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Comparison of the Efficacy of Alvogyl Paste and Chlorhexidine Gel in Reducing Pain Following Impacted Mandibular Third Molar Surgery

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ABSTRACT

Background and Objective: The common side effects of mandibular third molar surgery are swelling, pain, and trismus, all resulting from tissue inflammation secondary to surgical trauma and the quality of life of these patients has been significantly impacted. This study aims to compare Alvogyl paste and 0.2% chlorhexidine gel (CHX) to evaluate their effects on postoperative pain following third molar surgery due to their antimicrobial and anti-inflammatory properties.

Methods: This study is a randomized single-blind clinical trial conducted from February 2022 to September 2022 on 51 patients with an age range of 18-39 years who required the removal of impacted mandibular third molars and had referred to the Oral Surgery Clinic at the Faculty of Dentistry in Baghdad. The samples were divided into three groups with 17 patients each; in the first group, patients received 0.5 gm Alvogyl paste following third molar surgery while the second group received 1 ml of 0.2% chlorhexidine bio-adhesive gel and the last control group didn't receive any medication following surgery. The pain was assessed and compared daily on two occasions using a numerical rating scale (NRS) throughout the first week following surgery.

Findings: The results of the study on 51 patients showed that there was a statistically significant decrease between the three groups (p=0.001), but especially on the third day, the Alvogyl group compared to the other two groups (5.41±1.12 and 4.0±1.11 and 2.88±2.23) had a significant superiority in terms of pain reduction (p=0.001). In each group, the intensity of pain decreased significantly from the first day to the seventh day.

Conclusion: The results of the study showed that after impacted lower third molar surgery, Alvogyl paste performed better than 0.2% chlorhexidine gel in pain reduction.

Keywords: *Impacted Third Molar, Pain, Chlorhexidine Gel, Alvogyl®.*

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Introduction

Impaction may be defined as the failure of complete eruption of one tooth into a normal functional position within the normal period due to lack of space in the dental arch, caused by obstruction by another tooth or development in an abnormal position (1).

One of the most typical minor oral surgical operations is the surgical extraction of the mandibular third molar which can cause pain, swelling, and limitation in mouth opening. Several factors lead to these conditions; however, they originate from the inflammation that is caused by the trauma of surgery (2, 3).

A variety of techniques has been used to prevent or reduce postoperative swelling, including the use of medications like corticosteroids or non-steroidal anti-inflammatory drugs, biological factors like PRF, and various closure techniques and flap designs (4-6).

Alvogyl is an intra-alveolar addressing material that has been widely used in the treatment of dry sockets. It is known to rapidly provide pain relief and a soothing effect throughout the healing process and is known to reduce postoperative pain following mandibular third molar extractions. Alvogyl paste contains Iodoform (15.8%) as an antimicrobial, Butylparaminobenzoate (25.7%) as an anesthetic, Eugenol (13.7%) which retards the inflammatory process and also relieves the pain by inhibiting the action of prostaglandins, and Penghawar (3.5%) as an anti-inflammatory agent (7, 8).

Chlorhexidine (CHX) is Biguanide-derived and commonly used as a topical antiseptic in dentistry. Chlorhexidine has a high antibacterial effect due to its strong dicationic and molecular structure, which enables it to interact with the anions. It demonstrates a broad antibacterial activity against gram+ and gram- bacteria, fungi, some viruses, and dermatophytes, due to its capability to damage their internal cytoplasmic layer. It exhibits bacteriostatic action at low concentrations and bactericidal action at high concentrations (9). Its most commonly used formulation is a 0.2% intra-alveolar chlorhexidine gel at the bactericidal concentration for reducing postoperative complications, such as alveolar osteitis (10).

The purpose of this study is to compare the efficacy of alvogyl paste and 0.2% chlorhexidine bioadhesive gel on pain following impacted mandibular third molar surgery.

Methods

Study Design and Sample: This single-blinded randomized clinical study was performed on patients attending the Oral Surgery Clinic, Oral and Maxillofacial Surgery Department in the College of Dentistry Teaching Hospita, Baghdad University between the 2nd of February to the 30th of September 2022. Patients were informed about the procedure and written informed consent was obtained from them. The research ethical committee at Baghdad University approved this study (ethical approval code 417121).

This study included a practical sample of 51 patients who needed surgical extraction of a mandibular third molar that was either completely or partially covered by bone (Class I-II and position A-B, according to Pell and Gregory's classification), and who also had good oral hygiene and a surgical site free of active infection.

On the other hand, the study excluded patients with any systemic disease, a recent history of head and neck radiotherapy, pregnancy and female patients taking oral contraceptives, patients that were not capable of coming back for the follow-up visit, cystic lesions or periapical pathology related to the impacted tooth, or any interference with the inferior alveolar nerve, smokers, and patients allergic to the ingredients of alvogyl or chlorhexidine.

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The sample size and allocation were done using a random number generator program (Graphpad). Participants were informed about the different types of treatment but blinded to the assignment.

Fifty-one Patients were divided into 3 groups randomly, each group includes 17 patients: the Alvogyl group, which received (0.5 grams) of Alvogyl paste in the socket (Septodent Inc, Saint-Maur-des-Fossés, France); the chlorhexidine group, which received (1ml) of periokin 0.2% chlorhexidine gel in the socket (Kin Inc, Barcelona, Spain); and the control group, which received nothing after surgery.

Preoperative assessment: Complete history and information were obtained from each patient in a written case sheet that included: name, age, gender, occupation, past medical history, and dental history.

A pre-operative panoramic radiograph (OPG) was obtained to overview the maxillofacial region to show the impacted third molar, the related vital structures such as the inferior alveolar canal, and relevant pathological conditions.

Surgical procedure: The surgery was performed under local anesthesia using 2% lidocaine, and 1.8 ml of adrenaline, with buccal and inferior alveolar nerve blocks. A two-sided flap was reflected, with sufficient bone removal utilizing a low-speed surgical hand-piece; this was obtained by continuous, copious irrigation with normal saline solution during the procedure. When necessary, the tooth was sectioned with a turbine handpiece and removed by elevator, which was followed by complete irrigation and removal of debris. Either (0.5 gm) of Alvogyl paste or (1 ml) of 0.2% Chx gel was then placed inside the socket in the study groups and suturing the flap with interrupted sutures (3-0 braided) black silk as illustrated in figure 1.

The patients were instructed to take only the medication that had been prescribed for them including Augmentin® tab. 625 mg (Amoxicillin 500 mg, Clavulanic acid 125 mg) every 8 hours. In the case of penicillin-allergic patients, they were instructed to take Azithromycin cap. 500 mg 1 tab per day. Analgesic tablets were prescribed (Paracetamol 500 mg), three times per day for all groups.

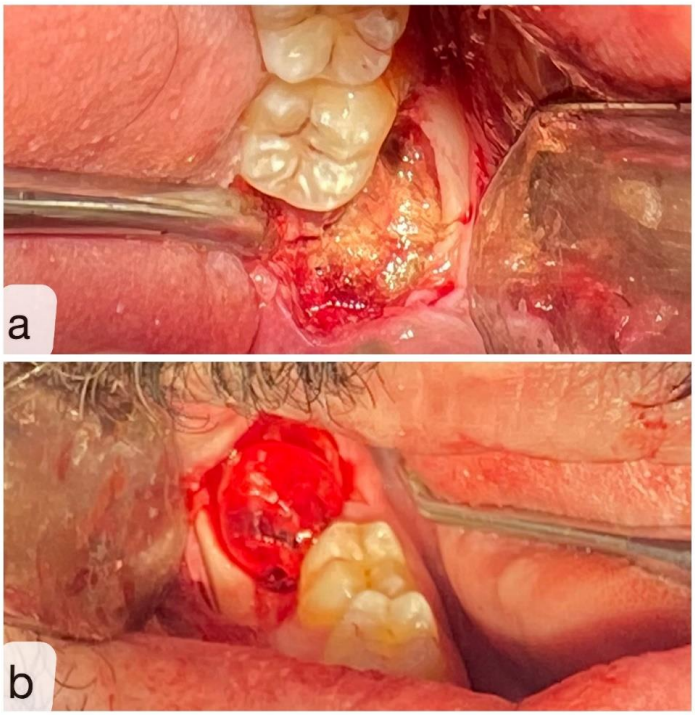

Figure 1. (a): The application of Alvogyl paste to the extraction socket, (b): the application of chlorhexidine gel to the extraction socket

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Pain measurement: The intensity of pain was assessed using the numeric rating scale (NRS), on which extreme scores start from zero (no pain) to 10 (worst pain possible). The recording of the pain was on two occasions, one at 10 o'clock am and the other at 10 o'clock pm at the same time except for the operation day in which the first recording was 4 hours after surgery and the second was at 10 o'clock pm, the mean of two records represented the pain for that day.

The pain was recorded from the day of the operation until the seventh day. NRS was handed to each patient on the day of surgery and the scale was explained to every patient clearly as 0: represents the absence of pain, 1-2: simple pain, 3-4: low pain, 5-6: moderate tolerable pain, 7-8: intolerable severe pain that can be relieved by medication, and 9-10: intolerable severe pain not relieved by medication.

All data were blindly evaluated, supporting the single-blinded design of the study, and were analyzed using SPSS ver.25 software and the Paired T-Test, ANOVA, and Post hoc test (LSD) were used as multiple comparison tests to compare the study groups. $P<0.05$ was considered to be statistically significant.

Results

The study included 51 patients with impacted mandibular third molars; 17 impacted teeth in the Alvogyl group (G I), 17 in the chlorhexidine group (G II), and 17 in the control group (G III). The patient age range was between 18 and 39 years with a mean of 25.69 years and a standard deviation (SD) of ±4.84 years as shown in Table 1.

According to the numerical rating scale (NRS), the comparison between the three groups by pain score for seven days postoperatively showed that pain experienced by patients was significantly lower in both study groups compared to the control group. Especially on the third day, the alvogyl group (5.41±1.12 & 4.0±1.11 & 2.88±2.23) was superior in pain reliving (p=0.001) (Table 2). Alvogyl is better than chlorhexidine in pain reliving but not statistically significant as expressed in Table 3.

Table 1. Comparison of the age distributions of the study groups

Age (Years)	Study Groups			p-value
	G I (n=17) Number(%)	G II (n=17) Number(%)	G III (n=17) Number(%)	
18-25	8(47.1)	9(52.9)	9(52.9)	0.238 NS
25-29	2(11.7)	6(35.3)	5(29.4)	0.238 NS
30-39	7(41.2)	2(11.7)	3(17.7)	0.238 NS

Table 2. Comparison between study groups by pain score for seven postoperative days

Postoperative Pain	Study Group			F	p-value
	G I Mean±SD	G II Mean±SD	G III Mean±SD		
Day One	5.59±2.09[a]	6.41±2.29[a]	8.29±0.98[b]	9.247	0.001 S
Day Two	4.82±2.50[a]	5.47±1.87[a]	7.12±1.26[b]	6.257	0.001 S
Day Three	2.88±2.23[a]	4.0±1.11[b]	5.41±1.12[c]	10.93	0.001

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					S
Day Four	1.71±2.02[a]	1.94±1.47[a]	4.47±1.06[b]	16.15	0.001 S
Day Five	0.59±1.06[a]	1.0±1.27[a]	3.12±1.16[b]	22.81	0.001 S
Day Six	0.18±0.52[a]	0.29±0.68[a]	1.76±1.43[b]	14.18	0.001 S
Day Seven	0.06±0.24[a]	0.12±0.33[a]	0.76±0.83[b]	9.094	0.001 S

Table 3. Post hoc analysis (LSD) to confirm the differences in the mean postoperative pain between study groups

	Study Groups			
Biomarker	**G I**	**G II**	**G III**	**p-value**
	Mean±SD	**Mean±SD**	**Mean±SD**	
1st Day	5.59±2.09	6.41±2.29	-	0.208
	5.59±2.09	-	8.29±0.98	0.001
	-	6.41±2.29	8.29±0.98	0.005
2nd Day	4.82±2.50	5.47±1.87	-	0.338
	4.82±2.50	-	7.12±1.26	0.001
	-	5.47±1.87	7.12±1.26	0.017
3rd Day	2.88±2.23	4.0±1.11	-	0.053
	2.88±2.23	-	5.41±1.12	0.001
	-	4.0±1.11	5.41±1.12	0.012
4th Day	1.71±2.02	1.94±1.47	-	0.665
	1.71±2.02	-	4.47±1.06	0.001
	-	1.94±1.47	4.47±1.06	0.001
5th Day	0.59±1.06	1.0±1.27	-	0.311
	0.59±1.06	-	3.12±1.16	0.001
	-	1.0±1.27	3.12±1.16	0.001
6th Day	0.18±0.52	0.29±0.68	-	0.725
	0.18±0.52	-	1.76±1.43	0.001
	-	0.29±0.68	1.76±1.43	0.001
7th Day	0.06±0.24	0.12±0.33	-	0.752
	0.06±0.24	-	0.76±0.83	0.001
	-	0.12±0.33	0.76±0.83	0.001

Discussion

The results of this study showed that the highest score of pain for all three groups was seen on the 1st day of the operation, then it decreased gradually till the 7th day, as the study findings reveal a significant difference in the scores among groups as GI was the group with the lowest pain score followed by GII while GIII was the group with the highest pain score.

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This result may be due to components of alvogyl that contain eugenol which has sedative, antibacterial, and anodyne effects. Moreover, Alvogyl also contains butamben which is an anesthetic substance along with iodoform which is antibacterial. These properties possessed by Alvogyl make it a suitable dressing material for postoperative pain reliving or for patients suffering from dry sockets.

This study is consistent with a study by Jesudasan et al. in 2015 who suggested the routine use of eugenol-containing paste (Alvogyl) following surgical extraction of a third molar. According to their study, Eugenol group proved to be more effective than chlorhexidine gel and control groups not only in relation to the incidence of alveolar osteitis but also the reduction of postoperative pain (11).

It also agrees with the study of Supe et al. in 2018 who found that the mean VAS scores in Alvogyl treated group were 3.96 and 0.44 on the third and seventh day, respectively after the application of the medication. Lenka et al. in 2019 found that the mean VAS scores were 2.90 and 4.10 in the Alvogyl treated group, and Zinc oxide eugenol-treated group, respectively and both studies concluded that Alvogyl had a faster effect on pain relief than Zinc oxide eugenol in patients with postoperative pain or dry socket (12, 13).

Assari et al. in 2022 found statistically significant differences in pain scores between Alvogyl and Cutanplast after dental extraction. When comparing Alvogyl with Cutanplast, Alvogyl had a faster onset of analgesia. Alvogyl was also able to provide pain relief that was both rapid and long-lasting (14). However, the analgesic effect of chlorhexidine gel can be attributed to its antiseptic quality that reduces the microbial population in the surgical site as well as the inflammatory mediators that are produced as a result of bacterial activity; as a result, the painful inflammatory response is reduced (15).

The result of this study is consistent with the results of a systematic review by Armond et al. in 2017 on 11 studies which suggest that the use of intra-alveolar chlorhexidine gel after surgical removal of mandibular third molars reduces the intensity of postoperative pain when compared to the absence of intra-alveolar medication or to the use of placebo (16).

Zhou et al. in 2017 stated that 0.2% chlorhexidine gel applied only once in the alveolus combined with PRF decreases the incidence of alveolar osteitis following removal of impacted mandibular third molars and significantly reduces post-operative pain (17). Other authors reported no significant differences in the pain reported by the patients during the first postoperative week (18, 19).

This randomized controlled study aims to compare Alvogyl paste and 0.2% chlorhexidine bio-adhesive gel in reducing pain following impacted third molar surgery and found that Alvogyl and chlorhexidine gel significantly reduce postoperative pain compared to the control group, and Alvogyl was superior to chlorhexidine gel in pain reduction; however, no statistically significant difference was found between Alvogyl and chlorhexidine gel groups.

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