAL) from 7.44 0.77 to 5.01 1.001 and 8.20 1.15 to 6.42 1.25, respectively. Table 3 shows intergroup comparison of curcumin and ornidazole at baseline and 1 months using unpaired *t*‐test. After 1 months, curcumin group showed significantly ($P < 0.001$) better reduction in PD (3.32 + 0.68), CAL (4.42 + 1.01), and plaque index (0.98 + 0.38) as compared to ornidazole group (PD [5.05 + 1.001], CAL [6.38 + 1.33], plaque index [1.58 + 0.18]).

Table 1 Curcumin group at baseline and 1 month

Parameter	Baseline	1 month	*t*	*p*
PD	6.71 ± 0.79	3.25 ± 0.60	18.9	< 0.001
CAL	8.01± 0.62	4.42 ± 1.01	6.2	< 0.001
Plaque index	2.43± 0.25	0.98± 0.35	7.55	< 0.001

Intra-group comparison. PD: Probing depth, CAL: Clinical attachment level

Table 2 Ornidazole group at baseline and 1 month

Parameter	Baseline	1 month	*t*	*p*
PD	7.44 ± 0.77	5.01 ± 1.001	19.2	< 0.001
CAL	8.20 ± 1.15	6.42 ± 1.25	7.98	< 0.001
Plaque index	2.56 ± 0.17	1.58 ± 0.18	1.86	> 0.005

PD: Probing depth, CAL: Clinical attachment level

Table 3 Comparison of curcumin and ornidazole at 1 month

Parameter	Curcumin	Ornidazole	*p*
PD	3.32 ± 0.68	5.05 ± 1.001	< 0.001
CAL	4.42 ± 1.01	6.38 ± 1.33	< 0.001
Plaque index	0.98 ± 0.38	1.58 ± 0.18	0.001

Intergroup comparison‑unpaired *t*‑test. PD: Probing depth, CAL: Clinical attachment level

DISCUSSION

Periodontitis is a chronic inflammatory disease caused by interplay between the subgingival microbiota and the host tissue response which leads to the destruction of supporting structures of teeth. The standard Western medicine has had only limited success in the prevention of periodontal disease and in the treatment of a variety of oral diseases. Hence, the search for alternative products continues, and natural phytochemicals isolated from plants used in traditional medicine are considered to be good alternatives to synthetic chemicals.[16]The concept of locally delivering chemotherapeutic agents to the periodontal pocket as a method to treat periodontal disease has been studied for over few decades. Local drug delivery systems used as an adjunct to nonsurgical therapy has drastically improved the periodontal tissue condition. Day‑to‑day advancements in this field have led to the discovery of various new pharmacological agents to be used as local drug delivery systems. Several herbal drugs have now been garnering attention in the treatment of periodontal disease.[17]

The present study aimed at comparing the clinical efficacy of two local drug delivery systems in gel forms – first, group‑containing ornidazole and other, group‑containing curcumin in periodontitis. The antimicrobial activity of ornidazole has been proposed due to the reduction of nitro group to a more reactive amine that attacks microbial DNA, inhibiting further synthesis, and causing degradation of existing DNA.[18] It was suggested that curcumin might reduce the risk of inflammatory disorders, such as cancer and ulcer. These biological effects are attributed to its anti‑inflammatory and antioxidant activities[19] might prove beneficial in periodontal therapy, and hence, this study, comparison between curcumin and ornidazole local drug delivery as an adjunct to nonsurgical therapy was done. Intragroup comparison among curcumin and ornidazole groups at baseline and 3 months showed significant decrease in PD, CAL, and plaque index. Intergroup comparison between curcumin and ornidazole group showed a greater reduction in the curcumin group compared to ornidazole group. Curcuminoids (mixture of curcumin, demethoxycurcumin, and bisdemethoxycurcumin) are considered as key active constituents of *C. longa* and are reported to possess several biological activities. Numerous lines of evidence suggested that curcuminoids are potent anti‑inflammatory agents working through multiple mechanisms, namely, suppression of the activation of nuclear factor‑kappa B, inhibition of cyclooxygenase‑2, downregulation of the expression of cell proliferation, antiapoptotic, and metastatic gene products. Curcuminoids have also demonstrated to modulate the proliferation and cellular response of various immune cell types, such as T‑cells, B‑cells, macrophages, neutrophils, natural killer cells, and dendritic cells.[20] This may be attributed to the various properties of curcumin such as anti‑inflammatory, antioxidant, antiallergic, anticarcinogenic, antimutagenic, anticoagulant, antidiabetic, antifibrotic, antiulcer, antifungal, and antibacterial. It causes shrinkage by reducing inflammatory edema and vascular engorgement of connective tissue. It promotes migration of epithelial cells to the wound area by promoting the localization of transforming growth factor‑β1 and inducing re‑epithelialization.[15] Antimicrobial properties of curcumin are likely due to its ability to inhibit bacterial lipopolysaccharide‑induced cytokine expression and bacterial quorum sensing systems.

One of the main drawbacks of this study is that microbial evaluation was not carried out. However,further studies should be done toward clinical evaluation and determination of long‑term efficacy of intrapocket application with curcumin and ornidazole on clinical parameters with larger sample and longer follow‑up periods.

CONCLUSION

Curcumin was shown to have a more profound effect on chronic periodontitis when compared to ornidazole, thus giving us a more favorable treatment outcome when used as a local drug delivery agent. However, a study on a large scale would prove conclusive.

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Conflicts of interest

Nill

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