

Efficacy of immediate postoperative intramasseteric dexamethasone injection on postoperative swelling after mandibular impacted third molar surgery: A preliminary split-mouth study

Ömür Dereci,¹ Aysegül Mine Tüzüner-Öncül,² Gülperi Kocer,³ Esra Yüce,⁴ Mehmet Askar,⁵ Adnan Öztürk⁶

Abstract

Objective: To evaluate the efficacy of immediate intramasseteric injection of dexamethasone on postoperative oedema.

Methods: The prospective study was conducted at the Department of Oral and Maxillofacial Surgery, Ankara University, Ankara, Turkey, in July 2012, and comprised patients aged 15-32 years who presented for the removal of bilateral vertical impacted mandibular third molar teeth. The right and left impacted third molars of each patient were randomly allocated into study and control groups. The impacted teeth in the study group were extracted with surgical bone removal, and 2ml of 8mg/2ml dexamethasone was injected into the ipsilateral masseter muscle immediately after suturing. In the control group, dexamethasone was replaced with 2ml of sterile saline solution. Postoperative facial oedema was measured with a tape scale by calculating the distance between several facial landmarks on postoperative day 2. SPSS 15 was used for data analysis.

Results: The mean age of 20 patients was 21.35 ± 4.18 years, and there were 9(45%) patients between 15-20 years of age, while 11(55%) were 21-32 years. In terms of gender, 9(45%) patients were male and 11(55%) were female. Postoperative oedema was significantly reduced in the study group compared to the control group ($p < 0.05$).

Conclusion: Immediate intramasseteric injection of dexamethasone was effective in reducing postoperative oedema after mandibular impacted third molar surgery.

Keywords: Dexamethasone, Oedema, Third molar, Intramuscular injection. (JPMA 66: 320; 2016)

Introduction

Oral surgical procedures may result in serious inflammatory reactions in facial structures.¹ Facial swelling is a sign of facial oedema and one of the most frequent complications of impacted third molar surgery. Several techniques such as atraumatic surgical manipulation and low-laser therapy have been proposed to decrease postoperative facial oedema.² Corticosteroids have also been accepted as an effective method for oedema control.³⁻⁵ It is suggested that the perioperative injection of steroids provides adequate plasma concentrations and effectively controls postoperative oedema through an anti-inflammatory action.⁶⁻⁸ However, there are many other methods of administering steroids that have been described in the literature.^{3,6}

Dexamethasone (DX) is a well-known glucocorticoid which suppresses inflammatory responses to injury.⁹⁻¹¹ DX administration has been suggested by many authors for the reduction of postoperative oedema and pain after

impacted third molar surgery.¹²⁻¹⁵

Masseter is a masticatory muscle which is substantially affected by postoperative oedema after impacted mandibular third molar surgery. Intraoral masseteric injection of DX is easy and tolerable and may be an effective route for reducing postoperative oedema by both local and systemic dispersion of DX. Although many different administration methods and dosages have been studied, but intramasseteric application of DX has not been reported so far. The postoperative oedema after third molar surgery is believed to rise to the peak level on postoperative day 2.¹⁶ Impaction of mandibular third molars are commonly seen in Anatolian Region and an effective way to reduce facial oedema after impacted third molar surgery is needed. It is hypothesised that immediate postoperative intramasseteric injection of DX may be effective in reducing postoperative oedema on the 2nd day after mandibular third molar extraction.

Masseteric injection is easy to perform and DX may demonstrate increased anti-oedema activity due to the location of the muscle. Therefore, intramasseteric injection of DX may be as effective as other DX administration methods such as intramucosal and intramuscular injections.

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Faculty of Dentistry, Department of Oral and Maxillofacial Surgery, ¹Eskisehir Osmangazi University, Eskisehir, ^{2,5,6}Ankara University, Ankara, ^{3,4}Süleyman Demirel University, Isparta, Turkey.

Correspondence: Ömür Dereci. Email: omurdereci@hotmail.com

The current study was planned to assess the effectiveness of intraoral postoperative intramassesterc DX injection on the reduction of swelling on day 2 after surgical mandibular third molar extraction.

Patients and Methods

The prospective study was conducted at the Department of Oral and Maxillofacial Surgery, Ankara University, Ankara, Turkey, in July 2012, and comprised patients aged 15-32 years who presented for the removal of bilateral vertical impacted mandibular third molar teeth.

After approval from the institutional ethical board, patients in American Society of Anaesthesiologists grade 1 (ASA-1) referred to our department for the removal of bilateral vertical impacted mandibular third molar teeth (Pell-Gregory Class 1) were included. Patients who were not ASA-1 were excluded. Patient enrolment was done in the first two weeks of the month while data collection was performed in the first and the last two weeks. All patients over 18 years of age signed informed consent forms, while for those below 18 years, the consents were signed by their parents after they were informed in detail about the treatment course and drugs to be used in the study.

Several anatomic landmarks were determined for preoperative and postoperative measurements to assess facial oedema. These landmarks were the commissural abiorum, tragus, lateral canthus and gonion. The study was designed as a split-mouth, single-blinded study in which the patient was blinded but the surgeon was not, and the left and right mandibular impacted third molars of each patient were allocated into the study and control groups through a coin-based randomisation and random numbers randomisation technique. If the right mandibular impacted third molar of a patient was allocated into the study group, the left tooth of the same patient was allocated into the control group. Patients were called for follow-up after two weeks of the surgery. Healing of the surgical wound was evaluated. If the healing was satisfactory, the contralateral impacted third molar was surgically extracted. Two surgeries were performed in each patient with an interval of 2 weeks. Routine impacted third molar surgical procedures with bone removal under 40mg/ml/0.012mg/ml articaine hydrochloride/epinephrine hydrochloride local anaesthesia (Ultracain D-S forte 2ml, Sanofi-Aventis Deutschland GmbH, Germany) were performed by the same surgeon.¹⁵ In the study group, the ipsilateral masseter muscle was located by bidigital palpation and 2ml of 8mg/2ml DX (Dekort, Deva Holding, Istanbul) was injected into the muscle intraorally immediately after tooth extraction. In the control group, ipsilateral intramassesterc injection of 2ml sterile saline

solution (Biofarma, Istanbul) was dispensed immediately after tooth extraction. Placebo injection was given to improve the randomisation strength and blindness of the study. The extent of the facial swelling was determined by distances between pre-set landmarks; commissural abiorum-tragus, lateral canthus-gonion, and commissural abiorum-gonion (Figure). Measurements were performed by a separate examiner with a delicate tape scale (Rollfix®, HOECHSTMASS Balzer GmbH, Germany) preoperatively and on postoperative day 2. All patients received same postoperative medication of 1000mg amoxicillin trihydrate three times a day (Alfoxil 1000mg, Fako Actavis, Istanbul) 550mg naproxen sodium three times a day (Apranax forte 550 mg, Abdi Ibrahim, Istanbul) and chlorhexidine gluconate three times a day (Klorhex 0.2%, Drogosan, Ankara).

Statistical analysis was done using SPSS 15. Non-parametric Mann Whitney U test was used to compare the difference between facial measurements in the study and control groups. Moreover, chi square test was used to determine whether the gender distribution was consistent with the general population. $P < 0.05$ was considered statistically significant.

Results

The mean of the 20 patients in the study was 21.35 ± 4.18 while the median age was 21 years (range: 15-32 years). There were 9(45%) patients in 15-20 age group and 11(55%) in 21-32. In terms of gender, 9(45%) patients were male and 11(55%) were female (Table-1).

Table-1: Demographic data.

Age (Mean; Median)	N	%*
21.35±4.18;21		
15-20	9	45
21-32	11	55
Gender		
Male	9	45
Female	11	55

*:Column percent.

Table-2: Outcome difference between study and control groups.

	Median (cm) (min-max)		Asym. sig.
	Control Group	Study Group	2-tailed
2. Day Measurement			
Tragus-Commissura Labiorum	12.3(10.7-15.8)	11.8(10.7-14.0)	$p=0.001^*$
Gonion-Commissura Labiorum	12.4(10.3-14.2)	10.9(9.2-12.6)	$p<0.001^*$
Gonion-Lateral Cantus	12.8(10.2-14.3)	10.8(9.0-12.1)	$p<0.001^*$

* $p < 0.05$ was considered statistically significant.

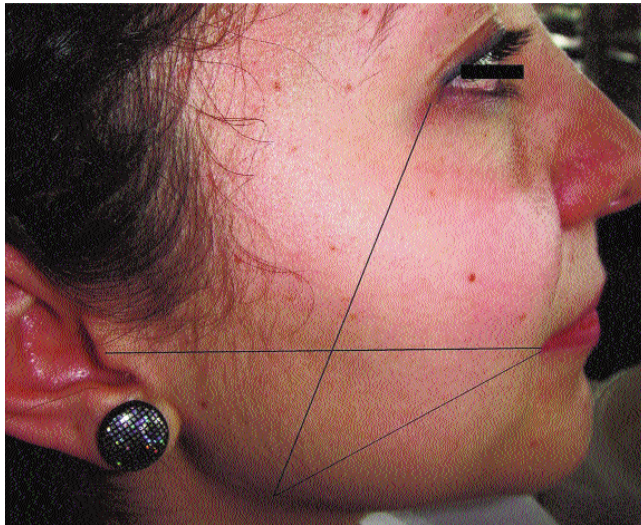


Figure: Distances between gonion-lateral canthus, gonion-comissuralabiorum and tragus-comissuralabiorum were demonstrated with imaginary lines.

Recovery of the surgical sites of all patients was uneventful and no steroid complications, such as muscular necrosis, pruritus, fatigue, nausea or vomiting, occurred. There was no statistically significant difference between gender distribution of the study and the general population ($p > 0.05$). Statistically significant differences were observed between the study and control groups in all day 2 measurements (tragus-comissuralabiorum, gonion-comissurelabiorum, gonion-lateral canthus) (Table-2). Postoperative oedema was significantly reduced ($p < 0.05$) in the study group.

Discussion

Impacted third molar extraction is one of the most common procedures in oral surgery.^{17,18} Several serious or mild complications such as pain, trismus or swelling frequently occur following the surgery. Postoperative oedema is a common complication that may seem important to patients and necessitates intervention.^{14,16} The response to injury after surgery is variable after mandibular third molar extraction and, therefore, the extent or duration of such postoperative oedema is not always predictable. In this manner, several medications are used to control facial oedema in patients who undergo extraction. Oral, intramuscular or submucosal corticosteroids are frequently used to reduce facial oedema and postoperative discomfort. A meta-analysis suggested that perioperative administration of corticosteroids in mandibular third molar surgery has a mild to moderate effect in reducing facial oedema.¹

DX is a synthetic corticosteroid that acts as an inflammation suppressor and decreases facial oedema

after oral surgical procedures. Many studies have reported that DX given perioperatively was effective in reducing postoperative discomfort (pain, trismus and oedema) after impacted third molar surgical extraction.^{12-16,18-21}

Several authors have suggested that the effect of DX is dose-dependent and administration of less than 4mg is not beneficial.^{6,22} A study¹⁴ to evaluate the effectiveness of submucosal administration of 4mg and 8mg dexamethasone reported that there was no statistical difference between the two doses. It has also been reported that submucosal DX application significantly reduced postoperative swelling on postoperative day 2 but not on postoperative day 7.¹⁴ Similarly, in a study,²⁰ 4mg administration of submucosal and intramuscular administration of 4mg DX was compared with the control group. Both were effective in reducing facial oedema on postoperative days 1 and 3, but not on day 7.²⁰ However, there was no difference between submucosal and intramuscular administration. Similarly, intramasseteric injection of 8mg DX reduced facial swelling on postoperative day 2 in the present study. No measurements were done on postoperative day 7, therefore, no comparisons were made of the termination phase of facial oedema.

Measurement of facial oedema can be challenging due to the non-linear and convex profile of the facial tissues. Direct measurements of the distances between pre-set landmarks with tape scales and rulers have also been used reliably by some authors.^{13,14,23} Therefore, as a simple and cost-effective method, a flexible tape scale was used for the measurement of facial oedema in the current study.

In this study, measurements of the gonion-comissuralabiorum, gonion-lateral canthus and tragus-comissuralabiorum distances in the study group on postoperative day 2 were significantly different ($p < 0.05$) from the control group, suggesting a reduction in facial swelling. The results of our study were consistent with other studies in which DX was administered through the intramuscular route.^{16,21} Similarly, a study suggested that preoperative intramuscular injection of 8mg DX significantly reduced facial swelling on postoperative day 2.¹⁶ Intramuscular injection of DX is an easy method of administration and single-dose application produces high plasma concentrations and increases the anti-inflammatory effect of the steroid. A study¹ suggested that immediate intramuscular injection of 4mg DX after surgery is sufficient to decrease postoperative discomfort and oedema.³ In the present study, masseter muscle was chosen for DX injection due to its accessibility and proximity to the operation site. However, it may be difficult to completely understand whether the reduction in facial

oedema is due to the quick systemic dispersion of DX by muscle vascular circulation or the diffusion of the steroid into the submucosal tissues at the time of injection.

In some studies, pain, trismus and postoperative discomfort were also evaluated in addition to facial swelling after DX administration following third molar surgery.^{12,14,19} Although steroids alone do not have analgesic properties, but some degree of reduction in pain usually accompanies their administration.¹¹ Trismus is a result of facial oedema and surgical trauma. Therefore, a possible reduction in trismus may be considered in the case of perioperative corticosteroid administration in third molar surgery. However, it has been reported that perioperative administration of corticosteroids had a limited or insignificant effect on trismus.^{16,19-23}

Only facial oedema was evaluated in this study and the exclusion of the parameters of postoperative pain and trismus is one of the limitations of this study.

Conclusion

Despite the limited sample size of the current study, it can be concluded that immediate postoperative intramassesteric DX injection may reduce facial swelling and oedema after mandibular impacted third molar surgery. Immediate intramassesteric use of DX may be an alternative to other administration techniques. However, larger case series and the addition of more parameters are needed to obtain more definite results.

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