



Efficacy of Pre-Operative Submucosal Injection of Dexamethasone in Mandibular Third Molar Surgery: A Randomized Control Trial

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INTRODUCTION: Surgical extraction of third molar irrespective of any technique results in postoperative pain, swelling of face and limited mouth opening. The aim of the present study was to assess and compare the effects of Dexamethasone (4mg) administered prior to surgery.

MATERIALS AND METHOD: A randomized control trial was conducted which included a total of fifty patients. All the patients were randomly put in two groups of twenty five each. Group I patients underwent transalveolar extraction of third molar under local anesthesia and standard oral drug regime. Group II patients received an additional submucosal injection of dexamethasone 4 mg, thirty minutes prior administration of local anaesthesia. Pain, swelling and mouth opening was recorded on second, seventh and tenth post-operative days after surgery.

RESULTS: The difference in pain scores on second post-operative day between two groups were found statistically non-significant. However, there was significant reduction in pain scores on seventh and tenth day in both groups. Mouth opening showed statistically significant difference between the two groups.

CONCLUSION: The observations of the present study provide a fundamental basis for the use of corticosteroids such as dexamethasone sodium phosphate in the form of submucosal administration in lower than usual doses to decrease postoperative inflammation when compare to other routes of drug administration.

KEYWORDS: Corticosteroids, Dexamethasone, Impacted third molar

INTRODUCTION

In oral cavity, mandibular third molar is one of the commonly impacted tooth.¹ There are various reasons for impaction of a tooth but the lack or loss of space in the arch is the major cause.² It can be due to combination of genetic and environmental factors resulted in discrepancy in size of tooth and jaw. In most of the cases, impacted mandibular molar are asymptomatic but pathology can develop in some cases. The problems associate with molars can be from simple dental caries to more complex conditions such as formation of cyst or development of malignant lesion in the follicular tissue surrounded by the tooth.³ Therefore extraction of impacted third molars is necessary and it is the most common practice in speciality of oral surgery so that prevent the suspected pathology before its arousal.⁴ Surgical extraction of third molar irrespective of any technique results in postoperative pain, swelling of face and limited mouth opening.⁵ There are various measures to alleviate the pain, swelling and trismus which includes application of cold or heat, oral or intravenous non-steroidal anti inflammatory agents (NSAIDs), corticosteroids.⁶

Many researchers suggested use of local injection of

steroid to overcome post-operative inflammation of surrounding tissue.⁷⁻⁹ However, use of local or systemic steroid have some side-effects such as risk of infection, hyperglycemia and suppression of immune system.¹⁰ Surgical extraction of impacted molar associates with injury to surrounding soft and bony tissues and may result in pain, swelling and trismus. These symptoms commonly arise after two days of extraction.¹¹ The sequel after surgery may hamper the patient's quality of life.

Synthetic corticosteroid, dexamethsone has good anti-inflammatory action. Its potency is 20-30 times when compared to natural corticosteroid. Alexander and Thronson observed use of many combination of Dexamethasone based on past literature.¹²

For many years, oral surgeons administered intravenous corticosteroids preoperatively or just after extraction of third molar in order to decrease inflammation and other associated symptoms of surgery. Various studies have suggested use of NSAIDs drugs is effective for controlling swelling and trismus.^{13,14} The aim of the present study was to assess and compare the effects Dexamethasone (4

mg) administered prior to surgical third molar surgery.

MATERIALS AND METHOD

A randomized control trial was conducted which included a total of fifty patients who reported to the Department of Oral and Maxillofacial Surgery in a Dental College & Hospital, Jaipur, Rajasthan.

Inclusion criteria

- Patients were 15 to 40 years of age.
- Patients without any significant medical history.
- All patients who have impacted lower third molars undergoing transalveolar extraction of the impacted third molar.

Exclusion Criteria

- Medically compromised patients
- Pregnant and lactating women were excluded
- Patient who had periapical pathology in the tooth to be extracted
- Patients who had habit of Smoking and consuming alcohol
- Uncooperative patients

Fifty patients who fulfilled the above criteria were included for the study. Informed written consent was taken from patients after explaining the about the procedure and follow up of the study. Intraoral periapical (IOPA) radiograph and Orthopantomogram was taken for all the subjects. Routine blood investigations were carried out. Detail history of patients was taken to rule out use of preoperative antimicrobial, NSAIDs or other drugs that might influence healing and inflammation. All the patients were randomly put in two groups of twenty five each.

Group I patients underwent transalveolar extraction of third molar under local anesthesia and standard oral drug regime. Group II patients received an additional submucosal injection of dexamethasone 4 mg, thirty minutes prior administration of local anaesthesia. All patients were operated by the single oral surgeon and the surgical wound was closed with 3-0 silk suture.

Patients were instructed to rinse their mouth with 5% betadine solution for one minute. An inferior alveolar nerve block, lingual nerve block and a long buccal nerve block, using 2% lignocaine

hydrochloride with vasoconstrictor [1:200000] was administered. Trapezoid flap was made using a full-thickness incision. Periosteal elevator was used to lift the flap. The surrounding bone was trimmed and the tooth was sectioned wherever required by using burs and the impacted third molar was extracted with the help of forceps and elevators. Patients were examined for the symptoms pain, swelling and trismus, preoperatively and on the second, seventh, tenth postoperative days.

Criteria of assessment

• **Pain:** According to visual analogue scale (VAS), all the patients was given a 10 cm VAS scale and instructed about the rating. They were asked to enter their level of pain at the time when analgesic is used, and the number of tablets taken till the end of the first week of extraction.

• **Swelling:** Facial swelling was evaluated by measuring the distance from the tragus of ear to corner of mouth and to pogonion. Second point was measured from ala of nose to the angle of the mandible.

• **Trismus:** For mouth opening, the subjects were asked to open the mouth slowly until the felling of first pain. At that point, the distance between the incisal edge of the mandibular and maxillary anterior teeth was measured using a measuring tape. The data were collected on printed forms and transports into Microsoft excel worksheet and data analyzed using SPSS (ver 20.0) statistical package. "P" value was set less than or equals to 0.05 as statistically significant.

RESULTS

The group I consisted of 13 (52%) males and 11 (48%) females. The patients were from 19-35 years of age. The group II consisted of 15 (56%) males and 10 (44%) females. The patients were from 17 to 35 year of age. In the present study it was observed that 33%, 11% and 49% of the teeth were mesioangular, horizontal and distoangular respectively and all teeth were moderately difficult.

The measurements of the facial swelling in terms of horizontal and vertical components showed no statistically significant difference between the Group I and Group II. In both Group I and II, horizontal and vertical component of the facial swelling reached to peak on 2nd postoperative day and got nearly normal on 10th day. However there was no statistically significant difference between

the two groups on any postoperative days. (Table 1 & 2). Pain and swelling scores were recorded on

second, seventh and tenth post-operative days after surgery. The pain was evaluated using VAS scale on

	Group	N	Mean	Std. deviation	t	P value
HR Pre-op	I	25	11.02	0.726	-2.358	0.02*
	II	25	11.36	0.706		
HR 2 nd day	I	25	11.77	0.765	-0.289	0.773 [#]
	II	25	11.72	0.687		
HR 7 th day	I	25	11.40	0.758	-0.526	0.600 [#]
	II	25	11.48	0.683		
HR 10 th day	I	25	11.17	0.707	-1.333	0.186 [#]
	II	25	11.36	0.702		

Table 1. Horizontal measurement of face

	Group	N	Mean	Std. deviation	t	P value
VR Pre-op	I	25	9.89	0.658	-2.588	0.011*
	II	25	10.23	0.646		
VR 2 nd day	I	25	10.56	0.684	0.302	0.763 [#]
	II	25	10.52	0.637		
VR 7 th day	I	25	10.19	0.725	-1.161	0.248 [#]
	II	25	10.35	0.631		
VR 10 th day	I	25	9.95	0.636	-1.355	0.179 [#]
	II	25	10.25	0.674		

Table 2. Vertical measurement of face

the second, seventh and tenth post-operative day. The difference in pain scores on second post-operative day between two group were found statistically non-significant, however, there were significant reduction in pain scores on seventh and tenth day in both groups. None of the patient in either of the group needed rescue NSAIDs or opioid analgesics during the post-operative period. There was statistically significant difference in the severity of pain between the two groups. The p value was <0.001 on each postoperative day. Maximum pain was

observed on second postoperative day. No significant difference was observed between the groups with respect to decrease pain by the time. Intensity of pain was greater in group I patient on all postoperative day. (Table 3)

Mouth opening showed statistically significant difference between the two groups. The p value on each postoperative day was <0.001. In both the groups, the results showed reduced mouth opening on the second postoperative day with a

mean value of 9.56 ± 0.684 mm in first group and 9.52 ± 0.637 mm in second group and a gradual

increase in mouth opening thereafter. The Group I got normal mouth opening on 7th day whereas

	Group	N	Mean	Std. dev.	t	P value
Pain 2 nd day	I	25	5.84	0.817	12.10	0.061 [#]
	II	25	3.60	1.049		
Pain 7 th day	I	25	3.02	0.958	8.45	<0.001 ^{**}
	II	25	1.30	1.073		
Pain 10 th day	I	25	1.12	1.023	5.33	<0.001 ^{**}
	II	25	0.22	0.615		

Table 3. Measurement of Pain score using Visual Analogue Scale

	Group	N	Mean	Std. dev.	T	P value
Mmo Pre-op	I	25	9.89	0.658	-2.418	<0.001 ^{**}
	II	25	10.23	0.646		
Mmo VR 2 nd day	I	25	9.56	0.684	0.302	<0.001 ^{**}
	II	25	9.52	0.637		
Mmo VR 7 th day	I	25	10.09	0.725	-1.161	<0.001 ^{**}
	II	25	10.35	0.631		
Mmo 10 th day	I	25	10.05	0.636	-1.355	<0.001 ^{**}
	II	25	10.30	0.637		

Table 4. Maximum Mouth Opening [^{**}Highly Significant (p<0.001)]

Group II achieved on 10th day. (Table 4). No systemic or local complications were observed with preoperative dexamethasone injection in any of the patient. Risk of local infection, alveolar osteitis was not observed in group II as compared to group I. Healing process was traced by long term follow ups of the both groups and observed no statistically significant change between the groups.

DISCUSSION

Non Steroidal Anti-Inflammatory Drugs are the oldest and most widely used drugs in history of extraction of teeth. However, no single NSAIDs is universally effective or tolerated.¹⁵ Need for better pain relief measure is of paramount importance for the clinician as well as the patient as pain during or after treatment can cause serious consequences including physiological complications, psychological impairments and overall affect the quality of life.

Dexamethasone is a most potent, highly selective, long acting synthetic corticosteroid which has an anti-inflammatory action.¹³ It has been used by oral surgeons since 1965 in an attempt to reduce

pain and swelling following surgery. Messer and Keller used patients as their own controls and concluded that thirty percent reduction in pain in the Dexamethasone group when assessed 48 hours post-operatively. Direct application of the steroid in the traumatized tissues may thus reduce the inflammation related events.¹⁶

Studies by Hooley JR et al.¹⁷ and Skjelbred P et al.¹³ showed that pain was significantly reduced due to use of prophylactic steroid administration. Also, Dexamethasone in particular appears to diminish pain after surgery.¹⁸

Use of corticosteroids to limit postoperative edema due to their suppressive action on transudation is a well known argument made by many authors but few have suggested definitive recommendations supported by randomised clinical trials.¹²

A study conducted by Baxendale BR et al. on Dexamethasone for reduction of swelling following extraction of third molar teeth concluded that, Dexamethasone group had more patients with mild swelling and very few patients

with severe swelling.¹⁹

Another study was conducted by Elhag M et al. for establishing anti-inflammatory effects of Dexamethasone.²⁰ It was observed that Dexamethasone group had mean swelling volumes significantly lesser ($P < 0.05$) than their controls but at such high dose of 10 mg, incidence of hypothalamic-pituitary-adrenal axis suppression was increased, as demonstrated by marked reduction in plasma cortisol in Dexamethasone group. Using the patients as their own controls, Messer and Keller concluded that there is a considerable reduction in swelling in Dexamethasone group in comparison with patients who did not administered Dexamethasone.¹⁶

Graziani F et al. reported that Dexamethasone significantly decrease facial swelling especially on second post-operative day when maximum facial swelling is expected. Also with increase in dosage from 4 mg to 10 mg of Dexamethasone, a greater reduction in swelling was observed.²¹

The facial size should reach the pre-operative facial measurement by seventh day, nine percent increment from the pre-operative measurement was observed. This was in agreement with various studies conducted by Bamgbose B O et al.²², Baxendale B R et al.¹⁹, Graziani F et al.²¹ and Anne Pedersen²³ but contrary to the above mentioned studies and the present study, Neupert EA et al.²⁴ and Edilby GI et al.²⁵ found that there was no significant reduction in swelling between Dexamethasone and control groups.

CONCLUSION

The study finding indicates the efficacy and safety of submucosal administration of dexamethasone injection during third molar extraction to eliminate or reduce post operative pain, swelling and trismus. The observations of the present study provide a fundamental basis for the use of corticosteroids such as dexamethasone sodium phosphate in the form of submucosal administration in lower than usual doses to decrease postoperative inflammation when compare to other routes of drug administration. Administration of low dose Dexamethasone around the extraction site has a more desirable effect due to more drug concentration at the site

of injury for a long time without loss due to distribution in system. Moreover, when surgical removal of the third molar is done under local anesthesia, it is very convenient for both patient and oral surgeon to use the submucosal site for effective administration of drug. Group randomisation, single examiner, regular follow-up to achieve the objectives of the study is the advantages but minimum sample size and lack of blinding procedure are some of the limitation of the study. In future, role of other corticosteroids such as methyl prednisolone, application of local drug delivery methods, optimum dose of steroid, histological & radiographic comparison of the wound healing can be done.

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