



Effect of Submucosal Injection of Dexamethasone on Postoperative Discomfort after Third Molar Surgery: A Prospective Study

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ABSTRACT

Aim: To evaluate the relative ability of 4 mg dose of intraoperative dexamethasone, administered submucosally, to reduce the postoperative discomfort after third molar surgery.

Materials and methods: A total of 100 patients requiring surgical removal of a single mandibular third molar were included. The experimental group (50) received dexamethasone 4 mg as submucosal injection and control group (50) received no drugs. The maximum interincisal distance and facial contours were measured at baseline and at postsurgery days 2 and 7. The measurement of pain was done using visual analog scale (VAS).

Results: None of the patients developed wound infection or any serious postoperative complications. Postoperative edema tended to be less severe on the second postoperative day in the experimental group and the result was statistically significant. There were no significant differences in the reduction of pain and trismus between the two groups studied.

Conclusion: Submucosal administration of dexamethasone sodium phosphate (4 mg) results in reduction of postoperative edema, comparable with or greater than other routes of administration. Presumably, a higher effective drug concentration at the site of injury without loss due to distribution to other compartments may be achieved, and the submucosal route is convenient for both the surgeon and the patient.

Clinical significance: Submucosal route of administration of dexamethasone (4 mg) is effective in reducing postoperative discomfort after third molar surgeries.

Keywords: Submucosal route, Randomized controlled trial, Corticosteroids, Postoperative edema, Extraction.

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INTRODUCTION

The extraction of impacted lower third molars is the most common operation in oral surgery, and usually produces pain, trismus and facial swelling in the postoperative period.¹ The surgical removal of impacted third molars involves trauma to soft and bony tissue and can result in considerable pain, swelling and trismus. These postoperative sequelae can cause distress to the patient and affect the patient's quality of life after surgery. Thus, many clinicians have emphasized the necessity for better discomfort control in patients who undergo third molar surgery, and several types of medications have been proposed.²

The use of corticosteroids as anti-inflammatory agents in dental practice began in the 1950's with the administration of hydrocortisone to prevent inflammation in oral surgery. A single glucocorticoid dose inhibits the synthesis and/or release of proinflammatory and inflammatory mediators in a variety of surgical procedures, with a reduction of fluid transudation and therefore edema. This effect is well known and has been widely used to reduce swelling associated with the surgical extraction of impacted third molars. Prolonged corticosteroid use can delay healing and increase patient susceptibility to infection. The glucocorticoids most widely used in oral surgery are dexamethasone (po), dexamethasone sodium phosphate (intravenous and intramuscular), dexamethasone acetate (intramuscular), methylprednisolone (po), and methylprednisolone acetate and methylprednisolone sodium succinate (intravenous and intramuscular).¹

Postoperative swelling and edema may be due in part to the conversion of phospholipids into arachidonic acid by phospholipase A₂, and the resultant synthesis of

prostaglandins, leukotrienes or thromboxane-related substances act as mediators of the inflammatory response. These symptoms are not observed immediately after surgery but rather begin gradually, peaking 2 days after the extraction. Corticosteroids such as dexamethasone may inhibit the initial step in this process and have been extensively used in varying regimens and routes to lessen inflammatory sequelae after third molar surgery.²

Therefore, the present study was conducted to evaluate the relative ability of 4 mg dose of intraoperative dexamethasone, administered submucosally, to reduce the postoperative discomfort after third molar surgery.

MATERIALS AND METHODS

In this randomized, controlled trial, a total of 100 patients requiring surgical removal of a single mandibular third molar, under local anesthesia were selected from the Department of Oral and Maxillofacial Surgery. The patients were randomly allocated to two groups, experimental group and control group with 50 patients in each group, by toss of a coin. After ethical approval, the purpose and design of the study was verbally explained to the patients and written informed consent was obtained.

Patients aged 18 years or more, teeth free from caries and are asymptomatic were included in the study. Patients with presence of systemic diseases, any existing periodontal disease, using antibiotics or anti-inflammatory drugs 2 weeks prior to the study, pregnant or lactating mothers were excluded from the study.

After the onset of local anesthesia, the experimental group received dexamethasone 4 mg as submucosal injection and the control group received no drug. Standard surgical and analgesic protocols were followed. The maximum interincisal distance and facial contours were measured at baseline and at postsurgery days 2 and 7. The measurement of pain was done using visual analogue scale (VAS).³

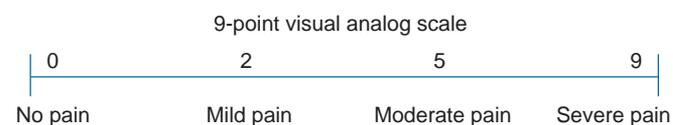
Preoperative Assessment

Mouth-opening was measured as the maximum distance between upper and lower central incisors using Vernier calipers. Facial swelling was evaluated by measurements made between three reference points: Tragus, pogonion and the corner of the mouth. Prophylactic preoperative dose of oral antibiotics (1 gm, amoxicillin) was given 40 minutes before the surgery. Postoperative antibiotics were not prescribed. Postoperatively oral analgesics (Diclofenac sodium, 75 mg twice/day for 3 days) were given.

Postoperative Assessment

Trismus and facial edema were measured on 2nd and 7th postoperative day [and it was recorded as the difference between preoperative (baseline) and postoperative values].

Postoperative pain was rated using a 9-point VAS anchored by the verbal descriptors 'no pain' (0), 'mild pain' (2), 'moderate pain' (5) and 'severe pain' (8).



RESULTS

At follow-up, no patients developed wound infection or serious postoperative complications. In all groups, facial swelling was most severe on the 2nd day after surgery and began to return to normal baseline facial contour by the 7th day postoperatively. The differences in edema between the two groups observed over time are given in Table 1. Postoperative edema tended to be less severe in the study groups receiving dexamethasone and statistically significant differences were observed between the groups, on the 2nd postoperative day. Evaluation of postoperative swelling on the 7th day showed no statistically significant difference between the groups.

There was no significant difference with respect to pain, in the groups studied (Table 2). The differences in the amount of trismus was not significant between the two groups at days 2 or 7 (Table 3).

DISCUSSION

The surgical removal of third molars is often associated with severe postoperative discomfort, even when teeth are removed using a gentle surgical technique.⁴ Thus, many clinicians have attempted to reduce the postsurgical sequelae by using anti-inflammatory drugs.⁵ The anti-inflammatory efficacy of corticosteroids has led to their widespread use when third molars are removed.^{6,7} Corticosteroids such as dexamethasone and methylprednisolone have been used extensively in dentoalveolar surgery due to their nearly pure glucocorticoid effects, virtually no mineralocorticoid effects, and the least adverse effects on leukocyte chemotaxis.⁸ Literature is rich with reports of the parenteral corticosteroid use in oral surgery, but data on the intraoral and submucosal administration route is scarce. Only one study has reported regarding the submucosal administration, and the investigators noted limited responses to single low doses of steroids.⁹

Table 1: Comparison of the facial edema among the two groups

Time	Control group (n = 50)		Study group (dexamethasone mg) (n = 50)		p-value
	A mean (SD)	B mean (SD)	A' mean (SD)	B' mean (SD)	
2nd postoperative day	115.76 (6.61)	137.96 (10.58)	111.02 (5.79)	133.57 (10.31)	0.000 (A and A') and 0.038 (B and B')
7th postoperative day	113.65 (6.27)	135.73 (10.37)	110.84 (5.75)	130.8 (20.08)	0.022 (A and A') and 0.129 (B and B')

Table 2: Comparison of the pain scores among the two groups

Time	Control group (n = 50), mean (SD)	Study group (dexamethasone 4 mg) (n = 50), mean (SD)	p-value
2nd postoperative day	3.73 (1.56)	3.1 (1.70)	0.054
7th postoperative day	1.98 (1.49)	1.27 (1.11)	0.009

Table 3: Comparison of the trismus among the two groups

Time	Control group (n = 50) mean (SD)	Study group (dexamethasone 4 mg) (n = 50), mean (SD)	p-value
Preoperative	43.12 (6.72)	42.27 (6.78)	0.532
2nd postoperative day	35.24 (7.47)	35.31 (8.01)	0.965
7th postoperative day	36.78 (6.48)	37.76 (6.46)	0.447

A study reported no benefit after administration of 4 mg of intravenous dexamethasone immediately before surgery, and such a dosage is widely recognized as subtherapeutic.¹⁰ In contrast, Messer and Keller noted a predictable decrease in postoperative discomfort by using 4 mg of intramuscular dexamethasone immediately after surgery. In a well-conducted trial with patients serving as their own control, the effect of dentoalveolar application of two different doses of dexamethasone powder (4 and 10 mg) and submucosal injection of dexamethasone 4 mg, in 43 subjects undergoing bilateral surgical extraction of lower third molars was investigated.¹¹ With regard to the edema analysis, each treatment subgroup showed a reduced postoperative degree of edema compared with the control group, which was as highly significant on the 2nd postoperative day as after 1 week. Moreover, from this study no significant difference was observed between treatment regimens. Similar findings were found in the present study, the submucosal administration of dexamethasone 4 mg resulted in a highly significant decrease in edema on the 2nd postoperative day.

Corticosteroids are primarily used after surgical procedures for suppressing tissue mediators of inflammation, thereby reducing transudation of fluids and lessening edema.^{12,13} Although some reduction of postoperative pain generally accompanies a reduction of edema, steroids alone do not have a clinically significant analgesic effect.

In a recent study, it has been shown that dexamethasone administered in a dose of 4 mg orally at 12 hours and 4 mg intravenously, 1 hour before third molar surgery does not suppress PGE2 release sufficiently to produce analgesia after anesthetic offset.¹⁴ It has also been stated that the administration of a glucocorticoid for analgesia after minor surgery such as the removal of impacted third molars is not indicated. Like previous reports,^{6,15} our data were unable to show that administration of a steroid significantly reduced pain. Moreover, the perioperative treatment with a corticosteroid had a limited and nonsignificant effect on trismus when compared with the control group at the two times of evaluation. It has also been reported that the topical injection of dexamethasone 4 mg reduced neither trismus nor patient's pain perception compared with the control group.¹¹

Tissue injury from any source almost always evokes an inflammatory response. Five stages of inflammation have been described and it has been reported that glucocorticoids are capable of blocking all the steps in the inflammatory response. They inhibit prostaglandin synthesis by blocking arachidonic acid, from cell membrane phospholipids.^{13,16}

Our study shows that the perioperative use of 4 mg dexamethasone injected submucosally reduces postoperative edema (2nd postoperative day) after third molar surgery.

CONCLUSION

The results of this study provide a basis for the submucosal administration of corticosteroids such as dexamethasone

sodium phosphate in lower (4 mg) than usual (8 mg) doses to achieve reduction of postoperative edema comparable with or greater than other routes of administration. Presumably, injection of low-dose dexamethasone in the surgical site achieves a higher effective drug concentration at the site of injury without loss due to distribution to other compartments or the onset of elimination. Moreover, when surgical removal of the third molar is performed under local anesthesia, it is convenient for both the surgeon and the patient to use the submucosal route, as effectiveness of the oral administration route depends on patient compliance, and repeated dose is required to maintain adequate blood levels during the postoperative period.

CLINICAL SIGNIFICANCE

Submucosal route of administration of dexamethasone (4 mg) is effective in reducing postoperative discomfort after third molar surgeries.

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