

Original Research Article

Effects of submucosal dexamethasone in minimizing postoperative pain, swelling and trismus in lower third molar surgery: a randomized double-blind study

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ABSTRACT

Background: Aim of the study was to evaluate the efficacy of 8 mg pre-operative submucosal dexamethasone administered in the vicinity of lower third molar in reduction of post-operative pain, swelling and trismus after trans-alveolar extraction.

Methods: This randomized prospective double-blind study included 60 ASA grade I patients with moderately difficult impaction (according to winter's war line and Pell and Gregory's classification). Patients were randomly divided into two groups. Group A (study group) patients received 8 mg of submucosal dexamethasone immediately after the onset of local anesthesia and group B (control group) received 2 ml of normal saline (placebo) respectively. Assessment of swelling, mouth opening, and pain was done at intervals of 1st, 3rd, and 7th post-operative days.

Results: There were 24 (80%) males and 06 (20%) females in group-A and 22 (73.3%) males and 8 (26.7%) females in group B. Administration of pre-operative submucosal dexamethasone had statistically significant effect in reduction of pain, swelling and trismus in all the postoperative evaluation days ($p < 0.05$) as compared to control group.

Conclusions: Pre-operative 8 mg submucosal dexamethasone injection in the vicinity of impacted lower third molar, is significantly effective in reduction of postoperative pain, swelling and trismus.

Keywords: Trans-alveolar surgery, Dexamethasone, Trismus

INTRODUCTION

Trans-alveolar extraction of mandibular third molars is probably the most common surgical procedure which causes the post-operative pain, trismus and swelling.¹ Trans-alveolar extraction is an invasive procedure and body's natural defense mechanism to cell injury and death is inflammation. This response is manifested by the release of large quantities of histamine, prostaglandins, bradykinins, serotonin, and other substances into the surrounding area.² Bradykinin and kallidin are two kinins that act independently as well as synergistically with

products of the arachidonic acid cascade to produce both hyperalgesia as well as increased vascular permeability. The inflammatory process is necessary for healing, but often excessive inflammation causes the patient unnecessary pain, swelling and trismus.³

Studies have shown that postoperative complications and symptoms associated with trans-alveolar extraction require adequate anti-inflammatory therapy.⁴ The anti-inflammatory and immune-modulating effects of glucocorticoids have been known for decades and have found extensive therapeutic use in a wide range of

diseases in which inflammatory response is a main feature.⁵ Suppression of each stage of inflammatory response appears to be the major action of glucocorticoids. Major pharmacological action of glucocorticoids in reducing the inflammatory response, is by inhibiting the production of vasoactive substances such as prostaglandins and leukotrienes as well as decreasing the number of chemical attractants such as cytokines.⁶

Various steroids preparations and routes of administration have been evaluated to decrease the inflammatory sequelae following third molar surgery.⁷ Submucosal dexamethasone is an effective alternate to dexamethasone given systemically. Studies have shown that there is a significant reduction in the amount of swelling, pain and trismus after submucosal dexamethasone. This technique is convenient for the surgeon as the injection is given in the region of the surgery and no specific tools are required. This technique is also convenient for the patient as it is quite simple, less invasive, injection is given into the anesthetized area and offers a low-cost solution for the typical discomfort associated with trans-alveolar extraction of lower third molars. Submucosal injection offers the advantage of concentrating the drug near the surgical area with less systematic absorption.⁸ Many studies have determined the effectiveness of steroids after surgical procedures, but currently there is no standard dosing regimen for oral and maxillofacial surgeons to follow. This prospective randomized double-blind study is to evaluate the efficacy of single dose (8 mg) dexamethasone administered submucosally in reduction of post-operative pain, swelling and trismus in relation to lower third molar surgery by comparing it to control group.

METHODS

In this randomized double blind prospective study, a total of 60 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 (group A and group B), experimental group and control group with 30 patients in each group, with the help of chits. Both men and women participated in the study. After obtaining the permission from ethical committee, the aim, objective and design of the study was explained to the patients and written informed consent was obtained.

Patients aged between 18-40 years, who are healthy, ambulatory in ASA grade-I with asymptomatic tooth and have a moderately difficult (Pederson 1988) impacted lower third molars, were included in the study. Patients with systemic diseases, any existing periodontal disease or anyone took antibiotics or anti-inflammatory drugs within 2 weeks of the study, pregnant or lactating mothers were excluded from the study. Patients who

refused to take part in the study or used any other drug during observation period were also excluded.

Pre-operative assessment

For standardization of the sample the degree of surgical difficulty of the impacted tooth was assessed on the pre-surgical OPG using winter's war lines and Pell and Gregory criterion and was categorized by Pederson's difficulty index. Pre-operative tracing of the impacted tooth was done upon the OPG using acetate paper (Figure 1). Mouth opening, taken as the maximum distance between the incisal edges of maxillary and mandibular incisors, was measured with scale in mm. Measurement of facial swelling was made only in one dimension, between 2 reference points: most prominent point in the middle of ear lobule and corner of the mouth (Figure 2). These preoperative measurements were considered as the baseline for that particular case.



Figure 1: Preoperative OPG evaluation.



Figure 2: Measurement of facial swelling in one dimension.

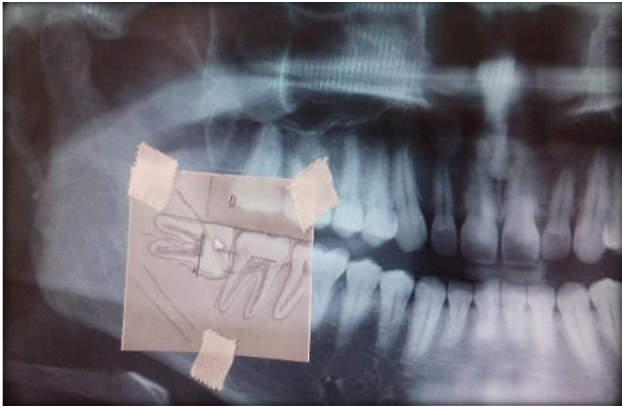


Figure 3: Pre-operative radiographic evaluation.



Figure 4: Extra-oral swelling evaluation.

Surgical technique

Local anesthesia was given as inferior alveolar, lingual and buccal nerve block using 2% lignocaine HCl in 1:80000 adrenaline. A single surgeon performed all the trans-alveolar surgeries. Before the surgery all the patients were made to rinse their mouth with 15 ml of 0.2% chlorhexidine solution for one minute prior to administration of local anesthesia. After the onset of local anesthesia, the experimental group (Group A) received 8 mg (2 ml) dexamethasone as submucosal injection and the control group (Group B) received 2 ml saline.

Ward's incision was given and full thickness mucoperiosteal flap was raised. Buccal guttering was performed with the help of round bur under continuous saline irrigation. Sectioning of the crown or roots was performed as required. After complete removal of the tooth, the remaining dental follicle was curetted out and sharp margins were smoothened with bone file. The socket was closed with interrupted sutures using 3-0 black silk. Sterile gauge pack soaked in saline was placed over the surgical site as pressure pack. Sutures were removed on the 7th post-operative day. The duration of operation was taken from starting from incision to the last suture. Postoperative antibiotics (Amoxicillin 500 mg

plus clavulanic acid 125 mg TDS) and analgesic (Tab paracetamol plus ibuprofen TDS) were prescribed for the first three days followed by as required for the pain relief. The day after surgery, the patients were instructed to start with warm saline rinses 3 times a day for one week. Before discharge, patients were given a questionnaire containing a 5-point scale to record pain levels. Patients were instructed to avoid any drugs other than those prescribed and not to seek medical help elsewhere for post-operative problems. They were also informed to return for evaluation on 1st, 2nd and 7th postoperative days. Clinical measurements of mouth opening and facial contours were noted on these appointments.

Assessments

Pain assessment

Pain was assessed using a five point category rating scale (Table1). Pain was recorded as: "0-no pain" (patient feels well), "1-mild pain" (patient feels pain even if concentrating on some activity), "2-moderate pain" (patient is disturbed but can continue with normal activities), "3-severe pain "(patient is forced to abandon normal activities), "4-very severe pain" (patient must abandon every type of activity and feels the need to lie down).

Table 1: Pain assessment.

Scores	VAS scale to evaluate pain	Reference values given to patients
0	No Pain	The patient feels well
1	Slight pain	If patient is distracted, he/she does not fell pain
2	Mild pain	The patient feels pain even if concentrating on some activity
3	Severe pain	The patient is very disturbed but can continue with normal activity
4	Very severe pain	The patient must abandon every type of activity and normal activity and feels the need to lie down

Measurement of facial swelling

Facial swelling was evaluated by a flexible scale in millimeters (Figure 2). Measurement was made between two reference points: most prominent point in the middle of ear lobule and the corner of the mouth.

Assessment of mouth opening

To measure the maximum mouth opening ability of the patient the reference points used was the incisal edge of the maxillary central incisor and the incisal edge of the mandibular central incisor at maximal opening available. The measurements were measured by a ruler (to the

nearest mm). Postoperative trismus was measured as decrease in mouth opening.

At the initial visit and at post-surgery days 1st, 2nd and 7th, information was recorded by a single clinical examiner. The questionnaire regarding pain assessment was collected on the 7th postoperative day after being duly signed by the patient.

Statistical analysis

Data collected was analyzed using student's paired-t test and ANOVA (SPSS-data analyst).

RESULTS

Pain

The difference in mean VAS between group A and group B on 1st and 2nd day were found to be statistically significant ($p < 0.001$) but on the 7th post op it was statistically non-significant ($p > 0.84$) (Figure 5).

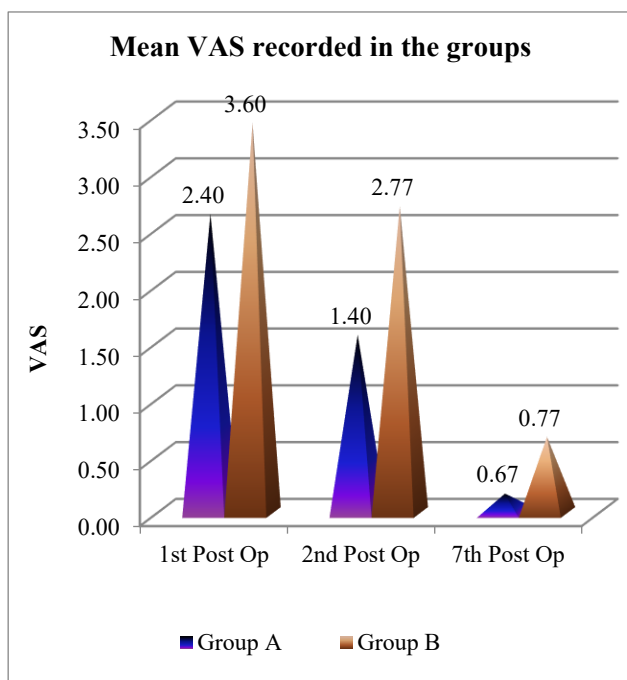


Figure 5: Mean VAS recorded in the groups.

Swelling

The difference in mean swelling between group A and group B on 1st, 2nd and 7th post op day was found to be statistically significant ($p < 0.01$, 0.001 and 0.05 respectively) (Figure 6).

Mouth opening

The difference in mean Trismus between group A and group B on 1st, 2nd, and 7th post op day was found to be statistically significant ($p < 0.001$) (Figure 7).

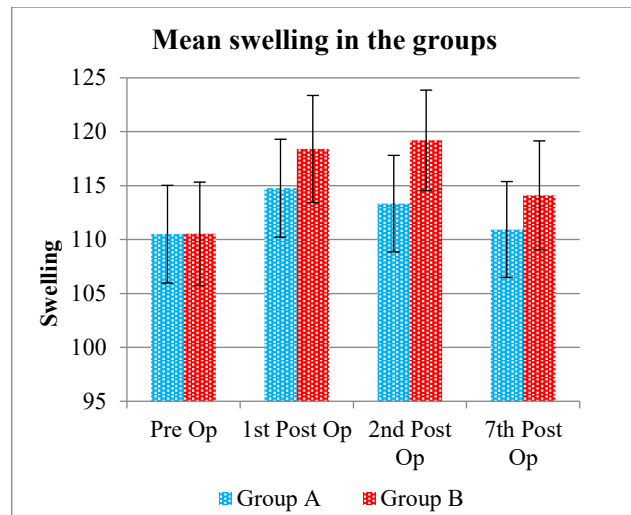


Figure 6: Mean swelling in the groups.

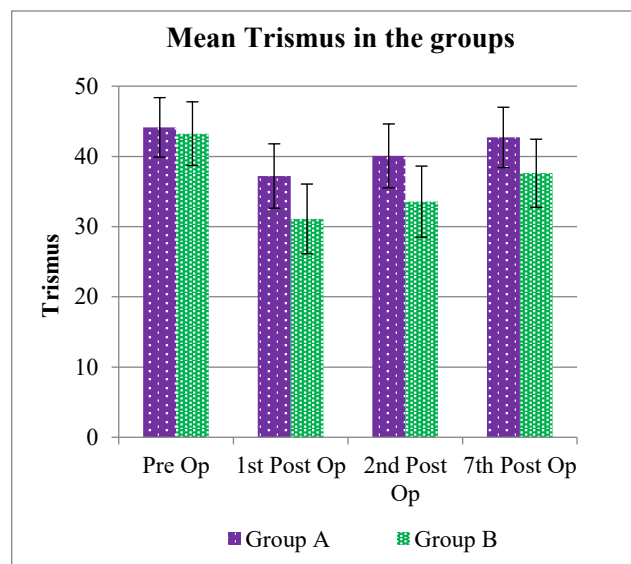


Figure 7: Mean trismus in the groups.

DISCUSSION

Inflammatory process is an essential part of postsurgical healing after oral and maxillofacial surgery procedures, once initiated it may exceed the necessary physiological limits and result in excessive swelling, pain, and trismus. There has been a constant search for ways to control the inflammatory process.

For more than 40 years, corticosteroids have been used in an attempt to minimize or prevent postoperative sequelae after surgical removal of impacted third molars. Corticosteroids block the activity of phospholipase A2, thus inhibiting the release of arachidonic acid from cell membranes and synthesis of prostaglandins, leukotrienes and thromboxanes.⁴ Several studies have been published in the literature on this subject. Most studies have reported that steroids significantly reduce the pain, swelling and trismus while a few have shown no benefit

from the administration of steroids.⁹ These studies are difficult to compare because a variety of steroids were evaluated using dissimilar study designs and methods of evaluating pain and swelling.^{10,11}

Submucosal dexamethasone is an effective alternative to dexamethasone given systemically. In this study, local infiltration of the dexamethasone around the site of surgery was chosen as it is expected to provide a repository effect in a way similar to the intramuscular route (i.e., slow absorption and prolonged duration of action). In addition, infiltration does not require clinician's expertise or additional armamentarium.¹² However, the clinician's experience, the patient's discomfort and the added armamentarium may be a hindrance in using the intravenous route. This technique is also convenient for the patient as it is quite simple, less invasive, injection is given into the anaesthetized area (painless) and offers a low-cost solution for the typical discomfort associated with the extraction of impacted lower third molars. Sub-mucosal injection offers the advantage of concentrating the drug near the surgical area with less systemic absorption.⁸

Dexamethasone has been used extensively in dento-alveolar surgery due to their purely glucocorticoid effects virtually no mineralocorticoid effects and the least adverse effects on leukocyte chemotaxis.^{8,9} Dexamethasone has a longer duration of action and is considered more potent than other glucocorticoids. We gave dexamethasone in a single dose in order to minimize the potential side effects. This dosage (8 mg) and duration of dexamethasone administration does not suppress the adrenal glands and therefore poses no risk of stress intolerance.¹³

Our randomized double-blind study investigates the efficacy of sub-mucosal dexamethasone administration on reduction of postoperative edema, trismus and pain following surgical removal of impacted mandibular third molars. Post-operative measurements of swelling, assessment of pain and trismus showed improvement with sub-mucosal dexamethasone. Several investigators have reported limited responses to single low doses of steroids. Neupert et al noted no benefit in swelling after administration of 4 mg of intravenous dexamethasone immediately before surgery, and such a dosage is widely recognized as sub therapeutic.¹⁴ In contrast, Messer and Keller noted a predictable decrease in postoperative swelling and discomfort by using 4 mg of intramuscular dexamethasone immediately after surgery.⁶ Skjelberg described a 55% reduction of swelling with 9 mg intramuscular betamethasone just before the operation.⁷ Beirne used a single dose of 125 mg methylprednisolone given by intravenous injection.¹⁵ In agreement with the other studies, our data shows that the submucosal administration of dexamethasone 8 mg resulted in a highly significant decrease in swelling on 1st, 2nd and 7th postoperative day as compared with control group.^{12,16} Acute postoperative pain following third molar surgery is predominantly a consequence of inflammation caused by tissue injury.^{11,17-21} The role of corticosteroids in

preventing post-surgical pain is controversial. Corticosteroids alone do not seem to have a clinically significant analgesic effect, but it has been reported that steroids can be related to a reduction in the number of analgesic tablets used after surgical extraction.^{15,17,21} Dionne et al used 4 mg of dexamethasone given 12 hours before and just after third molar surgery in 33 patients, 28 received a placebo control. As markers of the extent of inflammation, samples of prostaglandin E2 (PGE2) and thromboxane B2 (TxB2) were collected over time at the mandibular surgical sites. Dexamethasone significantly decreased the levels of PGE2 and TxB2, but had a minimal effect on reported pain on the day of surgery.¹⁸ Tiwana et al reported that the administration of IV corticosteroids before third molar surgery offers a beneficial effect on health-related quality of life, we agreed with this, because having less swelling, pain and trismus the patient can return to his normal life.^{19,22}

CONCLUSION

Third molar surgery is a traumatic procedure and the most common in oral and maxillofacial surgery field. Being a highly vascularized area, predominantly constituted by loose connective tissue, a series of functional and structural alterations is expected among them of which, swelling, pain and trismus is most common. From our study, we conclude that the single pre-operative dose of submucosal dexamethasone effectively improves the postoperative quality of life in the trans-alveolar extractions of impacted lower third molars.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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