



EFFECT OF SUBMUCOSAL INJECTION OF DEXAMETHASONE ON POSTOPERATIVE SEQUELAE FOLLOWING SURGICAL REMOVAL OF IMPACTED THIRD MOLARS: A CLINICAL STUDY.

Maxillofacial Surgery

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ABSTRACT

Background and Objectives: Impacted third molar surgery is one of the most common procedures performed by maxillofacial surgeons in the outpatient setting. Since the region of surgery is highly vascularized and constituted mostly by loose connective tissue that contains blood and lymph vessels, a series of functional and structural alterations occur after extraction which is expressed as pain, swelling and trismus. These sequelae can have a serious impact on the patient's quality of life; therefore, a reduction of postoperative complications seems a logical goal, particularly if healing is not compromised.

Method: A hospital-based case-control study with a study population of 50 patients was done to assess the efficacy of submucosal injection of 8mg dexamethasone on reducing the post-operative sequelae such as oedema, pain and trismus following surgical removal of impacted third molars. The study was conducted in patients with bilaterally impacted mandibular third molars where one side is randomly selected and 8mg dexamethasone is administered submucosally and the other side is selected as control. All the patients selected for the study were followed up on first, third and seventh post-operative day.

Result: The submucosal injection of dexamethasone showed significant improvement in oedema and trismus on all postoperative days but decrease in postoperative pain was not significant on first and third days but significant on seventh day. Submucosal injection of dexamethasone 8 mg is an effective therapeutic strategy for improving the quality of life after surgical removal of impacted lower third molars.

KEYWORDS

Impacted third molar; Dexamethasone; Trismus; Oedema.

INTRODUCTION

An impacted tooth is one that is partially erupted or unerupted, beyond the chronological date of eruption and will not eventually assume a normal relationship with the other teeth and tissues. Dental impaction may be the consequence of local factors which include mechanical obstruction, insufficient space in the dental arch due to skeletal incongruities (micrognathia), or the premature loss of deciduous teeth or a tooth arch size discrepancy. Lower third molar is the most commonly impacted tooth. Kramer and William found the incidence of impacted third molar to be 41.13%. Impacted molars can lead to a variety of complications like caries, periapical lesions, periodontal disease, temporomandibular joint disorder, root resorption of adjacent teeth and oral cysts and tumours thus necessitating its removal. Thus, the removal of impacted lower third molars is still the most performed dentoalveolar surgical procedure in oral-maxillofacial surgery clinics². The surgical removal of impacted third molars is an invasive procedure that involves extensive tissue trauma and a considerable postoperative inflammatory response³. It is often associated with intense pain, swelling and trismus as a result of the postoperative inflammatory response. Although the inflammatory process is necessary for healing, when exacerbated it can have a serious impact on the patient's quality of life, as well as having financial consequences. Reduction of these postoperative sequelae seems to be a logical goal, particularly if healing is not compromised.

Over several decades many studies have reported the effectiveness of corticosteroids given before or just after removal of third molars in improving recovery. Corticosteroids like betamethasone, methyl prednisolone and dexamethasone are the most widely studied ones. Though literature search revealed several studies regarding the effect of corticosteroids in the reduction of post-operative sequelae following impacted third molar surgery, sufficient studies on Indian population is lacking. Also, there was paucity of studies using submucosal injection of dexamethasone. Hence the present study attempts to assess the effect of submucosal injection of dexamethasone on post-operative sequelae in our population.

The aim of this study is to assess the effect of submucosal injection of dexamethasone on postoperative sequelae following surgical removal

of impacted lower third molars. The objectives are to assess effect of dexamethasone on post-operative oedema, trismus and pain and postoperative complications such as dry socket & presence of infection at the operative site following surgical removal of impacted third molar.

MATERIALS AND METHODS

A randomised clinical trial was conducted to assess the efficacy of submucosal injection of 8mg dexamethasone on reducing the post-operative sequelae such as oedema, pain and trismus following surgical removal of impacted third molars was conducted after obtaining approval from the institutional ethical committee, IEC number: 31/2013/DCC. The study was conducted in patients with bilaterally impacted mandibular third molars reporting at the Department of Oral and Maxillofacial Surgery, Government Dental College, Kozhikode during the period between 2013-2015 where one side is randomly selected as study side and 8mg dexamethasone is administered submucosally and the other side is selected as control. 50 patients with bilaterally impacted mandibular third molars were selected for the study and in a split mouth way sides were named category A and category B randomly. (Table 1) Category A was administered 8mg dexamethasone submucosally prior to the procedure and category B was the control side. The surgical removals were spaced 1 month apart.

Inclusion Criteria included healthy patients with bilaterally impacted mandibular third molar which were indicated for removal, age between 18-40 years, and patients who gave consent for study.

Exclusion Criteria included medically compromised patients, patients with acute pericoronar infection, pregnant patients, patients currently on steroid therapy, patients in which steroids are contraindicated like peptic ulcer, diabetes mellitus & hypertension.

For assessing the difficulty level of impactions, Pederson difficulty index (table – 2) was used. Subjects with similar difficulty level only were included in the study.

Post operative pain assessment was done using 10-point visual

analogue scale, with 0 indicating absolutely no pain and 10 indicating unbearable pain (Figure 1). Inter incisal distance was measured for assessment of post operative trismus. A 3-point grading system (table-3) was used for the assessment of post operative oedema with 0 for no oedema to 3 for severe or intense oedema.

Surgical Procedure:

A detailed history of the patient was taken and recorded in the proforma. An informed consent was taken from the patient after explaining the procedure, benefits and expected complications. Patient was positioned on the chair such that mandibular occlusal plane was parallel to the floor. Standard scrubbing procedure was done. Then patient was draped with sterile towels with exposure of surgical field. Surgical site was prepared and wiped with povidone iodine solution. Oral cavity was irrigated with 0.2% chlorhexidine gluconate solution. Patient's one side was randomly selected for giving dexamethasone 8mg injection submucosally. A syringe was loaded with the medicament with appropriate dosage and administered according to the side chosen. All the surgical procedures for third molar removal were done by the same surgeon. Local anaesthesia was achieved using 2% lignocaine with 1:80,000 adrenaline by classical inferior alveolar nerve block, lingual nerve, and buccal nerve blocks. Ward's incision was placed and a buccal full thickness mucoperiosteal flap was elevated. The amount of bone removal varies with depth of impaction. Bone removal was done by guttering technique around the impacted tooth under copious saline irrigation using a sterilised micromotor and a high vacuum suction was used to provide clear surgical site during the procedure. Sectioning of the tooth was done wherever necessary. Sectioning of tooth reduces operating time and avoids the need to remove additional amount of bone to accommodate the elevated tooth. Once adequate bone removal and sectioning was done the tooth was removed with least amount of force using either the elevators or the extraction forceps. Once the impacted tooth was delivered from the alveolar process the surgeon must pay strict attention to debriding the wound of all particulate bone chips and other debris. A bone file was used to smoothen any rough and sharp edges of the bone. Surgical site was then irrigated with copious amount of normal saline to remove any remaining tooth debris or bone pieces. Surgical site was primarily closed with 3-0 silk suture material for haemostasis and a pressure pack was given for half an hour. All the patients were given Cap. Amoxicillin 500mg thrice daily for five postoperative days and combination of Paracetamol and Ibuprofen twice daily for three postoperative days. If Visual Analogue Scale score was 9 or more then Tab. Tramadol 50mg SOS was given and number of tablets taken per day was also scored.

Patient were assessed clinically for post operative trismus, pain, and oedema at 24hrs, 72 hrs and 7 days after the surgery.

Statistical Analysis

All analyses were made using the Statistical Package for the Social Sciences (SPSS, IBM, Chicago, IL, USA) version 16. Data was represented as frequency and percentage from which mean and standard deviation was calculated and Paired t-test was used to find the correlation. Probabilities of less than 0.05 were accepted as significant.

RESULTS

The study population included 25 males and 25 females between the ages of 18-40 with a mean age of 26.52 ± 4.85 years. (Table 4) In the study category A included 11 mesioangular, 13 horizontal, 14 vertical and 12 distoangular impactions; category B included 13 mesioangular, 9 horizontal, 15 vertical and 13 distoangular impactions. The difficulty level was assessed with Pederson index and patients with similar difficulty was included in the study. The average difficulty score for category A was 4.56 ± 1.13 and category B was 4.58 ± 1.18 . (Table 5)

The postoperative assessments were done on the first, third and seventh day postoperatively for oedema, pain, and trismus.

On first post-operative day oedema was graded and the mean for category A was 1.26 ± 0.44 and category B was 1.94 ± 0.51 and the p value was <0.001 which is significant. On the third postoperative day, category A showed a mean of 0.68 ± 0.47 and category B showed 1.30 ± 0.54 and the p value was found to be <0.001 and significant. Analysis of oedema on seventh day showed a mean of 0.02 ± 0.14 for category A and 0.24 ± 0.43 for category B with a p value 0.002 which is also significant. (Table 6). (Graph 1).

The post operative pain on first day for category A showed a mean of

5.74 ± 1.08 and for category B the value was 5.96 ± 1.34 with a p value 0.070 (p value >0.05). The post operative pain on third day data shows a mean of 3.70 ± 1.37 for category A and 3.80 ± 1.41 for category B with a p value of 0.451 (p >0.05). On seventh day the means were 0.78 ± 0.81 and 1.14 ± 0.90 for category A and category B respectively with a p value of 0.001 (p <0.05) which is significant. (Table 7). (Graph 2)

Mouth opening was measured using a vernier calliper preoperatively and on first, third- and seventh-day post operatively. Preoperative observation showed mean of 44.16 ± 3.45 mm and as it is a split mouth study it is same for category A and B. On first day post operatively the mean mouth opening for category A was 37.78 ± 3.60 mm. The mean decrease in mouth opening was 6.38 mm and for category B, the mean was 35.26 ± 4.27 mm and the mean decrease in mouth opening was found to be 8.90mm. The p value was <0.001 and was significant. On the third postoperative day the mean mouth opening for category A was found to be 41.46 ± 3.75 mm and mean decrease was 2.70mm. For category B the mean was 39.12 ± 4.28 mm with a mean decrease of 5.04mm with a p value of <0.001 with high significance. The mean mouth opening on post-operative day seven showed a value of 44.08 ± 3.40 mm for category A and 43.18 ± 3.72 mm for category B. The mean decrease in mouth opening was found to be 0.08mm and 0.98mm for category A and category B respectively. The p value was <0.001 and was also found to be significant. (Table 8) (Graph 3).

Post-operative complications like dry socket and infection were not found in both the categories.

DISCUSSION

Impaction of tooth within the alveolar bone is a frequent finding in the modern times. Third molars are the commonest teeth involved and mandible is more affected than maxilla. Since impacted teeth can lead to several complications, the surgical removal of impacted third molars is one of the commonest procedures undertaken in an oral and maxillofacial surgery clinic. It is an invasive procedure and considerable tissue trauma, and post-operative inflammatory response are often present.

Glucocorticoids are a group of steroids that possess anti-inflammatory properties. Perioperative use of corticosteroids is a pharmacological approach often used for reduction of oedema, trismus and pain after removal of impacted mandibular third molars. The use of corticosteroids has gained wide acceptance in the oral and maxillofacial surgery community, and numerous reports are now available supporting the use of systemic corticosteroids in the setting of third molar surgery.

Dexamethasone and methylprednisolone are the mainstay of perioperative and preoperative corticosteroid therapy during surgical removal of impacted third molar. Neupert EA et al (1992) studied the reduction of post-surgical sequelae with preoperative dexamethasone given intravenously⁵. Tarek L Al-Khateeb et al (1996) done a study to determine effect of dexamethasone versus methylprednisolone in third molar impaction⁶. Dexamethasone has no mineralocorticoid activity, the half-life is roughly 36–72 h, and the drug is 25 times more potent than hydrocortisone. It also seems to have the least depressing effect on leucocyte chemotaxis.

Our data based on the clinical trial shows that preoperative submucosal injection of dexamethasone significantly reduces post-operative facial oedema. This was highly significant on first and third post-operative days when the maximal facial swelling is expected. Even on seventh post-operative day there was significant decrease in oedema on the side which received dexamethasone compared to the control side. This was in agreement with studies by Graziani F et al (2006)⁷ and Deo SP et al (2011)⁸ which also showed a decrease in oedema when preoperative dexamethasone was used. But in most of the studies effects were compared in different patients randomly selected as cases and controls rather than in same person on different sides as in the studies by Antunes AA et al (2011)⁹ and Majid OW (2011)⁹. Our study was in same patient with split mouth technique which minimized interpersonal variations when different patients were selected as cases and controls.

When amount of maximum mouth opening was assessed post operatively, both sides showed decrease in maximum mouth opening on all days post operatively regardless of whether it is case or control. But the maximum mouth opening was less affected when

dexamethasone was given submucosally. On first, third and seventh postoperative days when patient was assessed, the side which received dexamethasone had lesser mean decrease in mouth opening compared to the control side. Maximum mouth opening increased gradually in both study group and controls and reached normal preoperative value on seventh day in most of the study group and to a lesser extent in controls. A study by Li C et al (2013) showed better control of swelling and trismus with dexamethasone injection¹⁰. Trismus is largely a consequence of oedema because of fluid build-up within the muscles of mastication adjacent to the operative site. Dexamethasone inhibits the oedema formation by acting in the initial phase of the inflammatory process by suppressing the production of vasoactive substances, such as prostaglandins and leukotrienes, thereby reducing fluid transudation and consequent trismus. The results showed that administration of submucosal injection of dexamethasone improved post-operative mouth opening thereby improving the quality of life of patient. But a contrasting report was given by Klongnoi B et al (2012)¹¹ which stated that dexamethasone does not affect trismus.

Pain following the surgical removal was also assessed on first, third and seventh post-operative days subjectively using a visual analogue scale ranging from 1 to 10. The results show that there was no significant decrease in pain on first and third post-operative day whereas the decrease on seventh post-operative day was statistically significant. The real contribution of corticosteroids to the control of pain is not yet fully clarified. Many of the previous studies does not show any correlation between pain and use of dexamethasone as in studies by Grossi GB (2007)¹² and Alexander RE et al (2000)¹³. In some other studies there showed a decrease in pain also as by Moraschini V et al (2015)¹⁴ and Warraich R et al (2013)¹⁵. The reduction in swelling may be accompanied by a reduction in pain. However, corticosteroids alone do not seem to have a clinically significant analgesic effect. Dionne et al (2003)¹⁶ found that dexamethasone 4 mg administered intravenously and orally 1 h before and 12 h after third molar extraction, respectively, led to a reduction in the thromboxane TXB2; however, the reduction in the amount of the prostaglandin PGE2, which is the main mediator responsible for the response to peripheral pain, was not controlled properly. All the patients in current study received a combination of paracetamol 325mg and ibuprofen 400mg twice daily for three post-operative days which may also have acted as a confounding factor in measuring pain.

Many other variables such as age of patient, gender, experience of the surgeon may all influence post-operative sequelae of surgical removal of third molars. The bias of such factors or their dominance in one group or another, which would affect the reading of the results, has been minimized by the split mouth design of the study. But difficulty and duration of surgical procedure, oral hygiene, deleterious habits like smoking and alcohol consumption may all influence the results obtained. Efforts have been made to avoid all these biases.

A limitation of the present study was that neither the patients nor the surgeons were blinded to the use of dexamethasone. As the route of administration was submucosal and the fact that it was given prior to the procedure without any placebo on the control side made it impossible to blind the patient.

There are few contraindications¹⁸ such as active tuberculosis, glaucoma, peptic ulcers, osteoporosis, diabetes mellitus, immunosuppression and infectious diseases like herpes simplex; for the use of dexamethasone. The complications of dexamethasone use include headache, dizziness, trouble sleeping, increased appetite and adrenal suppression in chronic usage. It has been stated that healthy subjects receiving single dose of steroids have no complications.

Dosage and route of administration for dexamethasone use in pre and perioperative application to reduce postoperative sequelae does not have a consensus as many of the studies have differences in opinion. Most of the studies show a similar effect on post-operative sequelae of dexamethasone with single preoperative dose of either 8mg or 4mg. Pradeep D Choudhary et al (2015)¹⁷ and Grossi GB (2007)¹² compared the two dosages and found no significant difference in reduction of oedema, pain and trismus. Deciding on the route of administration of steroids depends on operator expertise and preference. Oral or parenteral administration of steroids may result in decreased availability at the surgical site due to distribution of drug in the whole body. So, a route which can give adequate amount of drug in the surgical vicinity is preferred like intramuscular, submucosal, endoalveolar etc. Majid OW (2011)⁹ studied the difference in effect of

dexamethasone by submucosal and intramuscular routes and found no significant differences in any of the parameters. Submucosal dexamethasone is quite simple, less invasive, painless and convenient for the surgeon and the patient, and offers a low-cost solution for the typical discomfort associated with the extraction of impacted lower third molars.

Our present study was aimed at promotion of better quality of life, by reducing postoperative oedema, pain and trismus using application of submucosal injection of dexamethasone prior to the surgical removal of impacted third molars. Additional studies are required to confirm the effectiveness of locally administered corticosteroids in third molar surgery compared with other commonly used routes. Larger patient samples are also needed to evaluate the potential adverse effects of locally applied corticosteroids on wound healing after surgery.

Figures

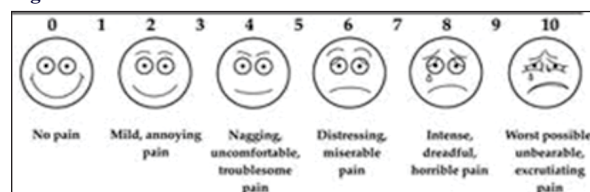


Figure 1: VAS for assessment of pain

Tables

Table 1: Side and category

	Category A		Category B	
	Frequency	%	Frequency	%
Right side	21	42	29	58
Left side	29	58	21	42
Total	50	100	50	100

Table 2: Pederson's difficulty index

Spatial relationship	Difficulty index value
Mesioangular	1
Horizontal/Transverse	2
Vertical	3
Distoangular	4
Depth (position)	
Level A	1
Level B	2
Level C	3
Ramus Relationship	
Class 1	1
Class 2	2
Class 3	3
Difficulty index	Total Score
Very Difficult	7 – 10
Moderately Difficult	5 – 6
Minimally Difficult	3-4

Table 3: Assessment of post operative oedema

Score	Class	Description
0	None	No inflammation
1	Mild	Intraoral swelling confined to the surgical field
2	Moderate	Extraoral swelling in the surgical zone
3	Severe or intense	Extraoral swelling spreading beyond the surgical zone

Table 4: Distribution of sex

	Frequency	Percentage (%)
Males	25	50
Females	25	50
Total	50	100

Table 5: Type of impaction

	Category A		Category B	
	Frequency	%	Frequency	%
Mesioangular	11	22	13	26
Horizontal	13	26	9	18
Vertical	14	28	15	30

Distoangular	12	24	13	26
Total	50	100	50	100

Table 6: Assessment of Oedema

	Category A		Category B		P value
	Mean	SD	Mean	SD	
Post operative day 1	1.26	0.44	1.94	0.51	<.001
Post operative day 3	0.68	0.47	1.30	0.54	<.001
Post operative day 7	0.02	0.14	0.24	0.43	.002

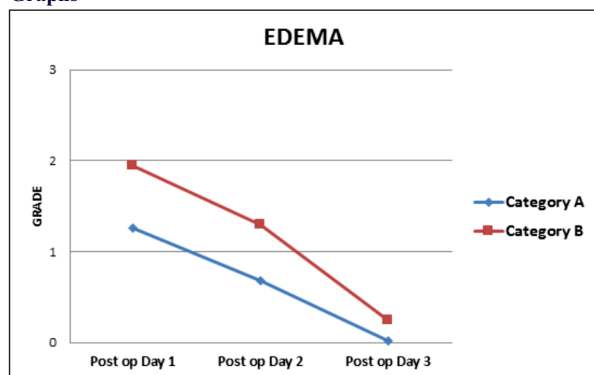
Table 7: Assessment of Pain

	Category A		Category B		P value
	Mean	SD	Mean	SD	
Post operative day 1	5.74	1.08	5.96	1.34	.070
Post operative day 3	3.70	1.37	3.80	1.41	.451
Post operative day 7	0.78	0.81	1.14	0.90	.001

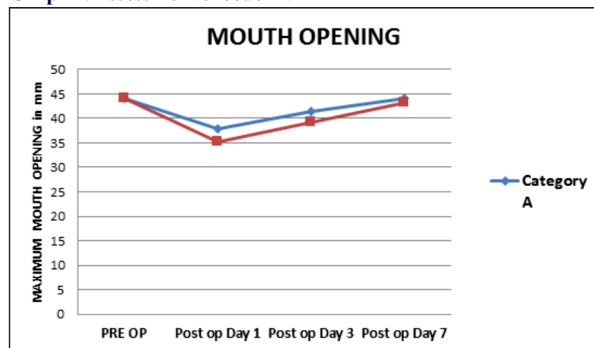
Table 8: Assessment of Maximum Mouth Opening

	Category A		Category B		P value
	Mean	SD	Mean	SD	
Preoperative mouth opening	44.16	3.45	44.16	3.45	
Post operative day 1	37.78	3.60	35.26	4.27	<.001
Post operative day 3	41.46	3.75	39.12	4.28	<.001
Post operative day 7	44.08	3.40	43.18	3.72	<.001

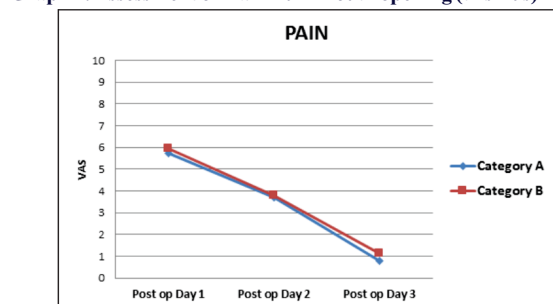
Graphs



Graph 1: Assessment of oedema



Graph 2: Assessment of maximum mouth opening (trismus)



Graph 3: Assessment of pain

CONCLUSION

The era of evidence-based dentistry has necessitated the use of research in decision making and incorporation of better methodology

and pharmacology for the wellbeing of the patients. The aim of any surgeon is to give the best treatment for the patients with least post-operative complications. This requires good expertise of the surgeon with judicious use of medications at the right time. Surgical removal of impacted third molar is one of the common procedures in oral and maxillofacial surgery which pose the oral surgeon with dilemmas of post-operative complications such as pain, oedema and trismus.

In conclusion, the submucosal injection of dexamethasone showed significant improvement in oedema, pain, trismus and different dimensions of health-related quality of life after surgical removal of impacted lower third molars. From the above observations, this study provides a basis for routine administration of single dose preoperative dexamethasone to reduce the postoperative sequelae such as oedema, trismus and pain. Submucosal dexamethasone is quite simple, less invasive, painless, and convenient for the surgeon and the patient, and offers a low-cost solution for the typical discomfort associated with the extraction of impacted lower third molars. Pre-operative injection offers the advantage of concentrating the drug near the surgical area with less systemic absorption.

Further comparative studies are required using different corticosteroids, doses, and administration routes to establish the most effective regimen for controlling trismus, oedema, and pain after surgical removal of third molar. Larger patient samples are also needed to evaluate the potential adverse effects of locally applied corticosteroids on wound healing after surgery.

It is highly desirable for any maxillofacial surgeon to perform a surgical removal of third molar with virtually no complications. Even though we could not eliminate all the complications, our study tries to reach a part of that goal by reducing the postoperative sequelae with available medicaments.

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