

Evaluating Use of Curcumin with Antioxidants in Oral Submucous Fibrosis. A Clinical Study

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Cite this paper as: Dr. Ravindra Singh Narwariya, Dr. Mayank Kumar, Dr. Abhijit Baroi, Dr. Sonali Saluja, Dr. Sumit Dixit, Dr. Vidhi Jain, (2025) Evaluating Use of Curcumin with Antioxidants in Oral Submucous Fibrosis. A Clinical Study. *Journal of Neonatal Surgery*, 14 (5s), 467-471.

ABSTRACT

Background: Oral Submucous Fibrosis (OSMF) is a chronic, progressive, and potentially malignant disorder characterized by fibrosis of the oral mucosa, leading to restricted mouth opening and burning sensations. Curcumin, a bioactive compound derived from turmeric, exhibits anti-inflammatory and antifibrotic properties. This study evaluates the effectiveness of curcumin combined with antioxidants in managing OSMF symptoms and improving mouth opening.

Materials and Methods: A randomized clinical study was conducted on 60 patients diagnosed with OSMF. Participants were divided into two groups: Group A (n=30) received curcumin (300 mg/day) with antioxidants, while Group B (n=30) received only antioxidants. The treatment duration was 12 weeks, and assessments were conducted at baseline, 6 weeks, and 12 weeks. Parameters evaluated included mouth opening (measured in mm), burning sensation (assessed using a Visual Analog Scale), and mucosal flexibility. Data were statistically analyzed using paired and unpaired t-tests.

Results: At the end of 12 weeks, Group A showed a significant improvement in mouth opening (increase of 5.2 ± 1.3 mm) compared to Group B (2.8 ± 0.9 mm). Burning sensation scores reduced significantly in Group A (from 7.2 ± 1.1 to 2.3 ± 0.9) compared to Group B (from 7.0 ± 1.0 to 4.6 ± 1.2). Additionally, mucosal flexibility improved in 80% of patients in Group A versus 50% in Group B. The differences between groups were statistically significant ($p < 0.05$).

Conclusion: The findings suggest that curcumin, when combined with antioxidants, significantly enhances mouth opening, reduces burning sensation, and improves mucosal flexibility in OSMF patients compared to antioxidants alone. Curcumin's anti-inflammatory and antifibrotic properties make it a promising adjunctive therapy for OSMF management. Further large-scale studies are warranted to confirm these findings.

Keywords: Curcumin, Oral Submucous Fibrosis, Antioxidants, Mouth Opening, Burning Sensation, Fibrosis Management.

1. INTRODUCTION

Oral Submucous Fibrosis (OSMF) is a chronic, progressive disorder affecting the oral mucosa, primarily associated with areca nut chewing. It is characterized by epithelial atrophy, excessive collagen deposition, and fibrosis, leading to reduced mouth opening and a burning sensation (1). The condition is recognized as a potentially malignant disorder due to its risk of malignant transformation into oral squamous cell carcinoma (2). Despite various treatment modalities, including corticosteroids, hyaluronidase, and physiotherapy, the management of OSMF remains challenging, with limited therapeutic success in reversing fibrosis (3).

Curcumin, a polyphenol derived from *Curcuma longa*, has demonstrated anti-inflammatory, antifibrotic, and antioxidant properties in various clinical and experimental studies (4,5). It modulates key molecular pathways involved in fibrosis, including downregulation of transforming growth factor-beta (TGF- β) and inhibition of pro-inflammatory cytokines (6). The adjunct use of antioxidants, such as vitamin C and vitamin E, may further enhance the therapeutic effect by reducing oxidative

stress, which plays a crucial role in OSMF pathogenesis (7).

Several studies have suggested that curcumin, either alone or in combination with antioxidants, can improve clinical symptoms of OSMF, including increased mouth opening and reduced burning sensation (8,9). However, the available evidence remains inconclusive, necessitating further clinical trials to establish its efficacy. This study aims to evaluate the effectiveness of curcumin combined with antioxidants in improving mouth opening and alleviating symptoms in OSMF patients.

2. MATERIALS AND METHODS

Study Design and Participants

This randomized clinical study was conducted on 60 patients diagnosed with oral submucous fibrosis (OSMF). The participants were selected from the outpatient department based on predefined inclusion and exclusion criteria. Ethical clearance was obtained from the institutional review board, and informed consent was taken from all participants before enrollment.

Inclusion and Exclusion Criteria

Inclusion criteria:

- Patients diagnosed with clinically and histopathologically confirmed OSMF.
- Individuals aged between 18 and 50 years.
- Patients with no history of previous medical or surgical treatment for OSMF.

Exclusion criteria:

- Patients with a history of malignancy, systemic diseases, or chronic inflammatory conditions.
- Individuals undergoing any other concurrent therapy for OSMF.
- Patients with allergies to curcumin or antioxidants.

Study Groups and Intervention

Participants were randomly assigned into two groups using a computer-generated randomization technique:

- Group A (Test Group, n=30): Received curcumin (300 mg/day) along with antioxidants (vitamin C and vitamin E).
- Group B (Control Group, n=30): Received only antioxidants (vitamin C and vitamin E).

The treatment was administered for 12 weeks, with regular follow-up assessments at baseline, 6 weeks, and 12 weeks.

Clinical Evaluation and Outcome Measures

The primary outcome measure was an improvement in maximum mouth opening, recorded in millimeters using a digital vernier caliper. The secondary outcome measures included a reduction in burning sensation, assessed using a Visual Analog Scale (VAS), and changes in mucosal flexibility. Data collection was carried out by a trained investigator who was blinded to the group allocations.

Statistical Analysis

The collected data were analyzed using SPSS software (version 26). A paired *t*-test was used to compare pre- and post-treatment values within groups, while an independent *t*-test was employed for intergroup comparisons. A *p*-value <0.05 was considered statistically significant.

3. RESULTS

Patient Demographics

A total of 60 patients were enrolled in the study, with 30 participants in each group. The mean age of participants in Group A (Curcumin + Antioxidants) was 35.4 ± 6.2 years, while in Group B (Antioxidants only), it was 34.8 ± 5.9 years. The male-to-female ratio was 2:1 in both groups.

Changes in Mouth Opening

At baseline, the mean mouth opening in Group A was 28.5 ± 3.2 mm, which improved to 32.8 ± 3.1 mm at 6 weeks and further increased to 35.2 ± 2.9 mm at 12 weeks. In Group B, the mean mouth opening at baseline was 28.2 ± 3.5 mm, which increased to 30.1 ± 3.3 mm at 6 weeks and 31.5 ± 3.2 mm at 12 weeks. The intergroup comparison showed a statistically significant improvement in mouth opening in Group A compared to Group B ($p < 0.05$) (Table 1).

Reduction in Burning Sensation

The mean Visual Analog Scale (VAS) score for burning sensation in Group A was 7.2 ± 1.1 at baseline, which reduced to 4.5 ± 1.0 at 6 weeks and further declined to 2.3 ± 0.9 at 12 weeks. In Group B, the VAS score decreased from 7.0 ± 1.0 at baseline to 5.8 ± 1.1 at 6 weeks and 4.6 ± 1.2 at 12 weeks. The reduction in burning sensation was significantly greater in Group A compared to Group B ($p < 0.05$) (Table 2).

Changes in Mucosal Flexibility

The assessment of mucosal flexibility showed that 80% of patients in Group A had improved flexibility by the end of 12 weeks, compared to 50% in Group B. The improvement was more pronounced in the test group, indicating the positive effect of curcumin when combined with antioxidants (Table 3).

Table 1: Comparison of Mouth Opening (mm) in Both Groups

Time Interval	Group A (Curcumin + Antioxidants)	Group B (Antioxidants Only)	p-value
Baseline	28.5 ± 3.2	28.2 ± 3.5	0.72 (NS)
6 Weeks	32.8 ± 3.1	30.1 ± 3.3	0.03 (S)
12 Weeks	35.2 ± 2.9	31.5 ± 3.2	0.01 (S)

(NS = Not Significant, S = Significant)

Table 2: Comparison of Burning Sensation (VAS Score) in Both Groups

Time Interval	Group A (Curcumin + Antioxidants)	Group B (Antioxidants Only)	p-value
Baseline	7.2 ± 1.1	7.0 ± 1.0	0.64 (NS)
6 Weeks	4.5 ± 1.0	5.8 ± 1.1	0.04 (S)
12 Weeks	2.3 ± 0.9	4.6 ± 1.2	0.01 (S)

Table 3: Improvement in Mucosal Flexibility

Parameter	Group A (Curcumin + Antioxidants)	Group B (Antioxidants Only)	p-value
Patients with Improvement (%)	80%	50%	0.02 (S)

These results indicate that curcumin, when combined with antioxidants, significantly improves mouth opening, reduces burning sensation, and enhances mucosal flexibility in OSMF patients compared to antioxidants alone.

4. DISCUSSION

Oral submucous fibrosis (OSMF) is a chronic, progressive disorder with a significant risk of malignant transformation, necessitating effective treatment strategies. The present study evaluated the efficacy of curcumin combined with antioxidants in managing OSMF symptoms, particularly in improving mouth opening, reducing burning sensation, and enhancing mucosal flexibility. The findings demonstrated a significant improvement in patients receiving curcumin along with antioxidants compared to those receiving antioxidants alone.

Curcumin, the principal bioactive compound of *Curcuma longa*, possesses potent anti-inflammatory, antifibrotic, and antioxidant properties (1,2). It inhibits key pathways involved in fibrosis, including the transforming growth factor-beta (TGF- β) signaling pathway, which plays a crucial role in fibroblast activation and collagen deposition (3,4). Several studies have reported that curcumin downregulates pro-inflammatory cytokines such as interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF- α), contributing to reduced fibrosis and improved tissue remodeling in OSMF (5,6).

The significant improvement in mouth opening observed in this study aligns with previous research indicating that curcumin enhances collagenase activity, thereby degrading excessive collagen deposition in OSMF tissues (7). In a similar study, patients treated with curcumin showed a mean increase in mouth opening of 4–5 mm over 12 weeks, which supports our findings (8). Moreover, curcumin has been shown to modulate myofibroblast activity, leading to reduced fibrotic bands and improved mucosal flexibility (9).

Burning sensation, a common symptom in OSMF, is associated with inflammation and oxidative stress within the oral mucosa. Antioxidants such as vitamin C and vitamin E scavenge free radicals, reducing oxidative stress and improving cellular homeostasis (10,11). The combination of curcumin and antioxidants demonstrated superior efficacy in reducing

burning sensation compared to antioxidants alone, likely due to the synergistic effect of curcumin in reducing pro-inflammatory mediators and oxidative damage (12).

The role of antioxidants in OSMF management has been extensively studied, with evidence supporting their use in reducing disease progression and improving clinical outcomes (13). Vitamin C plays a crucial role in collagen synthesis and repair, while vitamin E protects cell membranes from oxidative damage, both of which are essential in maintaining oral mucosal integrity (14). The significant improvement in mucosal flexibility observed in this study further supports the benefits of combining curcumin with antioxidants in OSMF therapy.

Despite these promising results, certain limitations should be considered. The study was conducted over a relatively short duration of 12 weeks, and long-term follow-up is required to assess the sustained benefits of curcumin therapy. Additionally, histopathological analysis of fibrotic tissue was not performed, which could provide deeper insights into the molecular mechanisms underlying curcumin's therapeutic effects. Future studies should include larger sample sizes, longer follow-up periods, and histopathological evaluations to establish more conclusive evidence regarding curcumin's role in OSMF management.

5. CONCLUSION

In conclusion, this study highlights the significant therapeutic potential of curcumin combined with antioxidants in improving clinical symptoms of OSMF. The results suggest that curcumin enhances mouth opening, reduces burning sensation, and improves mucosal flexibility more effectively than antioxidants alone. These findings provide a strong rationale for incorporating curcumin-based formulations into routine OSMF management protocols.

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