

The comparison of anti-inflammatory effect in two methods of topical dexamethasone injection and topical application of ginger aqua-alcoholic extract after removing mandibular wisdom teeth

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Abstract

Introduction: Removing wisdom tooth is one of the most damaging facial surgeries encountered. Dexamethasone is a complex of drugs used that has many side effects. On the other hand, ginger has anti-inflammatory properties without side effects. Therefore, this study compared anti-inflammatory properties of two soft tissue injections of dexamethasone sodium phosphate 1/6 mg, using topical mucobioadhesive containing ginger extract.

Method: 45 healthy patients were selected without any systemic diseases with double-sided wisdom teeth that they intended to have removed. Two-way teeth of the patients were removed by a similar procedure by maxillofacial surgeon. On one side of 2 cm² of mucobioadhesive containing ginger extract (20%) and on the other side, dexamethasone phosphate 1/6 mg was used. The maximal oral opening rate was measured by the researcher before surgery and 24 and 72 hours after surgery to evaluate Trismus.

Results: 45 patients with an average age of 28 years participated in this study. During the measurements, the mean of maximum mouth

opening before teeth removal was 47/48 mm. At the side using the mucobioadhesive containing ginger extract (20%) this value after 24 hours was 39/57 and after 72 hours was 40 mm. At the side using dexamethasone phosphate 1/6 mg this value after 24 hours was 46/42 and after 72 hours was 44/55 mm.

Conclusion: Based on the statistical data obtained from this study, it seems that topical administration of tissue glue containing ginger extract (20%) and soft tissue injection of dexamethasone sodium phosphate (1/6 mg) after surgery both reduced trismus after surgery. But dexamethasone sodium phosphate was slightly more successful than the mucobioadhesive containing ginger extract.

Key words: third molar removal, trismus, mucobioadhesive, ginger, dexamethasone sodium phosphate,

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Introduction

Nowadays, the act of removing wisdom teeth, whether surgically or non-surgically, is one of the most commonly used actions by general and specialized dentists. Many reasons cause patients and dentists to remove the wisdom teeth. In this regard, root analysis of second molar tooth (in case of a false growth pattern of the tooth (horizontally), the formation of cysts and tumors with dental origin around the latent wisdom teeth, which may be benign or malignant depending on the lesion, jaw bone weakening by a latent tooth and lacking the mechanical strength of the jaw bone against impact, and facing irregularity and mess in the rest of the jaw teeth can be observed (1). Also, extensive caries or damage in the pulp of the wisdom teeth due to the difficulty of working conditions and performing root canal surgery on these teeth, as well as weakness, inability of the patient to cooperate or patient's desire, is a preferred decision to remove wisdom teeth. The prevalence of impacted wisdom teeth in the mandible has been reported 31/9% in mandibular left third molar, and 28% in mandibular right third molar. Based on the abundance of data, it includes the following types: The mesioangular impacted teeth (43%), Vertical impaction (38%), distoangular impaction (6%), horizontal impaction (3%). In general, tooth extraction toughness (easy to hard, respectively) is as follows: Vertical, angle to mesial, horizontal, angle to distal (2). In general, the most common problems after removing the wisdom tooth are complications such as pain, swelling, trismus, and the anesthetic of the lingual nerve, infection, etc. which occur due to the trauma to the tissue and the inflammation caused by it (3, 4). Inflammation is the natural defense mechanism of the body to damage or cell death, which is characterized by redness, warmth, pain and swelling in the area (5). When tissue damage occurs, a large amount of histamine, bradykinin, serotonin, and other chemicals are released in the area. These substances, in particular, histamine, cause local vasodilatation, increased blood flow to the affected area, as well as the permeability of the capillaries and venules (6-8). Following this, edema occurs which itself causes the patient's unpleasant experience, pain, disability and possibly greater paresthesia (9). The complications of removing these teeth and surgical pain that occurs in 90% of patients with moderate to severe severity and the effect on the daily activities of the patient, has turned the removal of pain and discomfort into one of the important goals in dentistry. And for many years, science has sought to find ways to reduce pain (10, 11).

In this context, these strategies include less manipulation during surgery, maintaining periosteal health, taking painkillers, corticosteroid injections, etc. (12). Nowadays, drugs such as non-steroidal anti-inflammatory drugs, drug-containing painkillers and corticosteroids, etc. are available to reduce pain and side effects (6). The use of corticosteroid drugs, such as dexamethasone and betamethasone, is also one of the methods for controlling pain, swelling and trismus after wisdom teeth surgery (13, 14). Dexamethasone is a pharmaceutical and long-acting form of corticosteroids (half-life of the plasma is 110-120 minutes and the biological half-life is 36-45 hours). One of the most useful methods

is intraoral injection of dexamethasone, which has already been reported to have an effect on pain and edema caused by dental surgery similar to that of intramuscular injection (15). Therefore, it has a significant effect on postoperative pain and edema. Even mucosal injections are better than muscle injections due to less complications and equal effects (16).

Despite the benefits mentioned, this drug has different short-term and long-term complications (17, 18). The most common side effects of dexamethasone that appear in the short term include euphoria, insomnia, decreased or blurred vision, frequent urination, irritation, excessive thirst, numbness, mental weakness, pain and swelling, allergy, infection at the injection site, pain at the injection site, restlessness, skin rash, redness, eye sensitivity to light, gastrointestinal ulcer and the most important complications are seizure, heart failure, bloody stools, heart rate disorder, muscle pain and muscle weakness, menstrual disorder, nausea and vomiting, pain in the back of the arms, headache, swelling of the legs, etc. (19). Due to its anti-inflammatory effects, dexamethasone is one of the most widely used drugs in Iran and an overdoing process of consuming it has taken place. (20).

Given the complications, new research suggests the use of complementary medicine, especially herbal medicine, as a low-cost treatment with minimal side effects. Ginger is one of the most widely used medicinal plants, which has been introduced in ancient medicine as an anti-inflammatory herb (21). The antioxidant and anti-inflammatory properties of ginger are well known and are influenced by substances such as gingerol in this plant. Its anti-cancer properties have also been proven inside the laboratory. In the process of drying ginger, gingerol is converted to shogaol (22).

Recent research has proven shogaol's properties in preventing Alzheimer's disease. The active compounds of this plant, such as zingerone, shogaol, gingerdion, gingerol have the ability to inhibit the production of prostaglandins and nitrite oxide and even interleukins involved in inflammation. In addition, and more specifically, the enzymes that produce these inflammatory mediators are controlled by the active ingredients of ginger (23).

With regard to the above, and that wisdom teeth surgery is one of the most commonly used traumatic dentistry actions that causes a patient significant inflammation and pain, and on the other hand, suggested strategies to reduce this distressing pain are the use of steroidal anti-inflammatory and non-steroidal anti-inflammatory drugs, which they themselves cause serious damage, including digestive, cardiovascular and bone damage; therefore, considering the anti-inflammatory and analgesic properties of ginger extract which is a medicinal herb with high efficiency and low side effects, it seems that if it is effective, it can replace a harmful steroidal drug. Therefore, this study, by comparing the effect of topical application of ginger aqualcoholic extract with topical injection of dexamethasone 1/6 mg, intends to introduce this method, in case of efficiency, as an alternative to dexamethasone injection.

Materials and Methods

45 patients referred to the Bushehr faculty of Dentistry clinic in 2017 who had double mandibular wisdom teeth and were referred to have a simple tooth extraction (without surgery) or extraction with surgical procedures. The similarity of the two mandibular teeth was determined by an expert Oral & Maxillofacial radiologist through panoramic radiography images and based on the indications in the radiology images and the classifications available in the reference books as well as by a clinical examination by a Oral & Maxillofacial surgeon to make sure that the angle of tooth placement in the jaw, the amount of bone and soft tissue on the tooth, as well as the condition of the tooth is similar to that of the Ramos anterior border. The tooth extraction toughness was determined by the Winter's & Terence guidelines and the Pell-Gregory criteria (24). Patients underwent injections of two carpule of lidocaine anesthetics using the method of inferior alveolar nerve block and long buccal, then teeth were removed by maxillofacial surgeon and under the mucoperiosteal flap cutting procedure (if surgery was required) or by simple dragging. Then, with a random choice based on random numbers, 4 cm² of bioadhesive containing 20% ginger extract was placed in the extracted cavity, or 1/8 ml dexamethasone 1/6 mg was injected there.

Criteria for entering the study:

The patient has a double-sided dental wisdom in the lower jaw (according to the angle of tooth placement in the jaw, the amount of bone and soft tissue on the tooth, the condition of the tooth relative to the Ramos anterior border), and has a tendency to cooperate and has no prohibition of dental surgery and allergy to ginger. The mentioned tooth do not have any pathological lesions in the root zone in clinical and radiographic examinations. Failure to perform any other surgery for at least two weeks.

Criteria for exiting the study:

Systemic diseases, including kidney or liver, bleeding problems such as hemophilia, neutropenia, blood platelet deficiency, etc., previous or current stomach ulcers, any heart disease, known allergies, allergies or individual reactions to each of the medicines used or the medicines that are likely to be used in the study (Ginger, Lidocaine anesthesia, Acetaminophen Codeine 300, Gelofen 400, Amoxicillin 500, and Metronidazole 250 mg), pregnancy and lactation, the use of analgesic or anti-inflammatory drugs 24 hours before the study, taking any anti-inflammatory or analgesic medicine etc., except for the prescribed analgesic substance (acetaminophen Codeine 300 mg), having pain and other inflammatory symptoms including swelling, high blood pressure, any deviations and inability to open the full mouth before the study, smoking or consuming other tobacco products less than a week before the study, smoking or consuming other tobacco products up to two weeks after surgery, alcohol consumption.

The amount of opening the patient's mouth before surgery (Trismus Status Review) was measured and recorded using a tool named "Caliper" in each side, 24 hours and 72 hours after surgery.

The method of data collection and statistical analysis

The method of collecting information in this study field and its tool was a questionnaire, observation and checklist. Descriptive statistics, abundance (percentage) and mean (standard deviation, mean, and range) were used to analyze the data, and for the inflation situation, the McNemar test was used at a significant level of 0.05 and using SPSS V.19 statistical software.

Results

In this study, 45 patients who intended to remove the mandibular double-sided wisdom teeth participated. The mean (\pm standard deviation) age of patients was 28/31 (\pm 6/37) with a min age of 19/00 and a maximum age of 43/00 years.

Maximum mouth opening (the distance between the incisal edges of the upper and lower central incisors in the maximal opening of the mouth) was measured before performing treatment interventions in the patients participating in the study.

During the measurements, the distance between the incisal edges of the upper and lower central incisors in the maximal opening of the mouth before teeth removal was at least 39/00, the most 63/00 mm and the average was 47/48 mm.

In the place where the mucobioadhesive containing ginger extract was used, after 24 hours, these values were 28/00, 58/00 and 39/57 mm, respectively, and 72 hours later, were 22/00, 59/00 and 40/02, respectively. Statistical analysis revealed a decrease in amount of mouth opening within 24 hours and 72 hours after tooth extraction. However, there was no significant difference between the time of follow-up 24 and 72 hours after tooth extraction. (Pvalue=0/518)

Also, in the place where the local injection of dexamethasone sodium phosphate 1/6 mg was done, 24 hours after surgery, these values were at least 29/00, the maximum was 61/00 and the mean of was 46/42 mm; and after 72 hours, were 30/00, 63/00 and 44/55 mm, respectively. Statistical analysis revealed a difference in mouth opening rate in patients receiving dexamethasone sodium phosphate (1/6 mg) during the follow-up period (P value = 0.008) so that after 24 hours the maximum oral contraction showed reduction. Also, the maximum oral opening was lower after 72 hours compared to the first 24 hours, which showed a statistically significant decrease compared to before intervention. (P value (001/0>).

Discussion

After extraction of the mandibular wisdom teeth due to damage to the surrounding tissues and vessels, severe inflammation is caused which causes pain, swelling, and trismus; thus, the medicine used to reduce these symptoms such as trismus is often an injection of dexamethasone anti-inflammatory drug, which has many serious side effects (14, 24). Hence, this study aimed to compare analgesic

Table 1: The average maximal oral opening rate before, 24 hours and 72 hours after the extraction of mandibular wisdom teeth in patients receiving mucobioadhesive containing ginger 20%

Variable	Subgroups	Mean	Standard deviation	Minimum	Maximum
Patients' maximal mouth opening	Before tooth removal	47.48	6.55	39	63
	24 hours after tooth removal	39.57	8.15	26	58
	72 hours after tooth removal	40.02	10.07	22	59

Table 2: The average amount of mouth opening rate before, 24 hours and 72 hours after the extraction of mandibular wisdom teeth in patients receiving dexamethasone sodium phosphate (1/6 mg)

Variable	Subgroups	Mean	Standard deviation	Minimum	Maximum
Patients' maximal mouth opening	Before tooth removal	47.48	6.55	39	63
	24 hours after tooth removal	42.46	7.45	29	61
	72 hours after tooth removal	44.55	7.34	30	63

and anti-inflammatory effects of two methods of injection of dexamethasone sodium phosphate 1/6 mg with topical application of the tissue glue contains 20% ginger extract, which is a herbal remedy that has no side effects, after removing the mandibular wisdom teeth.

In a meta-analysis conducted in 2012 by Sudarshan et al., a large number of clinical studies have shown that ginger has many healing properties. It is used in dentistry in cases of oral mucous membrane *Candida albicans*, inflammation and pain in the oral cavity, herpes virus, and so on. It also has proven anti-cancer properties. But the author himself acknowledges that the effects of this drug in the field of dentistry are certainly more and more important than the ones mentioned and the proof of it, is performing more clinical studies with appropriate design for the use of ginger in different fields, forms and doses (25).

Although many studies have already been done to prove the anti-inflammatory and analgesic effects of ginger and dexamethasone sodium phosphate, according to a study, there was no study that looked at the effects of these two after removing mandibular wisdom teeth, or a study that examined the effects of topical tissue glue containing ginger extract after removing teeth from the jaw.

The results of this study showed that the mucobioadhesive containing ginger extract and topical injection of dexamethasone sodium phosphate had both anti-inflammatory properties to reduce post-surgery trismus, so that in both groups, 24 hours after removal of the teeth, the opening of the mouth was reduced, but 72 hours later the opening of the mouth slightly improved, but still was

less than before the time the teeth came out. Therefore, the present study showed that dexamethasone sodium phosphate was more successful than ginger extract.

The results of using mucobioadhesive containing ginger extract in the present study were consistent with the results of using 500 mg ginger powder capsule compared to ibuprofen and placebo in the study of Najafi et al. Inflation in the ginger consumer group was slightly lower than the ibuprofen and placebo groups; in addition, the maximum oral opening rate was slightly higher in the ginger group than in the ibuprofen and placebo groups. Also, the number of over-taking of acetaminophen codeine in patients with ginger consumption was much lower than the placebo group and slightly higher than the ibuprofen group (26).

On the other hand, the effect of post-surgical dexamethasone sodium phosphate injection in a clinical study conducted by Mung Latt et al. in 2016 on patients with bilateral dental wisdom teeth extracted showed that the use of dexamethasone after mandibular wisdom teeth surgery significantly reduces pain, trismus, swelling and consuming extra analgesics after surgery in patients, compared with placebo. Pain, especially one day after surgery, showed a significant decrease, and the use of excessive analgesics was lower (27).

Statistical analysis revealed a difference in mouth opening rate in patients receiving dexamethasone sodium phosphate 1/6 mg during the follow-up period, in a way that after 24 hours the maximum oral opening rate decreased. In addition, the maximum oral opening after 72 hours compared to the first 24 hours was lower, which showed

a statistically significant decrease compared to before intervention and in fact, there was no improvement in the amount of mouth opening rate on the third day compared to the first day. This was also the opposite of our study's result, and was due to the lower dosage of dexamethasone sodium phosphate (1/6 mg) in our study compared to other studies (4 or 8 mg).

Another study by Bambgose et al in 2005 examined the effect of dexamethasone on trismus and swelling caused by the extraction of latent mandibular wisdom teeth. In this study, 100 patients with unilateral or bilateral teeth participated. On one side, diclofenac potassium was used alone and on the other side, diclofenac potassium was used with dexamethasone 4 mg. The results of the study showed that trismus status in the place where dexamethasone was used was not superior to the other side. Therefore, in this study, the use of dexamethasone did not show any effect on trismus after surgery (28).

In the study of Nawab Azam et al., which was done in the year 2008, the effect of mucosal and intravenous infusion of dexamethasone sodium phosphate after surgery was studied. Twenty patients were randomly divided into two groups of 10. In one group, 8 mg dexamethasone was injected intravenously and another group received 4 mg mucosal dexamethasone. The results showed that both of them had an effect on trismus after surgery, but they were not statistically different (29, 30).

Conclusion

Based on the statistical data obtained from this study, it seems that topical administration of mucobioadhesive containing ginger extract (20%) and soft tissue injection of dexamethasone sodium phosphate (1/6 mg) after surgery both reduced trismus after surgery. But dexamethasone sodium phosphate was slightly more successful than the tissue glue containing ginger extract.

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