



## Research Article

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### CURCUMIN AND METRONIDAZOLE IN PERIODONTAL THERAPY

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#### ABSTRACT

The goal of periodontal therapy is to prevent, arrest, control or eliminate periodontitis. It has been reported that scaling and root planning, when combined with local delivery system such as sub gingival medicament reduces microbes and improves clinical parameters better than scaling and root planning alone. Therefore the aim of the present study was to compare the clinical efficacy between two medicaments, delivered in gel form, one containing metronidazole and the other containing curcumin, as an adjunct to mechanotherapy. Fifteen subjects were selected, based on the inclusion and exclusion criteria of both sexes, in a split mouth design. Selected sites were randomly divided into two groups (group A -metronidazole whereas group B – curcumin) and the following clinical parameters such as gingival index (GI), modified sulcular bleeding index (mSBI), probing pocket depth (PPD) were recorded and assessed on day 0 and 30<sup>th</sup> days. When compared with metronidazole, a significant decrease in all clinical parameters was seen using curcumin. This study revealed that the experimental local drug i.e. curcumin used along with scaling and root planning is effective in reducing gingival inflammation and reducing pocket depth.

**Keywords:** Metronidazole gel, Curcumin gel and Periodontitis

#### INTRODUCTION

A periodontal disease is a general term which encompasses several pathological conditions affecting the tooth supporting structures.<sup>1</sup> Dental plaque has been proved by extensive research of Harold Loe (1965) to be a paramount factor in initiation and progression of gingival and periodontal diseases.<sup>2,3</sup> Due to which, much of the research should be directed towards a more effective and economic means of plaque control that can prevent further disease progression. Treatment of periodontal disease is routinely based on mechanical debridement of the tooth surface and appropriate and meticulous maintenance of oral hygiene. However, comprehensive mechanical debridement of sites with deep periodontal pockets is difficult to accomplish.<sup>4,5</sup> As an adjunctive approach, systemic or local administration of antibiotics is done because of the microbial aetiology of periodontitis. Various disadvantages of the systemic antibiotic therapy, like hypersensitivity reaction, organ toxicity and development of resistant bacteria, coupled with its requirement of higher dosage to attain required GCF concentration at the target site, led to the use of local drug-delivery system.<sup>4,6</sup> Among the antimicrobials used for the treatment of periodontitis, metronidazole is particularly suitable, due to its restricted spectrum of activity against obligate anaerobes<sup>7,8</sup> and its limited side effects, compared to those of tetracyclines, i.e., selection of multi resistant bacteria<sup>7,9</sup> and perturbation of the normal micro biota of the body. Hence, a need was felt of an alternative medicine that could provide a product already enmeshed within the traditional Indian setup and is also safe and economical. Turmeric, more commonly known as 'Haldi', is a rhizome of *Curcuma longa*, and may be a more acceptable and viable option for the common man. It has proven properties like anti-inflammatory,<sup>10,11</sup> antioxidant<sup>12-14</sup> and antimicrobial<sup>15,16</sup>

along with its hepatoprotective,<sup>17-22</sup> immunostimulant, antiseptic, anti mutagenic properties.<sup>23-30</sup> Due to these reasons, it was felt that promotion of turmeric in dental terrain may prove beneficial.<sup>2,31</sup> Hence; this present study was to compare the clinical efficacy between two local drug delivery systems, delivered in gel form, one containing metronidazole and the other containing curcumin, as an adjunct to mechanotherapy.

#### MATERIALS AND METHODS

Commercially available Metronidazole gel (metrogy) - each gram contains 10 mg metronidazole and Curcumin gel (curenex) - each gram contains 10 mg *Curcuma longa* extract.

#### Methods of randomisation of subjects

This study was conducted in a split mouth design on 15 subjects in each group of both sexes. Subjects were randomly selected from those attending the Department of Periodontics, A. J. Institute of Dental Sciences, Mangalore, India. Subjects were selected on the basis of the following criteria by examining the periodontium.

#### Inclusion criteria

Patients having at least 3 sites with probing pocket depth  $\geq 4$  mm and  $\leq 6$  mm; patients with moderately or severely inflamed gingiva that bleeds on probing; patients with at least 20 remaining teeth were considered.

#### Exclusion criteria

Subjects wearing removable partial dentures and undergoing orthodontic therapy; sites adjacent to recent extraction sites; teeth showing endoperio lesions, restorations and other plaque retentive factors; pregnant and lactating females; subjects taking anti-inflammatory drugs, antibiotics, immunosuppressant or oral

contraceptives since last 6 months would not be taken up for study; subjects sensitive and allergic to any medicine; tobacco users; medically compromised patients and patients having debilitating diseases.

#### Approval by ethical committee

The study protocol was reviewed by the 'Ethical Committee' of A. J. Institute of Dental Sciences.

#### Study protocol

The relevant data were recorded in a special proforma sheet. Clinical examination was done in a dental chair, under standard conditions of light, using a mouth mirror, explorer, William's graduated periodontal probe and tweezers; and assessment of clinical parameters was carried out. Selected sites were randomly divided into two groups which were treated using split-mouth design and clinical parameters were recorded. Group A- 15 subjects were treated with scaling and root planning followed by placement of experimental material (metronidazole). Group B - 15 subjects were treated with scaling and root planning followed by placement of experimental material (curcumin).

#### Recording of clinical parameters

The following clinical parameters were recorded for all subjects at baseline and at 30<sup>th</sup> day: -Modified sulcular

bleeding index (mSBI - Mombelli et al 1987), gingival index (GI - Loe and Silness 1963) was scored, periodontal pocket (probing pocket depth-PPD) was measured using Williams Periodontal Probe.

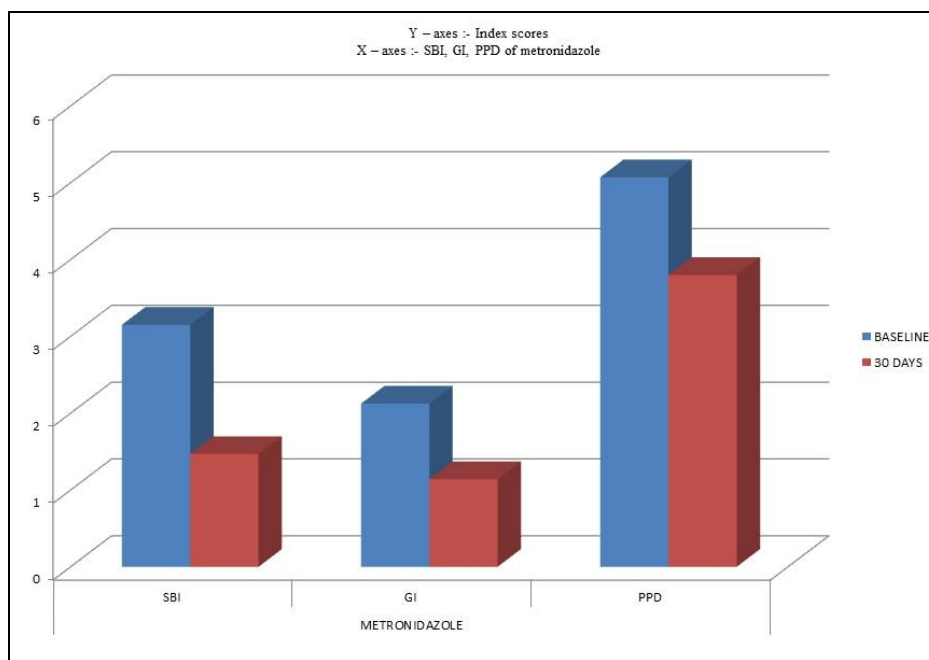
#### Mode of Local Drug Delivery

On completion of scaling and root planning, each group was isolated with cotton rolls to prevent contamination from saliva. A 2 ml disposable syringe equipped with a blunted 25 gauge needle, which was bent along its shank at an approximately 130° were used. The pocket opening was covered with Coe-pack to retain the material in the pocket as well as to prevent ingress of oral fluids. Subjects were recalled after 7 days for removal of the periodontal dressing. Recall visits were again scheduled after 30 days of placement of experimental drug for measuring the clinical parameters.

#### Data Analysis

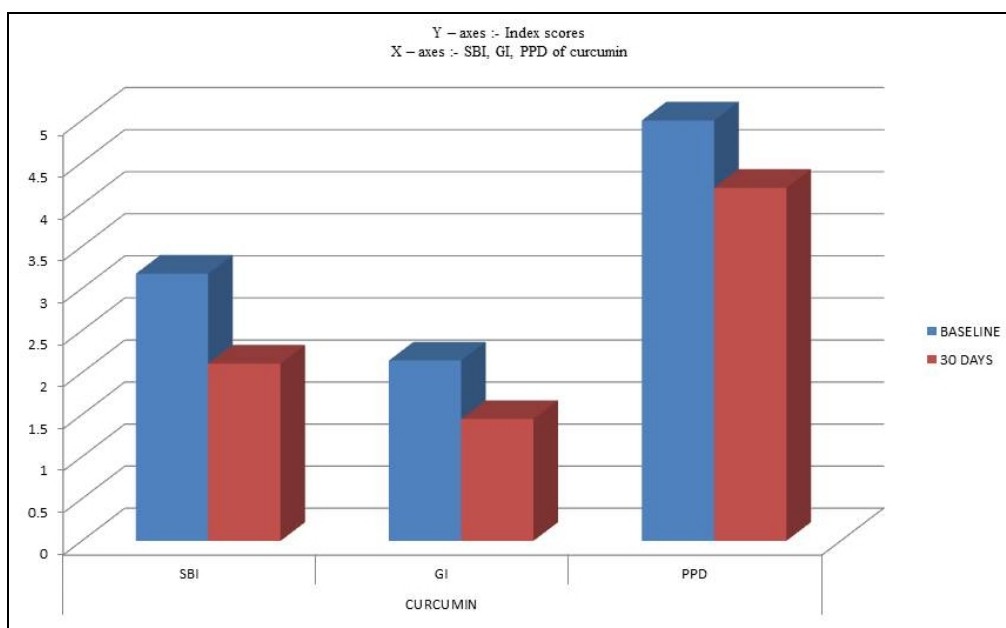
The data was tabulated in Microsoft excel and analysed using SPSS version 16. Comparison of the baseline and the 30 day values in each group separately were analysed using Paired t Test. (Intra group). Comparison of the differences from baseline to 30<sup>th</sup> day between the two groups was analysed using Unpaired t Test. (Inter group). The level of significant was set to  $p < 0.05$ .

#### Comparison of the baseline and the 30 day values in each group separately: paired t test (graph 1 and 2)



Graph 1: Metronidazole group

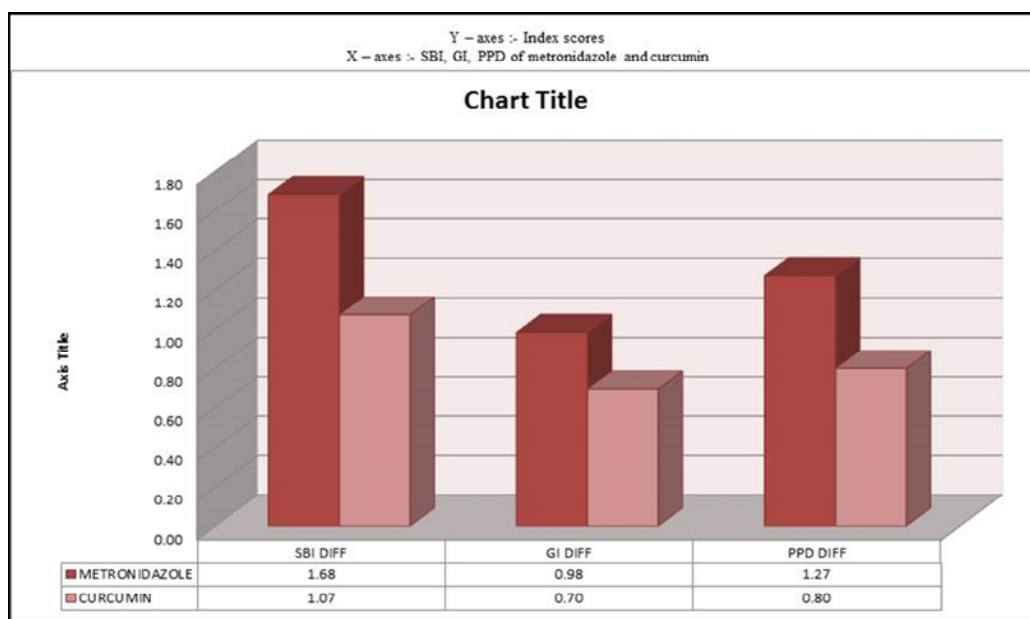
Graph 1 showed that in group-A (metronidazole), there was significant reduction in all clinical parameters i.e., sulcular bleeding index, gingival index and pocket probing depth from the baseline to 30<sup>th</sup> day.



Graph 2: Curcumin group

Graph 2 showed that in group-B (curcumin), there was significant reduction in all clinical parameters i.e., SBI, GI and PPD from the baseline to 30<sup>th</sup> day. However, greater reductions were observed in group – B in comparison with group – A as seen in graph 3.

Graph 3: Comparison of the differences between the two groups from baseline to 30<sup>th</sup> day: Unpaired t test



Graph 3: Metronidazole and Curcumin comparison from baseline to 30<sup>th</sup> day

Graph 3 reveals that there is significant reduction in group B (curcumin) in all clinical parameters when compared to group A (metronidazole).

## DISCUSSION

Advances in understanding the aetiology and pathogenesis have led to the development and subsequent acceptance of the use of pharmacological agents in the management of periodontal diseases. Local drug delivery systems have the ability to deliver the antibiotic to the target sites, achieve a sufficient concentration, and last for a sufficient duration to be effective.<sup>32</sup> Hence this present study was to compare the clinical efficacy between two local drug delivery systems, delivered in gel form, one containing metronidazole and other containing curcumin. Among the antibiotics that have been considered for periodontal treatment, Metronidazole has often been chosen because of its selective efficacy against obligate anaerobes. It acts by inhibiting DNA synthesis. It is known to convert into a reactive reduced form and affects specifically anaerobic rods and spirochetes in sub gingival microflora.<sup>1</sup> In this study, group A (metronidazole), gingival scores reduction was observed and it found to be reduced from 2.123733 to 1.1416 and there was significant reduction in pocket probing depth as well. These results were attributed to its following antibacterial properties through the following mechanism this reduction in inflammation and presence of healing in the connective tissue subjacent to the junctional epithelium is the primary reason for reducing the depth of periodontal probe penetration after treatment. Metronidazole follows first order kinetics i.e., gel provides increased drug concentration for 24 h after which it subsequently decreases rapidly at a rate directly proportional to their pocket concentration.<sup>33</sup> Whereas in curcumin group, gingival scores reduction was observed from 2.145267 to 1.4496 ( $p < 0.001$ ). These results were attributed to its following anti-inflammatory and wound healing properties it reduces the inflammatory mediators generated via arachidonic acid pathway and causes shrinkage by reducing inflammatory oedema and vascular engorgement of connective tissue. It also promotes migration of various cells including fibroblasts in wound bed and thus results in reduction of vascularization by bringing about fibrosis of connective tissue. It also promotes migration of epithelial cells to wounded sites by promoting localization of TGF- $\beta$ 1 thus helping in re-epithelization.<sup>4,34</sup> Trend for reduction in pocket depth by curcumin can be due to the ability of enhancing regeneration after traumatic injury as demonstrated in this present study and which is in accordance with the study conducted by sidhu *et al* (in an *in vivo* experiment on rats and guinea pigs)<sup>35</sup> as well as in a study conducted by gopinath *et al*.<sup>36</sup> However based on the clinical parameters, on comparison between both the groups, curcumin proved to be statistically better than metronidazole. It is clear from the above results that the experimental local drug i.e. curcumin used along with scaling and root planning is effective in reducing gingival inflammation and reducing pocket depth. It also controls the localized infection and prevents new lesion formation. 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 into the pocket. It is also biologically accepted without any side effects.

## Limitations

The limitation of this study was that microbial analysis was not carried out and long term study should be carried out to further strengthen these claims.

## CONCLUSION

In spite of all these limitations, curcumin showed better results in all clinical parameters. In this investigation, we introduced curcumin, as a local drug delivery to reduce inflammatory gingival signs and promote better healing with reduced pocket depth and demonstrated its superior efficacy when compared to widely used medicament i.e. Metronidazole.

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