Dental Research Journal

Original Article

Efficacy of topical *curcuma longa* in the healing of extraction sockets: A split-mouth clinical trial

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Received: 19-May-2023
Revised: 12-Jul-2023
Accepted: 20-Jul-2023
Published: 26-Oct-2023

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ABSTRACT

Background: The healing process after dental extraction is influenced by various factors, and finding effective strategies for promoting wound healing and reducing postoperative discomfort remains a challenge. This study aimed to evaluate the effectiveness of topical *Curcuma longa* gel in reducing pain and promoting wound healing after dental extraction, with the secondary objective of assessing the occurrence of dry sockets. The study was a split-mouth randomized controlled trial conducted at the oral and maxillofacial surgery department over 3 months.

Materials and Methods: This split-mouth randomized controlled trial consisted of a total of 21 patients undergoing bilateral extractions. One extraction socket was randomly assigned to the test group, where *Curcuma. longa* gel was applied, while the contralateral socket served as the control group, receiving a placebo. Pain and wound healing were evaluated using standardized scales on the 3rd and 7th days postextraction. Descriptive statistics, paired *t*-tests, and unpaired *t*-tests were performed using the SPSS software version 19. The statistical significance was fixed at $P \leq 0.05$.

Results: The test group showed significantly higher mean healing scores on the 3rd and 7th days compared to the control group. On the 7th day, the test group had significantly lower mean pain scores than the control group. No cases of dry sockets were observed in either group.

Conclusion: Topical Curcuma longa gel demonstrated positive effects in promoting wound healing and reducing pain after dental extraction. Clinicians should consider the use of Curcuma longa gel as a post-extraction medicament, particularly in cases involving multiple or traumatic extractions.

Key Words: Curcuma, oral surgical procedures, tooth extraction, wound healing

INTRODUCTION

The healing process of a surgical site after dental extraction is influenced by multiple factors, including host response, oral microbiota, extraction technique, smoking, systemic health conditions, and oral hygiene.[1] Dental extractions can result in damage to the bone and soft tissue, negatively impacting the patient's quality of life and often leading to complications such as bleeding, pain, swelling, trismus, and infections.[2] Although antibiotics and analgesics are routinely prescribed post-extraction, patients still frequently report discomfort during the recovery period. Researchers have explored various strategies and medications to reduce this postoperative discomfort, to find a simple yet effective method for providing an uneventful healing period.

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Website: www.drj.ir
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www.ncbi.nlm.nih.gov/pmc/journals/1480

How to cite this article: Pandya K, Abbinayah D, Selvakumar D, Jayakumar N. Efficacy of topical *Curcuma longa* in the healing of extraction sockets: A split-mouth clinical trial. Dent Res J 2023;20:110.

One commonly available herb that has been investigated for its healing properties is turmeric (*Curcuma longa*), which contains a beneficial component called curcumin (diferuloylmethane). Curcumin has been found to possess anti-inflammatory, antimicrobial, anticarcinogenic, antimutagenic, antifibrotic, and antiaging properties.[3] Systemic *C. longa* extracts have been extensively studied in a variety of clinical conditions such as osteoarthritis, diabetes mellitus, and radiation dermatitis.[4] Curcumin has also been used orally and topically to treat oral diseases.[5] A triple-blinded randomized controlled trial demonstrated a reduction in plaque index and disease activity in patients with chronic periodontitis who were administered a mouthwash of essential oils and curcumin.[6] Systemic and topical turmeric has also shown benefits in oral submucous fibrosis by decreasing the burning sensation and increasing the mouth opening.[7]

Mitic *et al*. evaluated the role of topical curcumin in the healing extraction socket of rats through biochemical assays and histopathological examination. They reported a decrease in myeloperoxidase and nitric oxide activity, which are inflammatory biomarkers. The same study also found a significant reduction in inflammatory cells and increased collagen production at the microscopic level, indicating the positive effects of topical curcumin in extraction wound healing.[8] Lone *et al.*, in their randomized controlled trial, displayed a positive effect of turmeric in reducing pain and promoting healing for the management of dry sockets.[4] Although studies have demonstrated the beneficial healing potential of oral systemic curcumin for various dental conditions, including postoperative management following third molar surgery,[9] there is limited evidence testing the effects of topical *C. longa* in the management of pain and healing after routine dental extractions.

In this split-mouth randomized controlled trial, the primary aim was to evaluate the effectiveness of *C. longa* gel in reducing pain and promoting wound healing after dental extraction. The study's secondary objective was to assess the occurrence of dry sockets in patients treated with *C. longa* gel. The authors posited that the topical use of *C. longa* would decrease pain and inflammation due to its anti-inflammatory properties.

MATERIALS AND METHODS

This study was a split-mouth randomized controlled trial conducted at the oral and maxillofacial surgery department over 3 months. The Institutional Ethics Committee approval (REF: IEC/20/FEB/157/17) and informed consent from all participants were obtained before the study. Clinical trial approval was also obtained and registered (Clinical trial registration no: CTRI/2021/05/033886).

Selection criteria

A total of 21 patients with bilateral extractions, excluding central and lateral incisors, were included in the trial, resulting in 42 extraction sites. The sample size was calculated as 25 per group. Patients with periapical pathology on a radiograph, pregnant and lactating women, those taking antibiotics or analgesics/anti-inflammatory drugs in the past 14 days, and those with a known allergy to *C. longa* were excluded.

Procedure

Patients with bilateral extractions meeting the criteria were included in the study. Written informed consent was obtained, and bilateral extractions were performed after administering local anesthesia using 2% lidocaine HCl with 1:200,000 epinephrine under aseptic precautions. All extractions were performed by a single oral and maxillofacial surgeon. Bilateral extraction sites were randomly assigned to two groups using a simple randomization technique through a lottery method. The test group had the extraction socket packed with gel foam coated with *C. longa* gel (Curenext Oral Gel by Abbott Healthcare Pvt., India), while the contralateral socket (control) was packed with plain gel foam as a placebo. Patients were prescribed diclofenac 50 mg and amoxicillin 500 mg 8 hourly for 3 days postextraction and were instructed to avoid other medications during the study. Follow-up evaluations were scheduled on the 3rd and 7th day.

Outcome measurements

Patients were evaluated on postoperative days 3 and 7 to assess pain, wound healing, and complications. The pain was evaluated using the Numerical Pain Scale, which measures pain on a scale from 0 to 10, with 0 indicating no pain and 10 indicating the worst possible pain. Wound healing was evaluated using a scale provided by Landry *et al.*[10] [Table 1], which estimates healing with five levels of scores evaluated using four parameters: tissue color, response to palpation, granulation tissue, and incision margins. A single investigator performed all the clinical

examinations and was blinded to the test and control side.

Statistical analysis

Statistical analysis was performed using the SPSS software version 19. Descriptive statistics were employed to estimate mean, standard deviation, and percentages. Both the outcomes of pain and healing were assessed on Likert scales. Since the Likert scale can be treated as continuous data, parametric tests were employed. The paired *t*-test was employed to assess the changes in the outcomes on the 3rd and 7th days within each group. The unpaired *t*-test was used to compare the outcomes between the study and the control groups. The statistical significance was fixed at $P \leq 0.05$.

RESULTS

The study enrolled 21 participants with 42 extraction sites, of which 62% were female and 38% were male, with a mean age of 56 years. The mean pain scores and mean healing scores were calculated for the test and control groups on the 3rd and 7th days. Both groups showed an overall improvement in pain and healing, with lower mean pain scores on day 7 compared to day 3 and higher mean healing scores on both days [Table 2]. The mean healing scores were significantly higher in the test group than in the control group on the 3rd (3.52 vs. 2.86; *P*: 0.036) and 7th days (4.32 vs. 3.62; *P*: 0.018). On day 7, the mean pain scores were significantly lower in the test group compared to the control group (0.8 vs. 1.7; *P*: 0.05) [Table 3]. No cases of dry sockets were observed in either group.

DISCUSSION

C. longa L. or turmeric or "Indian Saffron," a plant belonging to the ginger family, is known for its medicinal properties with a history dating to nearly 4000 years. It has gained recent attention in modern medicine, reflected by more than 3000 publications in the past 25 years. Turmeric contains three curcuma longaoids: *C. longa*, demethoxycurcuma longa, and bisdemethoxycurcuma longa.[11] *In vitro* studies have proven that *C. longa* is a potent anti-inflammatory, antioxidant, antimutagenic, anticarcinogenic, and antimicrobial.[12] This antioxidant property is essential for wound healing as the presence of reactive oxygen species for a longer duration is known to retard the healing process.[8] Several mechanisms have been proposed for the anti-inflammatory actions of *C. longa*, one of them being downregulation of NF-κB. Numerous studies have investigated the anti-inflammatory role of *C. longa* in diseases such as arthritis, Alzheimer's, and metabolic syndromes.

The current study evaluated pain and wound healing in extraction sockets treated with *C. longa* gel compared to the placebo-treated contralateral socket. Both pain and wound healing are affected by multiple variables; of which the individual patient response is one of the important factors.[13] To eliminate these patient-dependent confounders, the authors selected a split-mouth design for the study. Since the teeth along the midline receive innervations from both the right and left sides, central and lateral incisors were excluded from the study to facilitate a clear distinction between right and left extraction-site pains.

The process of healing that follows an extraction of teeth includes inflammation, cell proliferation, matrix deposition, and remodeling. During the initial phase of healing, the inflammatory mediators are primarily responsible for the pain and discomfort.[2] *C. longa* with its anti-inflammatory properties, may aid in reducing these symptoms. Oral *C. longa* has low bioavailability due to extensive first-pass metabolism.[12] Thus, topical *C. longa* was deployed in this study.

On day 3 and day 7 after the extraction procedure, the mean healing scores were higher and statistically significant on the side that received *C. longa* dressing

Table 1: The inflammation scoring system suggested by Landry, Turnbull, and Howley

Healing index	Tissue color	Response to palpation	Granulation tissue	Incision margins
Very poor 1	≥50% of gingiva red	Bleeding	Present	Nonepithelized, with loss of epithelium beyond the incision margin
Poor 2	≥50% of gingiva red	Bleeding	Present	Nonepithelized, with connective tissue exposed
Good 3	≥25% and<50% of gingiva red	No bleeding	None	No connective tissue exposed
Very good 4	<25% of gingiva red	No bleeding	None	No connective tissue exposed
Excellent 5	All tissue pink	No bleeding	None	No connective tissue exposed

Table 2: Within-group comparison of healing scores and pain scores

Test/Control	Mean	SD	*t*	*P*
Test group				
3rd healing	3.52	1.078	4.315	0.001*
7th healing	4.38	1.024		
3rd pain	1.86	2.151	3.990	0.001*
7th pain	0.81	1.209		
Control group				
3rd healing	2.86	0.910	3.927	0.001*
7th healing	3.62	0.973		
3rd pain	2.86	2.670	2.116	0.047*
7th pain	1.71	2.148		

Paired *t*-test, statistically significant at $P \leq 0.05$. SD: Standard deviation

Table 3: Between-group comparison of healing scores and pain scores in the test and control groups

Group	Mean	SD	*t*	*P*
3rd healing				
Test group	3.52	1.078	2.165	0.036*
Control group	2.86	0.910		
7th healing				
Test group	4.38	1.024	2.472	0.018*
Control group	3.62	0.973		
3rd pain				
Test group	1.86	2.151	1.336	0.189
Control group	2.86	2.670		
7th pain				
Test group	0.81	1.209	1.682	0.05*
Control group	1.71	2.148		

Unpaired *t*-test, statistically significant at $P \leq 0.05$. SD: Standard deviation

than the control sides. Nagasri *et al*., in their study, found similar healing benefits of *C. longa* in patients with chronic periodontitis.[11] Some studies evaluating the role of *C. longa* in gingivitis and periodontitis demonstrate the potential of *C. longa* in accelerating wound healing.[14] A recent study by Lone *et al*. demonstrated that *C. longa* is more effective in managing pain and inflammation associated with dry sockets than zinc oxide eugenol dressing.[5] However, no split-mouth studies are evaluating the healing of extraction sockets after *C. longa* application. This healing potential of *C. longa* can be attributed to many factors. Various studies have proven that *C. longa* increases regeneration of the epithelium, promotes fibroblast proliferation, and enhances vascular density.[3] Recent evidence also implicates the role of *C. longa* in wound contraction and tissue remodeling. Due to its anti-inflammatory potential, it decreases edema and vascular engorgement of oral tissues.[15-17]

Less pain intensity was reported on the *C. longa* side than on the placebo side. Our findings were similar to the study by Maulina *et al*. The randomized controlled trial by Maulina *et al*. included 90 participants, divided into two groups; one of which consumed mefenamic acid and the other consumed oral curcumin capsules. The curcumin group had significantly less postoperative pain compared to the mefenamic group, concluding systemic curcumin to have a significant role in reducing acute inflammation following extraction.[9]

A few limitations need to be considered while interpreting the current study's findings. An absolute patient blinding may have been compromised due to the difference in the color of the dressings on the test and control sides. Studies with larger sample sizes are required to further potentiate this evidence.

CONCLUSION

- The primary and secondary objectives were accomplished in the current study
- Clinicians must explore topical *C. longa* gel as a post-extraction medicament, especially in cases of multiple and traumatic extractions
- Studies with more robust sample sizes and multicenter trials must be encouraged further to establish the role of *C. longa* as a post-extraction medicament.

Financial support and sponsorship
Nil.

Conflicts of interest
The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or non-financial, in this article.

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