American Journal of Oral Medicine and Radiology

ISSN - 2394-7721

www.mcmed.us/journal/ajomr

Case Report

CURCUMIN: A NEOTERIC APPROACH FOR PERIODONTAL REGENERATION: A CASE REPORT

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ABSTRACT

Introduction: Successful regeneration of the lost tissues is a major goal and challenge in periodontal therapy. The rationale behind the use of bone grafts or alloplastic materials is the assumption that both favor regrowth of alveolar bone and also the formation of new attachment would be stimulated. The recent approaches are directed towards a herbal bone graft material that is expected to regenerate bone with minimal complications. Turmeric has been used in Indian systems of medicine for a long time. The most active component of turmeric is curcumin, which makes up 2–5% of the spice. Curcumin (diferuloylmethane), the main yellow bioactive component of turmeric has been shown to have anti-inflammatory, antioxidant, antiallergic, anticarcinogenic, antimutagenic, anticoagulant, antifertility, antidiabetic, antibacterial, antifungal, antiprotozoal, antiviral, antifibrotic, antivenom, antiulcer, enhancer of healing, myogenesis, hypotensive, hypocholesteremic activities. Recent studies have shown that curcumin leads to significant reduction in bleeding on probing, probing pocket depth and gain in the clinical attachment level when used as a local drug delivery and subgingival irrigant. Further, curcumin has also demonstrated as a potential osteogenic material. Based on the above findings, we will discuss the characteristics of curcumin as well as report a few cases done in the department to evaluate the regenerative potential of curcumin in periodontal intra bony defects. Materials and Methods: A 34year old female patient reported to the Department of Periodontology, with a chief complaint of mobile tooth in relation to the distal aspect of 11 with grade II mobility in her upper front tooth region since 4 months. The oral hygiene status was fair. On intra oral examination, a periodontal pocket measuring 8mm in depth was found. Flap surgery was performed IRT 11,12 and curcumin gel was placed as a bone regenerative material and follow up done for 1,3, 6 and 9 months.
Curcumin showed better results when used as a regenerative material and showed reduction in clinical variables namely probing pocket depth and clinical attachment level.

Key words:- Curcumin, Intra bony defects, Probing depth.

Access this article online	
Home page: http://www.mcmed.us/journal/ajomr DOI: http://dx.doi.org/10.21276/ajomr.2018.5.1.3	**Quick Response code**

Received:05.02.18	**Revised**:12.02.18	**Accepted**:22.02.18

INTRODUCTION

Successful regeneration of the lost tissues is a major goal and challenge in periodontal therapy. The rationale behind the use of bone grafts or alloplastic materials is the assumption that both favor

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regrowth of alveolar bone and the formation of new attachment would be stimulated. The recent approaches are directed towards a herbal bone graft material that is expected to regenerate bone with minimal complications.

Phytochemicals are considered to be safe with minimal toxicity and is thus finding increasing use as supplements and even in treatments either alone or in combination with conventional drugs. Curcumin (diferuloyl methane), a polyphenolic phytochemical, is a primary component of the dietary spice turmeric (Curcuma longa). It is the principal alkaloid of turmeric and the pharmacological activity of curcumin is largely attributed to this compound [1].

Curcumin (diferuloylmethane), the main yellow bioactive component of turmeric has been shown in the literature to have a wide spectrum of biological actions. These include its antiinflammatory, antioxidant, antiallergic, anticarcinogenic, antimutagenic, anticoagulant, antifertility, antidiabetic, antibacterial, antifungal, antiprotozoal, antiviral, antifibrotic, antivenom, antiulcer, enhancer of healing, myogenesis, hypotensive, hypocholesteremic activities[2]. Clinical trials indicate that human beings can tolerate a dose as high as 8 g/day with no side effects. Owing to their wide ranging pharmacological activities, plant extracts and phytochemicals such as curcumin could be utilized in regenerative medicine although only few such attempts have been reported[3].

Recent studies have shown that curcumin leads to significant reduction in bleeding on probing, probing pocket depth and gain in the clinical attachment level when used as a local drug delivery and subgingival irrigant. Further, curcumin has also demonstrated potential as an osteogenic material.

Based on the above findings, we will discuss the characteristics of Curcumin as well as a case report done in the department to evaluate the regenerative potential of curcumin in human periodontal intra bony defects.

MATERIALS AND METHODS

Cytotoxicity studies done using UMR-106 cells:

The sample did not show any level of inhibition of growth of UMR-106 cells even at a higher concentration of 16 µg/ml. Based on these result, a concentration of 10 µg/ml was selected for gel formulation.

Preparation of Gel:

Includes curcumin (10µg/ml), polyethlyenglycol (1%), and agarose (1.0%) are solubilized, mixed, and autoclaved and refrigerated.

Case report:

A 34 year old female patient reported to the Department of Periodontology, Rajarajeswari Dental College and Hospital, Bangalore with a chief complaint of loose tooth in her upper right front tooth region since 4 months. Regarding patient's medical history nothing significant was reported. The oral hygiene status was good. On intra oral examination, a periodontal pocket measuring 8 mm in depth was found in relation to the distal aspect of maxillary right central incisor with grade II mobility. Pre-surgical therapy included patient education and motivation, scaling and root planing with plaque control instructions. Treatment protocol included open flap debridement along with the placement of curcumin. The procedure was explained to the patient and written informed consent was obtained. The surgical procedure was approved by ethical committee of Rajarajeswari Dental College and Hospital, Bangalore. After obtaining adequate anaesthesia, full thickness flap was elevated by giving intra sulcular incision followed by interdental incision. After flap reflection and thorough debridement, presuturing was done and curcumin gel was placed in the intrabony defect and flaps were closed by giving sutures**.**

RESULTS:

The patient showed good compliance and satisfactory oral hygiene maintenance during the course of observation period. The healing was uneventful, without any signs of infections and complications, indicating biocompatibility of use of auto tooth as graft material.

Clinical re-evaluation at 9 months after the periodontal surgery revealed PPD of 6 mm and CAL of 3 mm with no signs of bleeding on probing and reduction in tooth mobility. Digital radiographic re-evaluations were performed at 3 months, 6 months and 9 months post-operatively. Although there was a significant reduction in probing pocket depth and bone fill which was appreciated 9 months post-operative, further randomized control trails are to be implemented with larger sample size to evaluate the regenerative potential of curcumin.

Figure 1. Curcumin Gel

Figure 2. Clinical Photographs

Pre-Operative

Debridement

Placement of Curcumin

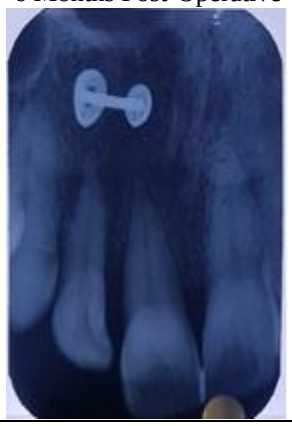
FIGURE 3: Radiographic Photographs From Baseline To 9 Months Postoperative

Pre-Operative

1 Month Post-operative

3 Months Post-operative

6 Months Post-Operative



9 Months Post-operative

DISCUSSION

Bone is one of the most widely transplanted tissues of the human body. Bone grafts are the standard clinical practice but their limitations have led to increased research in developing novel strategies for bone tissue regeneration [4]. Bone remodeling is a synchronized processes that is maintained by the osteoblasts and osteoclasts. Several proteins are involved in signaling for bone remodeling [5]. It is possible that the phytopolyphenols, such as curcumin [9], Quercetin and Genistein are present in food shows protective effect against osteoclastic activity.

Curcumin has been widely studied throughout literature for its anti-inflammatory, anti-oxidant, antibacterial and wound healing properties. However; its application in dentistry has been reported only in the last

decade. Recent studies have shown that curcumin leads to significant reduction in bleeding on probing, probing pocket depth and gain in the clinical attachment level when used as a local drug delivery and subgingival irrigant. Further, curcumin has also demonstrated as an potential osteogenic material [6].

A study was done by Merline K. Varghese et al compare the clinical efficacy between two medicaments, delivered in gel form, one containing metronidazole and the other containing curcumin, as an adjunct to mechanotherapy. When compared with metronidazole, a significant decrease in all clinical parameters were noted. Curcumin used along with scaling and root planing is effective in reducing gingival inflammation and reducing pocket depth [7].

In a recent research by Suhag *et al.*, periodontal sites were treated on day 0 (baseline) by a single episode of scaling and root planing. Subsequently selected sites were irrigated (triple irrigation regimen) with either saline (0.9%), chlorhexidine (0.2%), curcumin (1%) The results indicated that the irrigated sites had significant improvement in all parameters as compared with the nonirrigated sites. The curcumin group showed significant reduction in BOP (100%) and redness (96%) when compared with the chlorhexidine group and saline group on day 5 [8].

In a recent study done by Shubham Jain et al in 2016 aimed to engineer curcumin eluting tissue scaffolds and investigate their potential use in bone tissue regeneration. Curcumin loaded nanofibers were prepared by electrospinning at 1 and 5 wt%. The study confirmed the sustained release of curcumin from the nanofibers which significantly enhanced osteogenesis. This study demonstrates that sustained release of curcumin at moderate level can offer significant benefits for bone tissue engineering [6].

Another study done by Bharti a c et al stated that curcumin inhibits NF-κβ (transcription factor nuclear factor kappa β) and its ligand RANKL. NF-κβ is involved in impaired bone formation in osteoporosis and also inhibits the differentiation and mineralization of mature osteoblasts. Inhibiting NF-κβ results in stimulating the differentiation and mineralization of primary murine bone marrow stromal cells and pre-osteoblasts. Thus, curcumin through its interaction with NF-κβ can enhance osteogenesis [9].

An additional benefit of sustained release of curcumin from the scaffolds is its well reported bactericidal activity. Bacterial colonization of an implant leading to infections and resultant complications such as inflammation, pain, rejection of the implant and repeat surgeries is well known. It is envisaged that the release of curcumin may minimize such outcomes in addition to enhanced tissue regeneration after implantation of the scaffold [10].

Observation: Curcumin showed a better result when used as a regenerative material and reduction in clinical variables namely probing pocket depth and clinical attachment level.

Conflict of interest: None

Acknowledgements: We sincerely thank Skanda life sciences, Bangalore, India for their help in the preparation of curcumin gel and cytotoxic study which was carried out at their laboratory.

SOURCE OF FUNDING: None

CONFLICT OF INTEREST: None

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Cite this article:
Krishna Kripal, Prathush Ajit Kumar, Samba Siva Reddy, Sushma Reddy Bhavanam, Rekha BM, Kavita Chandrasekaran. Curcumin: A Neoteric Approach For Periodontal Regeneration: A Case Report. 5(1), 2018, 11-15.
DOI: http://dx.doi.org/10.21276/ajomr.2018.5.1.3