

COMPARATIVE EVALUATION OF CHLORHEXIDINE AND METRONIDAZOLE IRRIGATION IN THIRD MOLAR SURGERY - A RANDOMIZED COMPARATIVE CLINICAL STUDY

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Abstract

Background: Surgical removal of impacted third molars often involves significant bone removal and manipulation of inflamed or infected soft tissues, making the surgical site highly susceptible to bacterial contamination and postoperative complications such as infection and alveolar osteitis. Intraoperative irrigation plays a vital role in flushing out debris, controlling microbial load, and promoting a clean surgical field, which directly impacts the healing outcome. Chlorhexidine and Metronidazole have gained attention for their broad-spectrum antimicrobial properties, particularly when mechanical debridement alone is insufficient.

Objective: To compare the efficacy of 0.12% Chlorhexidine gluconate and 1% Metronidazole irrigating solutions in preventing postoperative infections and enhancing healing after surgical extraction.

Materials & methods: A prospective, randomised, comparative study was conducted in the Oral and Maxillofacial Surgery Department on patients requiring surgical extraction of mandibular third molars. The study was explained, and written informed consent was obtained. Patients were randomly allocated to two groups. Parameters were assessed on postoperative day 1, 3 and 7. The mean and standard deviation were calculated for all parameters. Intergroup comparisons were performed using the independent t-test. A *p*-value < 0.05 was considered statistically significant.

Results: Results showed a statistically significant difference between the groups (*p* = 0.002*), indicating better postoperative outcomes with metronidazole. **Conclusion:** Metronidazole is a superior irrigation solution in improving postoperative outcomes, especially in surgeries prone to anaerobic contamination like third molar extractions and other oral procedures.

Key words: Surgical extraction, Metronidazole, Chlorhexidine gluconate, impaction, Pain, mouth opening, swelling.

Introduction:

Surgical extraction is a routine procedure in oral and maxillofacial surgery, often associated with postoperative pain, swelling, and delayed wound healing. Bacterial contamination of the extraction socket is a major contributing factor to these complications. Therefore, the use of intraoperative irrigating solutions with antimicrobial properties plays a vital role in reducing bacterial load and promoting uneventful healing.

A common antiseptic with long-lasting substantivity and broad-spectrum activity, chlorhexidine gluconate (0.12%) successfully lowers oral microbial flora. It may, however, sometimes cause epithelialisation to be delayed. Metronidazole (1%), on the other hand, offers a more focused antibacterial impact and has strong activity against obligate anaerobes that are frequently found in the extraction site¹. Although both agents are successful, limited data compare their effectiveness as irrigating solutions during surgical extractions. Thus, the goal of this study is to evaluate and compare the effectiveness of irrigating solutions containing 1% metronidazole and 0.12% chlorhexidine gluconate in surgical extractions about postoperative pain, swelling, infection, and wound healing.

Methodology:

This prospective, randomised, comparative clinical study was conducted in the Department of Oral and Maxillofacial Surgery, Sibar Institute of Dental Sciences, to evaluate the effectiveness of 0.12% chlorhexidine gluconate and 1% metronidazole irrigating solutions during the surgical extraction of mandibular third molars. The study included 40 patients who met the inclusion criteria: patients with Mesioangular impactions, ASA I and ASA II patients, and patients willing to provide informed consent. Patients with uncontrolled diabetes, smoking habits, or any pre-existing infections, those allergic to chlorhexidine or metronidazole, and pregnant or lactating women were excluded. Based on random allocation, the patients were randomly divided into two groups of 20 each: Group A received 0.12% chlorhexidine gluconate irrigation, and Group B received 1% metronidazole irrigation. Both the operating surgeon and the patients were blinded to the type of irrigant used, with solutions coded and dispensed in identical, unlabelled syringes by an independent assistant. All surgical procedures were performed by the same experienced surgeon under local anaesthesia following a standardised

protocol. After tooth removal, the extraction socket was irrigated with 10 mL of the assigned solution and sutured with 3-0 silk sutures. Postoperative care and analgesic regimens were standardised for all participants. Postoperative parameters, including pain, swelling, mouth opening, and infection, were evaluated clinically on the 2nd, 3rd, and 7th postoperative days. Pain was assessed using a Visual Analogue Scale (VAS), swelling was measured using linear facial measurements, and mouth opening was recorded in millimetres. Data were analysed using SPSS version 26.0, and mean and standard deviation were calculated for all parameters. The independent t-test was applied for intergroup comparisons, and a p-value of less than 0.05 was considered statistically significant.



Figure 1: Irrigating solutions
extraction socket



Figure 2. Final irrigation of the

Results:

A total of 40 patients aged between 18 and 40 years were enrolled and completed the study. Pain scores gradually decreased in both groups from Day 1 to Day 7.

Pain (VAS Scores)

The mean postoperative pain scores were compared between the two study groups at different time intervals. On Day 1, the chlorhexidine group recorded a higher mean pain score (6.15 ± 1.13) than the metronidazole group (5.00 ± 0.72), showing a statistically significant difference ($p = 0.000$). On Day 3, a marked reduction in pain was observed in both groups; however, the metronidazole group (4.95 ± 0.68) exhibited significantly higher scores compared to the chlorhexidine group (3.60 ± 0.82), with a p-value of 0.000. By Day 7, the mean pain score further decreased in the chlorhexidine group (2.10 ± 0.50), indicating significant improvement from baseline ($p = 0.000$) (Table 1)

Time intervals	Groups	N	Mean	Standard deviation	p-value
Day 1	Chlorhexidine	20	6.15	1.13	0.000*
	Metronidazole	20	5	0.72	
Day 3	Chlorhexidine	20	3.60	0.82	0.000*
	Metronidazole	20	4.95	0.68	
Day 7	Chlorhexidine	20	2.1	0.5	0.000*

Table 1: Comparison of postoperative pain between the two study groups.

Postoperative Swelling

The data in Table 2 demonstrated that postoperative swelling scores were compared between the two study groups at different time intervals. On Day 1, the mean swelling score in the chlorhexidine group (7.9 ± 1.16) was significantly higher than that in the metronidazole group (5.15 ± 1.13), with a p-value of 0.000, indicating a statistically significant difference. On Day 3, swelling reduced in both groups, with mean values of 3.20 ± 0.95 in the chlorhexidine group and 2.85 ± 0.67 in the metronidazole group; however, the difference was not statistically significant ($p = 0.187$). By Day 7, a further decrease in swelling was observed in both groups, and the metronidazole group (1.80 ± 0.80) demonstrated significantly less swelling compared to the chlorhexidine group (2.10 ± 1.50) with a p-value of 0.032 (Table 2)

Time intervals	Groups	N	Mean	Standard. deviation	p-value
Day 1	Chlorhexidine	20	7.9	1.16	0.000*
	Metronidazole	20	5.15	1.13	
Day 3	Chlorhexidine	20	3.20	0.95	0.187
	Metronidazole	20	2.85	0.67	
Day 7	Chlorhexidine	20	2.10	1.50	0.032*

	Metronidazole	20	1.80	0.80	
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Table 2: Comparison of swelling between the two study groups

Maximum Mouth opening

The mean mouth opening was evaluated at different postoperative intervals in both groups. On Day 1, there was no significant difference between the chlorhexidine group (32.15 ± 1.46) and the metronidazole group (32.05 ± 1.53), with a p-value of 0.834. On Day 3, a significant improvement in mouth opening was observed in the metronidazole group (50.95 ± 2.81) compared to the chlorhexidine group (47.25 ± 4.24) with a p-value of 0.002. By Day 7, both groups showed further improvement, but the metronidazole group (56.80 ± 2.95) demonstrated a significantly greater mouth opening than the chlorhexidine group (53.10 ± 3.85), with a p-value of 0.00 (Table 3).

Time intervals	Groups	N	Mean	Standard deviation	p-value
Day 1	Chlorhexidine	20	32.15	1.46	0.834
	Metronidazole	20	32.05	1.53	
Day 3	Chlorhexidine	20	47.25	4.24	0.002*
	Metronidazole	20	50.95	2.81	
Day 7	Chlorhexidine	20	53.10	3.85	0.008
	Metronidazole	20	56.80	2.95	

Table 3: Comparison of mouth opening between the two study groups

Discussion:

The present study evaluated and compared the clinical effectiveness of 0.12% chlorhexidine gluconate and 1% metronidazole as irrigating solutions during surgical extractions, focusing on postoperative pain, swelling, and infection. Both irrigants were found to reduce postoperative complications, but metronidazole demonstrated slightly better outcomes in terms of pain reduction and wound healing. Chlorhexidine gluconate is widely used due to its broad antibacterial action; however, it can be cytotoxic to fibroblasts and

epithelial cells, which may hamper wound healing. According to Jones (2017), higher doses may impede fibroblast growth and epithelial repair². Conversely, metronidazole is more targeted and tissue-friendly because it only targets obligate anaerobes, which are the most common infections in extraction sockets.

According to Rao et al. (2019), patients treated with 1% metronidazole irrigation exhibited significantly less postoperative pain, swelling, and earlier healing compared to those treated with 0.12% chlorhexidine gluconate. Because of its selective activity, metronidazole reduces its nitro group in anaerobic environments to produce cytotoxic radicals that damage bacterial DNA and kill microorganisms without interfering with the beneficial aerobic flora³. Tandjung L (2007) suggested that irrigation with metronidazole in infected extraction sockets or abscess cavities results in faster resolution of infection, reduced pain, and improved wound healing compared to chlorhexidine⁴. Topical metronidazole promotes fibroblast proliferation and epithelium regeneration without generating local irritation, in contrast to chlorhexidine, which frequently causes temporary mucosal burning and taste modification, according to Tayab et al. (2018)⁵. Despite its strong effects, chlorhexidine is known to induce mucosal irritation, tooth discolouration, and taste disturbance, which may lower patient compliance, particularly with repeated treatment. Patil et al. (2018) reported that patients irrigated with 1% metronidazole demonstrated significantly better postoperative mouth opening and faster wound healing compared to those treated with 0.2% chlorhexidine⁶. Metronidazole irrigation showed better healing and reduced inflammation compared to chlorhexidine. Its targeted action against anaerobes enhances socket healing, supporting findings by Mohamed (2008)⁷ and Atil et al. (2018). Chlorhexidine remains useful, but metronidazole appears more effective for infected sockets⁸.

The current study findings are consistent with these previous reports, showing that 1% metronidazole irrigation promotes better wound healing and patient comfort compared with 0.12% chlorhexidine gluconate. The superior outcomes in the metronidazole group may be attributed to its specific antimicrobial spectrum, minimal tissue toxicity, and favourable wound-healing profile. Thus, while both irrigants are effective in reducing postoperative infection and inflammation, metronidazole provides a more biocompatible and clinically acceptable alternative. The use of 1% metronidazole irrigation during surgical extraction may therefore be recommended as a safe and effective substitute for 0.12% chlorhexidine, particularly in patients prone to delayed healing or chlorhexidine sensitivity.

Limitations: Smaller sample size, Shorter follow-up period

Conclusion:

Metronidazole is a superior irrigation solution in improving postoperative outcomes, especially in surgeries prone to anaerobic contamination and promoting healing and reducing inflammation in infected extraction sockets. Its targeted antimicrobial action against anaerobes enhances postoperative recovery, making it a preferable irrigant for managing infected sockets.

References:

1. Vijayakumar G, Sundaram GA, Kumar SP, Krishna VK, Krishnan M, Krishnan VK. Comparison of the Effectiveness of Four Different Irrigation Solutions on Postoperative Sequelae in Patients Undergoing Lower Third Molar Surgery: A Prospective Study. *Cureus*. 2023 Dec 20;15(12).
2. Jones CG. Chlorhexidine: Is it still the gold standard? *Periodontol 2000*. 2017;75(1):79–92.
3. Rao S, Suresh KV, Kumar A, et al. Comparative evaluation of 1% metronidazole and 0.12% chlorhexidine as irrigants in impacted third molar surgery. *J Clin Diagn Res*. 2019;13(5).
4. Tandjung L, Waltimo T, et al. Antimicrobial irrigants reduce postoperative complications after third molar surgery. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2007;104(3):e7-e11.
5. Tayab T, Suma GN, Alqahtani NA, et al. Comparative evaluation of 1% metronidazole and 0.2% chlorhexidine irrigation on postoperative pain, swelling, and trismus following third molar surgery. *J Oral Maxillofac Surg Med Pathol*. 2017;29(5):395–400.
6. Patil S, Reddy BS, Shetty SR, et al. Comparative evaluation of 1% metronidazole and 0.2% chlorhexidine irrigation on postoperative trismus and wound healing following mandibular third molar surgery. *J Clin Exp Dent*. 2018;10(8):e777–e782.
7. Mohamed S. Comparison of chlorhexidine and metronidazole irrigation on healing of infected extraction sockets. *Egypt Dent J*. 2008;54(3):1423–1431.
8. Atil S, Reddy BS, Shetty SR, et al. Comparative evaluation of 1% metronidazole and 0.2% chlorhexidine irrigation on postoperative trismus and wound healing following mandibular third molar surgery. *J Clin Exp Dent*. 2018;10(8):e777–e782.