

EFFECTS OF INTRASPACE DEXAMETHASONE INJECTION ON POST OPERATIVE SEQUELAE AFTER REMOVAL OF BILATERAL MANDIBULAR THIRD MOLARS

Maxillofacial Surgery

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ABSTRACT

Context: Surgical removal of mandibular third molars (MTMs) is a routine procedure, inevitably followed by pain, swelling and trismus. **Aims:** Evaluation of efficacy of pre-operative single dose of 8mg dexamethasone injection into pterygomandibular space (PMS) on post-operative sequelae (POS) after removal of bilateral MTMs. **Study Design:** This prospective, randomized, controlled, split-mouth study included 47 patients requiring removal of bilateral (94) MTMs. Study group received 8mg dexamethasone and control group received normal saline injection into PMS. Swelling, trismus and pain were assessed preoperatively and post operatively using facial anatomic landmarks, steel metric ruler, and visual analogue scale (VAS) respectively. **Material And Methods:** Patients remained blinded to side of dexamethasone usage. Standard surgical protocol like mucoperiosteal flap reflection, sectioning of tooth/bone removal, luxation and removal of MTM, bone filing to smoothen rough margins, curettage and debridement of socket with freshening of wound margins and primary wound closure was done using 3-0 silk sutures. Similarly, contra-lateral side surgery was performed after one month by same operator. **Statistical analysis:** Descriptive statistical methods like Mean and Standard deviation were used. For assessment of POS, unpaired t-test, Mann-Whitney test, Repeated measure ANOVA, and Friedman test were used. **Results:** Significant less swelling and trismus observed in study group on 2nd post operative day. VAS pain score too was significantly lower in study group on 1st and 3rd post operative day. **Conclusions:** Preoperative injection of single dose 8mg Dexamethasone into PMS is an efficacious and safer way of minimizing POS after removal of MTM.

KEYWORDS

Dexamethasone, Inferior alveolar nerve block, Intra space injection, Lower third molar surgery, Pterygomandibular space

INTRODUCTION

Surgical removal of mandibular third molars (MTMs) causes surgical trauma to involved oral tissues and releases inflammatory mediators such as histamine, serotonin, bradykinin, platelet activating factors, interleukin-1 and derivatives of arachidonic acid metabolites. This leads to inflammatory sequelae such as swelling, pain, trismus and loss of general oral functions during immediate post-operative period.¹ Several methods of controlling immediate inflammatory responses associated with MTM surgery include different surgical closure techniques, application of various types of drains, use of different analgesics, corticosteroids and antibiotics.² Pharmacological management of post-operative inflammatory response is routinely favoured both by practitioner and patients.

Dexamethasone, a synthetic steroid is frequently used to manage oedema, trismus and pain after performing myriad of oral surgical procedures owing to its potent anti-inflammatory and longer duration of action. Effectiveness of dexamethasone in reducing post-operative sequelae (POS) is dose dependent of which 8-12 mg generally yields the best results.¹ There are many routes of steroids administration like submucosal (s.m.), intramuscular (i.m.) (Deltoid, Gluteal, Masseter), intravenous (i.v.), Endo alveolar powder, per-oral and intra space etc.³ Studies have proved that pre-operative administration of 8mg Dexamethasone in oral as well as parenteral routes is superior to post-operative route because of its early onset of drug action.^{3,4} Furthermore, Inferior alveolar nerve block (IANB) technique, used for removal of MTM, is given in to pterygomandibular space (PMS) which is highly vascularized and contains loose areolar tissues for faster drugs absorption.¹

Therefore, this study was conducted with purpose of evaluation of efficacy of preoperative interspace (PMS) single dose 8 mg dexamethasone injection following MTM surgery in reducing post-operative swelling, trismus and pain.

MATERIALS AND METHODS

This prospective split mouth study was conducted in Oral and Maxillofacial Surgery Department of our institute and duration of study was three years. Ethical approval was obtained priorly from Institutional Ethics Committee.

Study sample comprised of 47 patients (17 males and 30 females) with mean age of 27 years, (ranging between

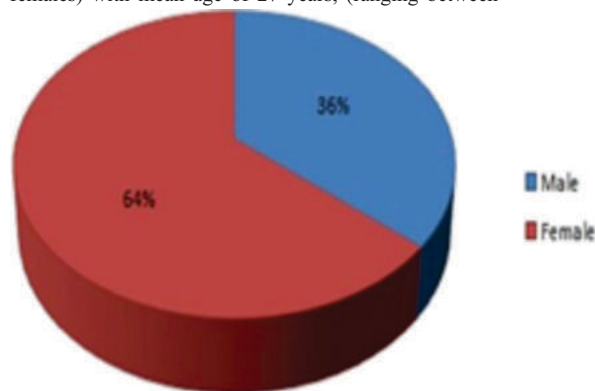


Figure 1: Gender distribution

17 - 42 years) requiring removal of their bilaterally impacted MTMs due to various indications. So, surgical removal of total of 94 nearly symmetrical bilaterally impacted MTMs were evaluated for postoperative sequelae (Figure 1).

Inclusion Criteria

- All healthy patients aged 18-45 years requiring surgical removal of bilateral MTMs with bilaterally similar type of tooth position (Winter's and Pell and Gregory Classification) and comparable surgical time.
- ASA class 1 patient.

Exclusion Criteria

- Acute infection involving impacted MTM.
- MTM involved in any pathology or malignancy.
- Patients on any medications which may alter/interfere with post-operative healing.
- History of any drug allergy.
- Medically compromised patients.
- History of bleeding disorders.
- History of radiotherapy/chemotherapy.
- Pregnant or lactating women or on oral contraceptives.
- Oral destructive habits like smoking, chewing tobacco, alcohol intake which alters post-operative healing.
- Inability to adhere to the schedule of the study.

SURGICAL PROCEDURE

Study site was decided by toss of coin prior to surgery. Patients remained unaware to side of usage of dexamethasone. Surgeries were performed by a single surgeon following standard surgical protocol. Classical IANB and long buccal nerve block techniques were performed using local anesthesia in the form of 2 ml 2% lignocaine HCL with adrenaline (1:80000) on surgical side. After objective sign of anesthesia were confirmed, 8mg/2ml dexamethasone or 2ml normal saline (Placebo) were administered in the PMS. One month later surgery on contralateral side was performed. Each procedure involved mucoperiosteal flap reflection, sectioning of tooth/bone removal, removal of tooth, bone filing to smoothen rough margins, curettage and debridement of socket, freshening of wound margins and primarily closure of wound done using 3-0 interrupted black silk sutures. All patients were given oral prophylactic medicines (Antibiotic, Analgesic, Antacid) for total of five days.

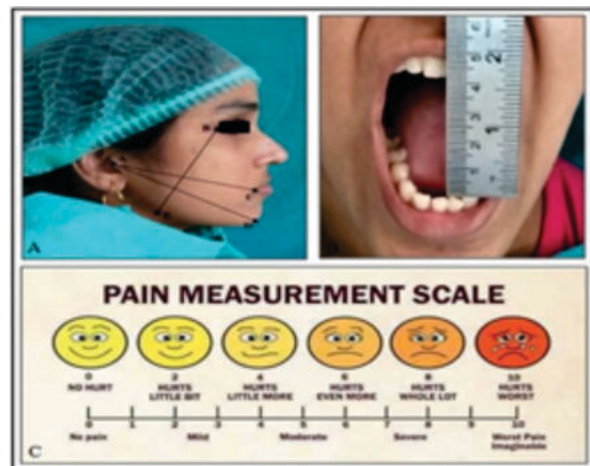


Figure 2: A: Extra-oral Swelling evaluation, B: Inter incisal mouth opening, C: Visual analogue scale

Measurements of trismus and facial swelling were taken preoperatively the day before procedure and on 2nd and 7th post-operative days. Facial swelling was assessed using three measurements: Lateral canthus of the eye to gonion angle, tragus to commissure of mouth, and tragus to pogonion (Figure 2). Trismus was evaluated by measuring the maximum inter-incisal distance (Figure 2). Evaluation of pain was done by using Visual Analogue Scale (VAS) (Figure 2). Pain scores were recorded on the day of operation and on 1st, 3rd and 7th post-operative days. All measurements were entered in Microsoft excel spreadsheet and data analysis of two groups were calculated using IBM SPSS 20. Significance level set at 5%.

RESULTS

The current research included 47 patients [17 (36%) males and 30 (64%) females] with Male: Female ratio of 0.56:1 showing clear female predominance. Age ranges between 17 - 42 years with an average age of 27.57±6.4 years.

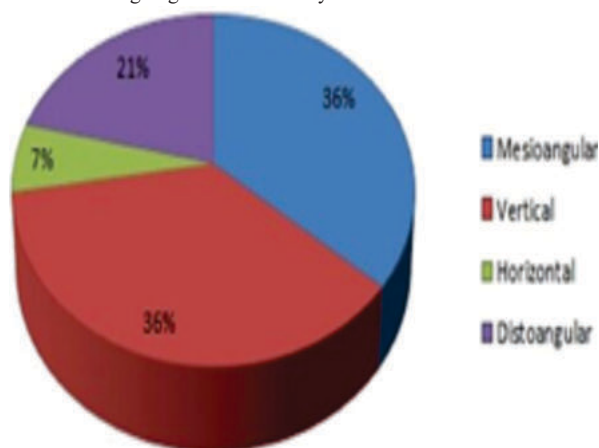


Figure 3: Type of impactions

In the present study sample, mesioangularly and vertically impacted MTMs was observed equally [17 (36%)] and horizontal impaction [3 (7%)] was least noticed (Figure 3).

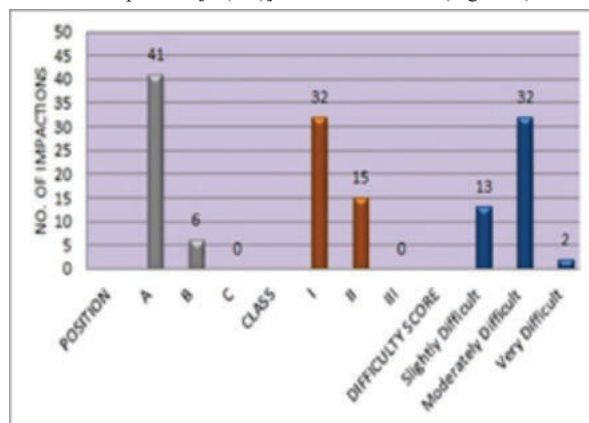


Figure 4: Position, Class and Difficulty score of impactions

According to Pell and Gregory classification system, class-I: 32 (68.08%) and position-A: 41 (87.23%) comprised the most common type of impaction observed. Pederson Difficulty Index Score showed moderate difficulty in 32 (68.08%) cases (Figure 4 & Table I).

Table II showed that mean (SD) score for all measurements of swelling were less for study site. It is evident from result that both study and control sites showed gradual reduction in swelling on post operative day 7 whereas mean difference between two set of values on 2nd and 7th post-operative days were found to be statistically significant ($p < 0.005$).

Table III shows that there was a significant difference in mean value of mouth opening between two groups on post-operative day 2 while highly significant ($p < 0.001$) difference was observed for both the groups on preoperative and 2nd post-operative day.

Table IV shows that the VAS pain scores difference were statistically significant between two groups on 1st and 3rd post-operative day ($p < 0.05$) but on the day of operation and 7th post-operative day they found to be non-significant.

Table I: Most common combinations of mandibular third molar impactions

Impaction types	Class	Position	Difficulty index
Mesioangular	II(58.82%)	A(76.47%)	Slightly difficult (76.47%)

Horizontal	II(100%)	B(66.66%)	Moderately difficult(100%)
Vertical	I(80%)	A(80%)	Moderately difficult(80%)
Distoangular	I(80%)	A(100%)	Moderately difficult(80%)

Table II: Measurements of swelling (millimeters)

Measurement	Evaluation	Study Group Mean (SD)	Control group Mean(SD)	p-value*
Tr-Com	Preoperative	114.96(4.61)	115.87(5.03)	>0.05
	Day 2	117.83(5.33)	120.11(5.93)	>0.05
	Day 7	116.19(4.86)	118.13(5.12)	>0.05
	p-value†	<0.001	<0.001	
	Difference			
Tr-Pog	Day 2-preoperative	2.87(1.28)	4.24(1.73)	<0.01
	Day 7-preoperative	1.23(0.81)	2.26(1.31)	<0.01
	Preoperative	144.96(6.18)	144.09(6.25)	>0.05
	Day 2	149.21(6.93)	150.38(7.49)	>0.05
	Day 7	146.15(6.37)	148.13(7.24)	>0.05
Gn-Lc	p-value†	<0.001	<0.001	
	Difference			
	Day 2-preoperative	4.25(1.74)	6.29(2.59)	<0.01
	Day 7-preoperative	1.19(1.25)	4.04(2.04)	<0.001
	Preoperative	108.94(10.11)	108.11(9.60)	>0.05
	Day 2	112.83(10.80)	114.00(10.39)	>0.05
	Day 7	110.83(10.31)	112.02(10.44)	>0.05
	p-value†	<0.001	<0.001	
	Difference			
	Day 2-preoperative	3.89(2.58)	5.89(2.09)	<0.01
	Day 7-preoperative	1.89(1.24)	3.91(1.95)	<0.01

*: Unpaired t-test/ Mann-Whitney test, †: Repeated measure ANOVA; SD, standard deviation; Tr-Com, tragus to the commissure of the mouth; Tr-Pog, tragus to pogonion; Gn-Lc, gonion angle to lateral canthus of the eye. Significant, P < 0.05.

Table III: Measurements of maximum mouth opening (millimeters)

Evaluation	Study group Mean (SD)	Control group Mean (SD)	p-value*
Preoperative	39.87(4.85)	39.74(4.77)	>0.05
Day 2	27.11(5.27)	22.34(4.86)	<0.01
Day 7	31.94(6.14)	29.74(4.70)	>0.05
p-value†	<0.001	<0.001	
MIO Differences			
Preoperative-Day 2	12.76(2.89)	17.40(2.79)	<0.001
Preoperative-Day 7	7.93(3.25)	10.00(2.79)	<0.05

*: Unpaired t-test/ Mann-Whitney test, †: Repeated measure ANOVA/Friedman test; SD, standard deviation; MIO, maximum inter-incisal opening. Significant, P < 0.05.

Table IV: Measurements of pain using VAS score (millimeters)

Evaluation	Study group Mean (SD)	Control group Mean (SD)	p-value*
Day of operation	3.66(1.34)	3.98(1.11)	>0.05
1st postoperative day	5.17(1.03)	6.32(0.96)	<0.01
3rd postoperative day	2.40(1.44)	3.19(1.39)	<0.05
7th postoperative day	1.04(0.20)	1.13(0.45)	>0.05
p-value†	<0.001	<0.001	
Difference			
Preoperative-Day 1	-1.51(1.12)	-2.34(1.34)	<0.05
Preoperative-Day 3	1.26(1.11)	0.79(1.28)	>0.05
Preoperative-Day 7	2.62(1.28)	2.85(1.16)	>0.05

*: Mann-Whitney test, †: Repeated measure ANOVA/Friedman test; VAS, visual analogue scale; SD, standard deviation;

Significant, P < 0.05.

DISCUSSION

The MTM is the most commonly impacted tooth in the dentition with a frequency of occurrence of 18% - 32%.⁵

Although not all impacted or unerupted teeth can cause problems, but based on clinical studies done by various authors, indications for removal of MTM have been listed as pericoronitis, dental caries, orthodontic reasons, odontogenic cysts and tumors, resorption of the adjacent tooth or root, for fitting of dental prosthesis, deep fascial space infection etc.⁶

The surgery of MTM is often followed by undesirable sequelae and complications in the form of general inflammatory response like pain, swelling, trismus, oral dysfunction etc.¹ Careful surgical technique and perioperative care can minimize the frequency of complications and to some extent lessen their severity. Such adverse sequelae directly influence patient's quality of life such as the ability to chew, swallowing, mouth opening, enjoyment of food, sleep impairment, changes in facial appearance & voice and difficulty in phonation etc.⁷ which ultimately may impact their wellbeing in the days following surgery. Hence, to minimize the unwanted effects of inflammation, it becomes essential to regularize the whole process.

Various methods like use of drugs such as analgesics, antibiotics and corticosteroids; different surgical closure techniques with or without incorporation of drains, physical therapeutic methods such as cryotherapy and laser application have been practiced by various surgeons to minimize the impact of postoperative sequelae.² Amongst all of the above-mentioned options, pharmacologic manipulation of inflammatory response has gained significant and widespread acceptance.

Like many other previous researchers our choice to deal with post-operative sequelae too inclined towards utilization of corticosteroids. Role of corticosteroids in suppressing tissue mediators of inflammation and thereby reducing fluid transudation and edema is well known. It is due to their use as a surgical adjuvant that favorable effects on reduction of post-operative sequelae can be anticipated.¹ Dexamethasone and methylprednisolone are most commonly used steroids following lower third molar surgery. Dexamethasone is a highly selective, long-acting, synthetic corticosteroid which exerts basic glucocorticoid and potent anti-inflammatory action by inducing synthesis of endogenous proteins which ultimately block the enzymatic activation of phospholipase A2, inhibit arachidonic acid release by cell membrane, and inhibit synthesis of prostaglandins, leukotrienes or substances related to thromboxane.¹ Potency of dexamethasone is approximately 25 times to that of the hydrocortisone, 6 times to prednisolone, 4 times to methylprednisolone & triamcinolone, and equipotent to betamethasone.⁸ Being a long acting steroid with half-life of 36-54 hours dexamethasone can be used as a drug of choice for single shot therapy, so we have chosen it for present study.^{1,3}

In this study single dose of 8mg dexamethasone was selected because of its effectiveness in reducing post-operative sequelae being dose dependent, which is a proven fact.¹ It is documented that to achieve optimum result, requirement of single dose of dexamethasone should be within 8 to 12 mg.¹ Various researchers have used 8mg of dexamethasone and concluded that it had a better control on POS.^{1,9,10} Our observations were in harmony with the study carried out by Filho et al. who used 4mg or 8mg dexamethasone pre operatively in 30 cases and found that 8 mg dexamethasone causes a tremendous reduction in trismus and facial swelling on second post-operative day.¹¹

Few studies which had compared use of 4mg dexamethasone versus placebo, showed lesser POS with usage of steroid and advocated its advantages.¹² But Alexander and Thronson who reviewed the literature from past 30 years (1970- 2000) and analysed different dosages of dexamethasone on POS were of opinion that 4mg dexamethasone can be of sub-therapeutic use only.^{1,13} So, it emphasized that in comparison to 8 mg of dexamethasone 4 mg of dose does not show potent reduction in

POS whereas in comparison to placebo it does have beneficial effects.

Like many earlier investigators, we have chosen preoperative administration of dexamethasone over postoperative one.^{4,9,14} We believe that early systemic/local availability and faster drug action are the main reasons behind the superior effects of pre-operative steroid administration.¹ We have found better resolution of POS in all the 3 parameters evaluated which was in line with some of the previous comparative studies and their results proved that pre-operative group had more desirable outcome on POS as compared to post-operative group.^{9,14}

Hashem M et al had compared preoperative administration of 8mg dexamethasone through oral route versus postoperative administration of the same dose and found that preoperative administration was superior concerning reduction of edema after MTM surgery.¹⁵ I.M. Mojsa et al has observed that post-operative submucosal injection of dexamethasone demonstrates better control of pain.¹⁶ But study carried out by Sithisongkhram K. et al who has compared preoperative versus post-operative dexamethasone injection in to PMS on 27 patients reported that there were no significant differences on POS with either pre or post-operative steroid administration.¹⁷ Findings of present study are in agreement with results of De Oliveira GS Jr et al. who performed 24 randomized clinical trials with 2,751 subjects for preoperative administration of dexamethasone for evaluation of its effects on outcome of POS and documented that preoperative steroid administration provides significant effect on reduction of postoperative pain irrespective of any other form, mode and time chosen.¹⁸

There are many routes of steroid administration which have been practiced widely since long by previous investigators like s.m., i.m., i.v., per-oral etc.¹³ All above routes have already been studied in depth by earlier researchers except intra-space administration. There were only few published data available on evaluation of efficacy of intra-space injection which was the driven force behind conception of present study.^{13,17,19}

Findings of our study are consistent with research carried out by K.Boonsiriseth et al who had administered dexamethasone in to PMS of 31 patients and found better control on POS.¹ Moranon P. et al had compared PMS and sublingual space for dexamethasone injection into 30 patients and found that both groups had lessen POS but PMS group had better effect on trismus on 2nd post-operative day similar to our observation.¹⁹ But results published by Bhargava et al and Singh et al concerning 60 patients each reported that dexamethasone injection in PMS causes similar post-operative clinical effects as administered by oral, i.v, i.m and s.m. routes, which is in disagreement with previous investigators.^{3,20}

We strongly advocate use of intra space injection owing to its multifold advantages such as its close proximity to the surgical site, an excellent site for better drug absorption due to high vascularity providing early onset of drug action, significant local drug availability because of avoidance of first pass metabolism, higher bioavailability but less systemic toxicity, avoids any secondary site or extra oral location for second injection thereby overcoming patient's fear or psychological trauma of new puncture, painless deposition because injection given into previously anaesthetized region and it does not require special expertise on the part of dental practitioner/oral surgeons for injection technique like the one with IV or IM injections.¹³

In our study, dexamethasone group has lower mean VAS pain scores than the control group on 1st and 3rd post-operative day (p value <0.05) and on day of operation and on 7th post-operative day there was no significant difference noted. However, controversy still exists regarding corticosteroid's role in reduction of postoperative pain but experiments and experience has proved that it does reduce pain by reducing postoperative edema. The findings of lower pain score in our study were in harmony with the studies carried out by some of the surgeons using oral, s.m. application of dexamethasone.^{16,21}

In the present study, measurements for degree of swelling were

recorded in accordance with the method proposed by Dutta SR.²² We observed that mean value difference of preoperative and postoperative day 2 and 7 were significantly lower (p value <0.01) in dexamethasone group compared to control group. Similar results were observed by various authors too who observed reduction in post-operative swelling when dexamethasone was administered by oral, s.m. i.m. and i.v. routes.^{3,16,21}

In our study, better results were obtained in dexamethasone group in comparison with control group on mouth opening/trismus, especially on the 2nd postoperative day, and found that the mean values difference between pre-operative and 2nd post-operative day were statistically highly significant (p value <0.001) in the study group. This finding is consistent with the result documented by Antunes et al., who reported that both oral and parenteral routes of administration of 8mg of dexamethasone attained superior results in terms of achieving normal mouth opening compared to control group.⁹

CONCLUSION

This study favors use of single shot pre-operative intra-space injection of corticosteroids (8 mg dexamethasone) for minor oral surgical procedures such as surgical removal of MTMs. This reduces unwanted common post-operative sequelae as it is superior to other routes of drug administration because of its innumerable benefits. Intra-space injection has added advantage of avoidance of secondary site or extra oral location for second injection thus, it successfully overcomes patient's fear or psychological trauma of new puncture. Our inclination towards preoperative use of intra-space 8mg dexamethasone injection derives its support from the fact that our results showed better clinical outcome and control of post-operative sequelae with utmost safety in steroid group when compared with non-steroid group.

Conflicts Of Interest

There are no conflicts of interest.

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