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ORIGINAL RESEARCH

# Comparison of Seven Days Use of Chlorhexidine Before and After Third Molar Surgery in Preventing Dry Socket

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## Abstract

**Background: Dry socket is a common complication following third molar extraction, characterized by sudden and severe pain that typically begins several days post-procedure, with an incidence rate of approximately 35%. This study aimed to investigate the effect of 0.12% chlorhexidine on the incidence of dry socket and the associated pain in patients undergoing surgery for maxillary and mandibular third molars.**

**Materials and Methods: In this clinical trial, 105 patients with non-impacted or partially impacted wisdom teeth were selected and divided into three groups. The first group used chlorhexidine mouthwash for seven days prior to surgery, while the second group used it for seven days afterward at 12-hour intervals. The third group (control) used gauze soaked in standard normal saline (0.9% sodium chloride) at the wound site. Cases of dry socket occurrence were recorded. Data were analyzed using chi-square, Fisher's, and Kruskal-Wallis tests.**

**Results: The incidence of dry socket was 3.4% in the first group, 5.1% in the second group, and 5.4% in the control group, with no statistically significant difference between the groups (p>0.05). Additionally, gender, oral hygiene level, smoking, type of surgery, and surgical site had no significant impact on the occurrence of this complication (p>0.05).**

**Conclusion: The use of chlorhexidine does not have a significant effect on preventing the occurrence of dry socket. However, there are no contraindications for its use.**

**Key words: Chlorhexidine; Third Molar; Dry Socket; Oral Surgery**

## Introduction

Dry socket is one of the most common complications following simple or surgical tooth extraction. If the extraction is performed surgically, the likelihood of dry socket occurrence increases by up to ten times (1), with an incidence ranging from 0% to 35%. The temporal distribution of the onset of dry socket symptoms is reported as follows: immediately after surgery, 5%, within the first 24 hours post-surgery, 50%, 48 hours post-surgery, 32.5%, and 72 hours post-surgery, 12.5% (2).

Several factors, such as gender, age, the intensity of trauma during surgery, inadequate rinsing, oral infections, smoking, contraceptive pill use, antibiotic consumption, pericoronitis, and the presence of anesthetics, increase the risk of complications (1, 3). The length of surgery significantly impacts the likelihood of this complication. Factors influencing the duration include tooth orientation, the complexity of extraction, and the surgeon's experience. (2,4, 5).

Bacterial contamination is a major etiological factor for dry socket (DS) (6, 7). Attempts to prevent its occurrence have thus focused on reducing oral microbes within the wound either through oral administration of antibiotics (6, 8) or local application of antiseptic solutions (9, 10).

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The primary goal in treating dry socket should be pain control, followed by wound healing. Various dressing materials, such as zinc oxide, eugenol and aloe gel, have been used in the management of dry socket; some prefer aloe gel over zinc oxide eugenol (11). The use of analgesics and cavity dressings with various materials is the most common method for pain reduction, and common analgesics in dentistry (acetaminophen, ibuprofen) may not always be sufficient to control severe pain and may lack adequate efficacy in managing dry socket pain (12-14). To help alleviate the pain associated with dry socket, several methods have been suggested in addition to available pain relievers. One effective option is chlorhexidine gel, which has been shown to reduce pain and prevent complications after the surgical extraction of impacted lower third molars (15, 16). Several studies also indicate that chlorhexidine alone is not effective in alleviating surgical complications (17).

Numerous studies have shown the effectiveness of 0.12% chlorhexidine mouthwash in preventing the occurrence of dry sockets after tooth extraction (18-20). Additionally, according to some studies, the efficacy of 0.2% chlorhexidine gel in preventing dry socket occurrence was greater than 0.12% mouthwash, and both 0.2% chlorhexidine mouthwash and 1% chlorhexidine gel resulted in a similar reduction of inflammatory parameters (21, 22). However, the results of several studies indicate that increasing the concentration of chlorhexidine may delay wound healing (23, 24).

It's important to note that bleeding after a tooth extraction is significant because the blood clot formed is essential for the healing and reconstruction process. This clot is very effective in preventing dry socket. Research has shown that completely rinsing away the clot with a normal saline solution can increase the likelihood of developing dry socket (25).

Preventive measures in the therapeutic management of dry socket include saline mouthwash, local eugenol dressing for pain relief, antifibrinolytic agents, antibiotics, and antiseptic agents (26, 27). Numerous studies have demonstrated the impact of chlorhexidine on controlling bacterial plaque and the relationship between oral hygiene and the prevention of dry socket. Various practical protocols have been studied, both as mouthwash and as intra-alveolar applications using adhesive gel post-surgery (28).

The effectiveness of antimicrobial mouthwash solutions as a preventive measure against alveolar osteitis has been the subject of debate in various studies. Some research with weak control groups has produced conflicting results. However, studies indicate that phenolic disinfectant mouthwash and a 0.2% chlorhexidine solution can reduce the incidence of alveolar osteitis (29). However, neither 0.12% chlorhexidine nor 0.05% cetylpyridinium chloride was found to be beneficial as a preoperative rinse or during surgery concerning the reduction of alveolar osteitis (17). Therefore, the aim of the present study was to evaluate the effectiveness of chlorhexidine use before and after third molar surgery to reduce the incidence of dry socket.

**Materials and Methods**

In this randomized controlled trial (RCT), a total of 105 participants who had either non-impacted or partially impacted mandibular third molars and were referred to the Oral and Maxillofacial Surgery Department of Islamic Azad University of Isfahan were enrolled. The study was approved by the institutional Ethics Committee (Approval Code: IR.IAU.KHUISF.REC.1402.051). Informed consent was obtained from all participants in written form prior to enrollment.

Patient recruitment was conducted using a convenience sampling method. The sample size was calculated based on an alpha level of 0.05, a statistical power of 80%, and an anticipated difference in dry socket incidence between the groups. This calculation determined a need for 35 participants per group, resulting in a total sample size of 105 individuals.

Participants were randomly assigned to one of three groups using a computer-generated randomization sequence to ensure unbiased group allocation.

The inclusion criteria required participants to be between 18 and 40 years of age, presenting with asymptomatic or partially erupting mandibular third molars scheduled for surgical extraction. Exclusion criteria included active pericoronitis, recent use of antibiotics, systemic diseases that could affect healing (such as diabetes), current tobacco use, oral contraceptive use, and sensitivity to any of the study medications**.**

**Surgical and Postoperative Processes**

Preoperative medical history was obtained from each patient using a form that included questions about smoking and the use of oral contraceptives. Clinical and radiographic examinations were performed on the targeted areas. The surgery was performed using



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local anesthetic 2% lidocaine with epinephrine 1:100,000. The inferior alveolar nerve block and long buccal infiltration were done. After that, we irrigated the intrusions with sterile saline, which is 10 mL. The socket was filled with 75 mg tetracycline with foam gel. The incision was closed with silk sutures (3-0).

**Preoperative and Postoperative Medications**

All patients received 800 mg of ibuprofen one hour before surgery and 10 mg of dexamethasone intravenously just prior to the procedure. The administration of dexamethasone was based on previous evidence indicating its effectiveness in reducing postoperative pain and swelling. Based on ethical considerations, in the absence of contraindications, this dose was limited to a single preoperative administration. Following surgery, a reduced dose of methylprednisolone was administered for a period of six days, unless contraindications were present (26).

**Chlorhexidine mouthwash**

The usage of chlorhexidine mouthwash in the subjects was conducted as follows:

Group One: Chlorhexidine was administered twice daily for 7 days before surgery and was discontinued immediately after the operation.

Group Two: Chlorhexidine treatment began on the second postoperative day and continued for 7 days.

Control Group: Normal saline was applied to the surgical site after the extraction.

The timing of chlorhexidine initiation in group number two was designed to prevent any cell-lysing effects during clot formation, which can increase the risk of developing a dry socket.

**Follow-up and Dry Socket Diagnosis**

Follow-up was done for seven days after surgery. During each of the follow-ups, the extraction site was evaluated for any signs of dry socket, including prolonged pain along with a lack of blood clots, foul smell, exposed bone, and necrotic tissues.

The normality of data was checked using the Shapiro-Wilk test. Comparing groups with respect to the revealed data set in SPSS version 27, chi-square, Fisher's exact test, and Kruskal-Wallis tests were used. ($\alpha$=0.05)

**Results**

Based on the chi-square test, there was no statistically significant difference in gender among the three studied groups (p = 0.773). The result of Fisher's exact test showed no significant difference among the three groups regarding oral hygiene status (p = 0.571). According to the chi-square test results, there were no significant differences among the three groups regarding smoking status (p = 0.834), type of tooth extraction (p = 0.759), and the location of the extracted tooth (p = 0.528).

According to the results of Fisher's exact test, there was no significant difference among the three groups regarding the presence of dry socket (p = 1.00). The incidence of dry socket in patients using chlorhexidine before surgery was less than in the other two groups, but the difference was not statistically significant (Table 1).

**Table 1.** The presence of dry socket at the treatment site in patients of the three groups

| Variable | | Chlorhexidine | | Control | P value |
|---|---|---|---|---|---|
| | | Before | After | | |
| | | N (%) | N (%) | N (%) | |
| Dry socket | No | 28 (96.6) | 37 (94.9) | 35 (94.6) | 1.00 |
| | Yes | 1 (3.4) | 2 (5.1) | 2 (5.4) | |

Based on the Kruskal-Wallis test results, there was no significant difference among the three groups regarding the timing of dry socket occurrence (p = 0.933) (Table 2).

**Table 2.** The occurrence time of dry socket at the treatment site in patients of the three groups

| Variable | | Chlorhexidine | | Control | P value |
|---|---|---|---|---|---|
| | | Before | After | | |
| | | N (%) | N (%) | N (%) | |
| Timing of dry socket | None | 28 (96.6) | 37 (94.9) | 35 (94.6) | 0.933 |
| | Day 1 | 0 (0.0) | 1 (2.6) | 0 (0.0) | |
| | Day 2 | 0 (0.0) | 0 (0.0) | 2 (5.4) | |
| | Day 3 | 1 (3.4) | 0 (0.0) | 0 (0.0) | |



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| | | | | |
|---|---|---|---|---|
| | Day 4 | 0 (0.0) | 1 (2.6) | 0 (0.0) |

According to Table 3, gender, hygiene status, smoking, and tooth location did not affect the occurrence of dry socket between chlorhexidine users before and after surgery and the control group.

**Table 3.** Characteristics of patients with dry silent by group

| Variable | | Chlorhexidine | | Control |
|---|---|---|---|---|
| | | Before | After | |
| | | N (%) | N (%) | N (%) |
| Gender | Male | 1 (100) | 1 (50.0) | 1 (50.0) |
| | Female | 0 (0.0) | 1 (50.0) | 1 (50.0) |
| Hygiene status | Poor | 0 (0.0) | 2 (100) | 0 (0.0) |
| | Moderate | 1 (100) | 0 (0.0) | 1 (50.0) |
| | Good | 0 (0.0) | 0 (0.0) | 1 (50.0) |
| Smoking | No | 1 (100) | 2 (100) | 1 (50.0) |
| | Yes | 0 (0.0) | 0 (0.0) | 1 (50.0) |

## Discussion

The results of the present study indicated that the incidence of dry socket in patients using chlorhexidine before surgery was lower than in the other two groups, but this difference was not statistically significant. Additionally, gender, oral hygiene level, smoking status, type of surgery, and surgical site had no significant impact on the occurrence of this complication.

It has been reported that bacterial infection and the release of their byproducts enhance fibrinolytic activity in the extraction socket, resulting in loss of clot integrity and dissolution, which further leads to alveolar osteitis (AO) (30, 31). By decreasing bacterial load and blocking bacterial activity, chlorhexidine (CHX) inhibits the possible increase in fibrinolytic activity following extraction. This results in a decrease in AO development, as was demonstrated in the present study.

In a study by Hita-Iglesias et al. (32), the gel form of CHX was found to be more effective than the mouthwash. This can be explained by the fact that the bio-adhesive gel provides a longer exposure period and releases CHX continuously during the first postoperative day (14). While CHX gel eliminates the need for patient cooperation, it also lacks the tooth discoloration, mucosal irritation, and taste alterations that are side effects reported with rinsing using CHX mouthwash (32).

In a study by Ragno et al. (9), a 0.2% chlorhexidine digluconate mouthwash was shown to reduce dry socket after the extraction of impacted third molars. Berwick and Lessin (33) found that neither of the two mouthwashes tested had a better effect than normal saline in preventing the occurrence of dry socket, which aligns with the results of the present study. Larsen (34) also showed that the use of chlorhexidine gel had no significant effect on reducing dry socket and bleeding complications in patients with bleeding disorders after third molar surgery.

On the other hand, the results of the study by Haraji et al. (19) indicated that the use of chlorhexidine reduces the occurrence of dry socket after third molar extraction. In the study by Babar et al. (35), the incidence of dry socket was reported as 8% in the experimental group and 28% in the control group, which contradicts the findings of the present study. Caso et al. (36) stated that it cannot be determined whether a single rinse with chlorhexidine on the day of surgery significantly reduces the occurrence of dry socket. However, their results indicated that rinsing at least on the day of surgery and several days after tooth extraction reduces the incidence of dry socket associated with the extraction of lower third molars.

Hamid et al. (37) concluded that the use of a 0.2% chlorhexidine gel for preventing dry socket in the extraction of lower third molars could provide better recovery for patients.

A study by Bonine (26) showed that using a 0.12% chlorhexidine mouthwash for two weeks after the extraction of impacted third molars effectively prevents dry socket. Regular use of chlorhexidine in dental clinics can help reduce pain and discomfort for many patients and lower the costs associated with the treatment of dry socket.

The differences in the results of various studies can be attributed to multiple issues in the design of each study and the presence of various uncontrolled variables. These include the involvement of multiple surgeons with varying levels of experience, the inclusion of patients using oral contraceptives without balance, and the assignment of control and



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placebo groups, as well as the lack of any rinsing in the placebo group or the use of a different rinse compared to the experimental group (38).

## Conclusion

The use of a 0.12% chlorhexidine mouthwash does not have a clear effect on reducing dry socket. However, considering the absence of any adverse effects on dry socket and the antimicrobial properties of this mouthwash, its use is not contraindicated in wisdom tooth surgeries.

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