

Postoperative pain relief after periodontal surgery: a comparative evaluation of Diclofenac mouthwash, diclofenac tablets and benzydamine mouthwash

Authors:

Dr. Shreya Sanjay Bhavsar, Dr. Nilam A Brahmhatt, Dr. Saurabh Lomesh Shroff

Department of Periodontology, Government Dental College and Hospital Ahmedabad

Corresponding Author:

Dr. Shreya Sanjay Bhavsar

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ABSTRACT:

Background: Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) are frequently prescribed to manage postoperative pain, including following periodontal procedures. However, systemic administration often results in adverse effects such as gastrointestinal discomfort, hepatic toxicity, and hematologic complications. To solve these complications, NSAID delivery via mouthwash can be used. **Objective:** To compare the efficacy and patient acceptance of diclofenac mouthwash, oral diclofenac tablets, and benzydamine mouthwash in alleviating postoperative pain and inflammation after periodontal flap surgery. **Methods:** A randomized, controlled, single-blinded study was conducted at the Department of Periodontology, Government Dental College and Hospital, Ahmedabad. Ninety patients with chronic periodontitis, aged between 25–60 years, requiring flap surgery in at least one quadrant, were enrolled and allocated into three groups (n=30 each): Group 1 – Diclofenac Mouthwash, Group 2 – Diclofenac Tablets, Group 3 – Benzydamine Mouthwash. Pain was assessed at baseline, 24, and 72 hours using the Visual Analog Scale (VAS) and Wong-Baker Facial Rating Scale (FRS). Gingival health was evaluated using the Modified Gingival Index (MGI) at baseline and on day 7. **Results:** All groups showed a reduction in pain perception postoperatively. Topical formulations demonstrated pain relief comparable to oral diclofenac, with fewer reported side effects. The diclofenac mouthwash group showed superior improvement in gingival condition compared to the tablet group. **Conclusion:** Topical NSAID formulations could be an effective and safer alternative to systemic NSAIDs in managing postoperative pain in periodontal surgery. Diclofenac and benzydamine mouthwashes offer similar analgesic effects as oral diclofenac while potentially enhancing gingival healing and minimizing adverse reactions.

Keywords: Pain, Diclofenac, Analgesic, Mouthwash

INTRODUCTION:

Pain is one of the most significant fears among dental patients, often leading to avoidance of dental care and increased anxiety prior to procedures. Pain is a common postoperative symptom following periodontal surgeries such as flap procedures, often resulting from tissue manipulation and inflammation during healing. Pain is a multifaceted experience that goes beyond simple physical discomfort; it encompasses sensory, emotional, cognitive, and social components. Defined by the International Association for the Study of Pain (IASP) as “an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage”¹, pain plays a vital protective role by alerting the body to harm. However, when pain becomes chronic or poorly managed, it can lead to significant functional impairment. Pain negatively affects daily activities,

reduces quality of life, impairs sleep, diminishes appetite, and contributes to anxiety and depression^{2,3}. Cognitive functions such as attention, memory, and decision-making can be disrupted by ongoing pain stimuli⁴. Socially, individuals suffering from chronic pain often experience isolation, reduced productivity, and strained personal relationships. Furthermore, the psychological impact of pain is deeply intertwined with its perception; people with higher levels of distress tend to report more severe pain⁵. This makes pain not just a symptom but a complex disease entity in itself, requiring a holistic and individualized approach to treatment. This makes pain not just a symptom but a complex disease entity in itself, requiring a holistic and individualized approach to treatment.

Effective management of this pain is essential not only for patient comfort but also to support optimal

recovery and adherence to postoperative instructions⁷. NonSteroidal Anti-Inflammatory Drugs (NSAIDs) are widely used in dental practice to manage such pain due to their ability to inhibit prostaglandin synthesis via cyclooxygenase (COX) enzyme inhibition. This action reduces both inflammation and nociceptive pain associated with surgical trauma.

Non-selective NSAIDs inhibit both COX-1 and COX-2 enzymes, offering effective pain relief but with notable side effects. COX-1 inhibition reduces gastric protection, increasing the risk of ulcers and GI bleeding⁸. Renal complications, such as fluid retention and hypertension, may also occur, particularly in vulnerable patients⁸. Additionally, these drugs can impair platelet function, leading to prolonged bleeding⁹, and have been linked to cardiovascular risks, especially diclofenac¹⁰. Hypersensitivity reactions and delayed bone or soft tissue healing further limit their use in postoperative settings¹¹. These risks highlight the need for careful patient selection and consideration of topical alternatives.

Topical drug delivery in dentistry has gained attention as a promising alternative. NSAIDs delivered in forms such as gels, sprays, and mouthwashes act locally at the site of inflammation, providing direct relief with reduced systemic absorption¹². Mouthwash formulations, in particular, are advantageous due to their simplicity of use, ability to access all oral surfaces, and localized therapeutic effects.

Diclofenac sodium, an NSAID with both analgesic and anti-inflammatory actions, has been developed into mouthwash formulations for topical use. Studies have shown that diclofenac mouthwash can effectively reduce postoperative discomfort after periodontal procedures while minimizing systemic effects¹³. In addition to diclofenac, benzydamine hydrochloride has emerged as another topical agent of interest. Unlike traditional NSAIDs, benzydamine exerts both anti-inflammatory and local anesthetic effects and has shown benefits in managing oral pain, mucositis, and inflammation. Its action on pro-inflammatory cytokines and mucosal tissues makes it suitable for postoperative use in dental settings.

This study is designed to compare the effectiveness and patient outcomes of, oral diclofenac tablets,

diclofenac mouthwash and benzydamine mouthwash following periodontal flap surgery. The primary hypothesis is that topical NSAID mouthwashes will provide pain relief comparable to oral diclofenac, with fewer adverse effects and potentially improved healing outcomes.

MATERIALS AND METHODS:

This study was designed as a randomized, controlled, single-blinded study conducted in the Department of Periodontology at the Government Dental College and Hospital, Ahmedabad. Ethical clearance was obtained from the institutional ethics committee (EC/NEW/INST/2021/573), and informed consent was secured from all participants prior to the initiation of the study.

A total of 90 patients diagnosed with chronic periodontitis with deep pockets indicated for periodontal flap surgery in at least one quadrant were recruited, with 30 participants randomly allocated to each of the three groups. The sample size was determined using standard power analysis formulae to ensure adequate statistical power. Inclusion criteria included patients aged between 25 and 60 years with a confirmed diagnosis of chronic periodontitis. Exclusion criteria comprised individuals with systemic health conditions such as diabetes or cardiovascular diseases, current or former smokers, those with known allergies to NSAIDs, and patients who had taken antibiotics within the preceding three months.

Participants were randomly assigned to one of three groups. Group 1 received diclofenac mouthwash, instructed to rinse with 15 ml twice daily for three days. Group 2 was administered diclofenac tablets, 50 mg orally twice daily for three days. Group 3 was treated with benzydamine mouthwash, used as a 15 ml rinse twice daily for three days.

Clinical parameters assessed included pain, measured using the Visual Analog Scale (VAS) and the Wong-Baker Faces Rating Scale (FRS) at 24 and 72 hours postsurgery. Gingival health was evaluated using the Modified Gingival Index (MGI) at baseline and again on day 7. Adverse effects, if any, were monitored and documented throughout the study duration.



Figure 1

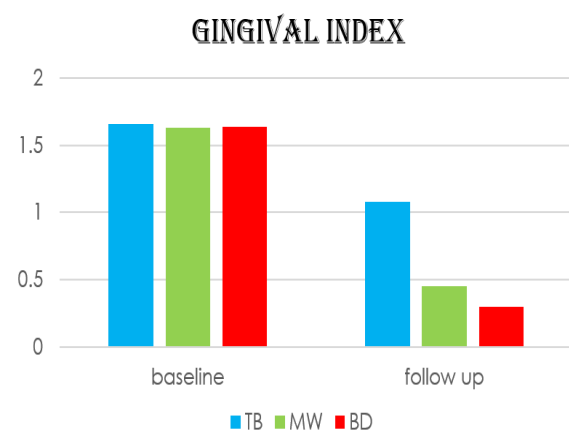
RESULTS:

All groups showed significant pain reduction over 24 hours ($p < 0.05$), with no significant differences between them at 24 or 72 hours ($p > 0.05$), indicating similar analgesic effects. MGI scores improved significantly in all groups by day 7 ($p < 0.05$), with diclofenac mouthwash showing greater reduction than tablets ($p < 0.05$). Benzydamine mouthwash also improved, but not significantly different from the diclofenac mouthwash.

TABLE 1

INDEX		GROUP A	GROUP B	GROUP C	P VALUE
VAS	At baseline	2.75	2.50	2.48	0.84(NS)
	After 24 hours	1.50	2.00	1.96	0.06(BS)
	After 7 days	1.13	1.50	1.41	0.12(NS)
FRS	At baseline	2.50	2.75	2.73	0.73(NS)
	After 24 hours	1.25	2.00	1.75	0.08(BS)
	After 7 days	1.25	1.75	1.60	0.36(NS)
GI	At baseline	1.66	1.63	1.64	0.98(NS)
	After 24 hours	1.54	1.00	0.98	0.002(HS)
	After 7 days	1.08	0.45	0.30	0.001(HS)
GROUP A DICLOFENAC TABLET GROUP B DICLOFENAC MOUTHWASH GROUP C BENZYDAMINE MOUTHWASH (P VALUE<0.05 HIGHLY SIGNIFICANT)					

Comparison of Visual Analog Scale (VAS), Facial Rating Scale (FRS), and Gingival Index (GI) Scores Among Diclofenac Tablet (Group A), Diclofenac Mouthwash (Group B), and Benzydamine Mouthwash (Group C) at Baseline, 24 Hours, and 7 Days Postoperatively



Graph 1

Comparison of Gingival Index (GI) Scores at Baseline and Follow-up Among Diclofenac Tablet (TB), Diclofenac Mouthwash (MW), and Benzydamine Mouthwash (BD) Groups

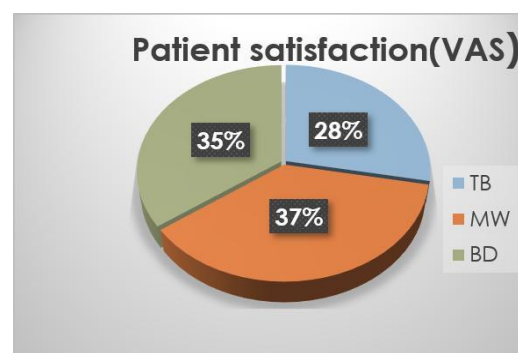


Figure 2

Distribution of Patient Satisfaction Based on Visual Analog Scale (VAS) Scores Among Diclofenac Tablet (TB), Diclofenac Mouthwash (MW), and Benzydamine Mouthwash (BD) Groups

DISCUSSION:

Pain is a complex and multidimensional experience that significantly impacts an individual's quality of life. Numerous studies across different populations have consistently shown a strong inverse relationship between pain intensity and quality of life indices. For instance, a large-scale study involving over 58,000 adults in India found that individuals experiencing pain reported substantially lower quality of life scores across physical, general health, and environmental domains. Notably, even after controlling for socio-demographic factors, the presence of pain was associated with a measurable reduction in overall QoL¹⁴. Similarly, in chronic pain clinics and primary care settings globally, pain has been linked to impaired mobility, sleep disturbances, emotional distress, and a reduced ability to carry out daily tasks^{15,16}. Tools such as the EQ-5D, SF-36, and the Brief Pain Inventory (BPI) have been widely used to quantify this burden, revealing that even a small change in pain intensity—by 1 to 3 points on a standard pain scale—can lead to clinically meaningful improvements or declines in QoL scores^{17,18}. Moreover, conditions such as diabetic neuropathy, osteoarthritis, and cancer-related pain have demonstrated particularly strong correlations, where increased pain severity significantly lowered both physical and psychological well-being^{19,20}. These findings underscore the need for effective pain assessment and management strategies, not only to address physical discomfort but also to enhance the overall quality of life in affected individuals.

Diclofenac mouthwash has gained attention as an effective pre-rinse in periodontal and oral surgical procedures due to its localized anti-inflammatory and analgesic properties²¹. As a nonsteroidal anti-inflammatory drug (NSAID), diclofenac inhibits cyclooxygenase (COX) enzymes, thereby reducing prostaglandin-mediated inflammation and pain²². When used prior to surgery, diclofenac mouthwash allows for direct drug delivery to inflamed gingival tissues, enhancing local therapeutic action while reducing systemic side effects commonly associated with oral NSAIDs. Clinical evidence suggests that a 0.074% diclofenac mouthwash used as a pre- and post-operative rinse significantly reduces postoperative pain and improves gingival healing, with comparable efficacy to systemic diclofenac tablets but with fewer gastrointestinal adverse effects²¹. This targeted topical approach can improve patient comfort and compliance, making diclofenac mouthwash a practical adjunct in periodontal therapy.

However, systemic administration, particularly over multiple days, carries well documented risks—ranging from gastrointestinal irritation to hepatotoxicity and renal impairment. These concerns make a compelling case for exploring localized NSAID delivery systems,

such as mouthwashes, which can minimize systemic exposure while maintaining efficacy at the surgical site.

This study provides a novel contribution to the current literature by systematically evaluating and comparing the analgesic efficacy of systemic diclofenac tablets with two topical NSAID formulations—diclofenac mouthwash and benzydamine hydrochloride mouthwash within a single randomized controlled clinical trial. While previous studies have examined the individual effects of either systemic or topical NSAIDs on postoperative pain and inflammation, few have employed a triadic comparative model assessing all three interventions simultaneously.

Moreover, this study incorporated a multimodal evaluation approach, utilizing the Visual Analogue Scale (VAS), Facial Rating Scale (FRS), and Gingival Index (GI), thereby capturing both subjective and objective clinical outcomes over multiple time intervals (baseline, 24 hours, and 7 days). This contrasts with earlier research, which often relied on a single pain scale and typically limited follow-up to the immediate postoperative period. The Facial Rating Scale (FRS), also known as the Faces Pain Scale, is a visual tool widely used to assess pain intensity, particularly in populations that may struggle to communicate verbally or numerically, such as children, older adults, and individuals with cognitive impairments. Rather than relying on numbers or complex language, this scale uses a series of facial expressions ranging from a happy face representing "no pain" to a distressed or crying face representing "worst pain possible." One of the most commonly used versions is the Wong-Baker FACES® Pain Rating Scale, which features six cartoon-like faces and allows patients to select the face that best represents their current level of discomfort²³. Each face is assigned a score on a 0–10 scale, enabling healthcare providers to quantify the patient's pain in a consistent manner. Importantly, the current study is among the first to demonstrate the superior anti-inflammatory effect of Diclofenac mouthwash and benzydamine mouthwash on gingival tissues when compared to systemic NSAIDs. By providing a more comprehensive and comparative perspective on NSAID-based interventions in dental pain and inflammation management, this investigation adds clinically relevant evidence to inform personalized therapeutic decisions in postoperative oral care.

Across all groups, a reduction in pain scores was observed at both 24 hours and 7 days postoperatively. While systemic diclofenac (Group A) demonstrated slightly greater reductions in VAS and FRS scores at 24 hours compared to the mouthwash groups, these differences did not reach statistical significance. These findings are consistent with those of Mishra et al. (2017), who found that diclofenac mouthwash provided analgesic efficacy comparable to systemic

diclofenac tablets following minor oral surgery, though systemic administration resulted in more rapid onset of relief in the early postoperative phase²⁴. Similarly, a randomized controlled trial by Attar et al. (2008) reported no significant difference in overall pain relief between systemic and topical diclofenac, although the systemic group showed earlier pain control²⁵.

Contrary to our findings, a study by Peddengatagari and Mutyala (2020) observed that benzydamine hydrochloride mouthwash resulted in significantly lower VAS and FRS scores compared to diclofenac tablets in the immediate postoperative period following periodontal therapy ($p < 0.05$)²⁶. The discrepancy may be attributed to variations in dosage, administration frequency, and patient-specific responses to topical anti-inflammatory agents.

A notable and statistically significant reduction in GI scores was observed in the mouthwash groups, with the most pronounced improvement seen in Group C (benzydamine) followed by Group B (diclofenac). These results suggest a superior local anti-inflammatory effect of topical NSAIDs, which may be attributed to their ability to act directly at the site of inflammation without systemic metabolism. This is in agreement with the findings of Aoun et al. (2020), who demonstrated that diclofenac sodium mouthwash significantly reduced gingival inflammation scores within seven days post-scaling and root planing²⁷. The efficacy of benzydamine hydrochloride in controlling gingival inflammation has also been substantiated in several studies, which highlighted its anti-inflammatory, analgesic, and local anesthetic properties²⁸.

Conversely, some studies have challenged the effectiveness of benzydamine in oral inflammatory conditions. A systematic review by Riley et al. (2015) assessing benzydamine for the prevention of oral mucositis in cancer patients found limited evidence supporting its superiority over placebo, with pooled risk ratios not reaching statistical significance²⁹. Similarly, research comparing benzydamine and chlorhexidine suggested that while benzydamine offered superior patient comfort, it was less effective in reducing plaque accumulation and gingivitis³⁰.

The findings of this study suggest that topical NSAIDs, particularly benzydamine and diclofenac mouthwash, are effective alternatives to systemic NSAIDs for postoperative pain and inflammation control in dental procedures. The statistically significant improvement in GI scores among topical groups underscores their potential to enhance localized periodontal healing. Topical delivery also minimizes systemic exposure and related adverse effects, making these agents especially suitable for patients with gastrointestinal or renal concerns.

However, it is important to consider that patient adherence, rinsing technique, and oral clearance rates can influence the efficacy of mouthwash-based therapies. Additionally, while the analgesic effects of

topical NSAIDs are evident, their onset may be slower than systemic counterparts.

The limitations of the present study include a modest sample size, limited followup duration, and lack of biomarker assessment to objectively evaluate inflammation. Future studies should consider long-term outcomes, larger multicenter samples, and the incorporation of inflammatory cytokine profiling to better understand the biological impact of these agents on tissue healing.

As dental professionals move toward evidence-based, patient-centered care, this trial contributes valuable data regarding the comparative effectiveness and safety of localized versus systemic NSAID use in periodontal surgery settings.

CONCLUSION:

This study aims to provide evidence supporting the use of NSAID mouthwashes as viable alternatives to oral NSAIDs for managing postoperative pain in periodontal flap surgeries. A shift to localized delivery may enhance patient comfort and compliance while minimizing systemic complications.

Conflict of Interest: There are no conflicts of interest.

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