

The use of Submucosal Dexamethasone to minimise Post-Operative Sequelae after Third Molar Surgery

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Abstract

Purpose: The aim of this study is to evaluate the use of submucosal dexamethasone to minimize post operative sequelae after third molar surgery. **Materials And Method:** A total of ten patients including 6 females and 4 males in the age group of 22 to 32 years who reported to the Department of Oral & Maxillofacial Surgery, I.T.S Centre for Dental Studies and Research Muradnagar, Ghaziabad who required surgical removal of asymptomatic impacted mandibular third molars were included in this prospective study. **Results:** We found that there was significant reduction in postoperative swelling, (p value 0.000), trismus (p value 0.000) in the patients in whom dexamethasone was administered, however there was no significant difference in the amount of pain (0.343, 0.045, 0.758) when compared immediately post operatively, 2nd, 7th day post operatively.

Conclusion: With this information we can conclude that dexamethasone sodium phosphate (8mg) when administered preoperatively by submucosal route reduces the postoperative swelling, trismus in patients undergoing surgical removal of impacted lower third molar.

Keywords : Dexamethasone Sodium Phosphate, Third Molar Surgery.

Introduction

The surgical extraction of impacted mandibular third molar is the most common surgical procedure performed in oral surgery and is often associated with swelling, pain and trismus as a result of post operative inflammatory response, and these have a serious impact on the patient's quality of life, as well as financial consequences.¹

Cellular and tissue destruction usually follows the removal of impacted third molar which leads to the production and release of several biochemical mediators involved in pain process such as histamine, bradykinin and prostaglandins (derived from arachidonic

acid).² Edema occurs as osmotic pressure rises, capillary permeability is altered, transudation of fluid occurs through the vessels into the area of damage and local lymphatic system becomes obstructed by fibrin and fibrinogen clot derived from plasma and adjacent tissues, fluid then accumulates in the interstitial spaces. According to Peterson edema maximizes in 48-72 hours.³

Buccally administered enzymatic preparations which are compounds of streptokinase, streptodornase, hyaluronidase and lyophilised chymotrypsin are also used to reduce post-operative edema.⁴ To reduce post-operative pain, swelling and trismus

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following orthognathic surgery, minor oral surgery, removal of impacted third molar tooth cortisol, a hormone from adrenal cortex and its synthetic analogues (methyl prednisolone, bethamethasone, dexamethasone) are used.² Corticosteroids are successful in controlling acute inflammation by interfering with multiple signalling pathways involved in inflammatory response.⁵

Fewer studies on corticosteroids given in the region adjacent to the site of operation have been done, and these gave encouraging results when compared with controls. The technique is convenient for the surgeon, as the injection is given in close proximity to the operating field, and it is painless for the patient, as the injection is given in the anaesthetised area. The aim of this study is to evaluate the effectiveness of submucosal injection of dexamethasone sodium phosphate (8mg) on reducing post operative pain, swelling and trismus after third molar surgery.¹

Materials And Method

A total of ten patients including 6 females and 4 males in the age group of 22 to 32years who reported to the Department of Oral & Maxillofacial Surgery, I.T.S Centre for Dental Studies and Research Muradnagar, Ghaziabad who required surgical removal of asymptomatic impacted mandibular third molars were included in this prospective study. Routine blood investigations were done for all the patients and informed consent was taken from each patient. The study was approved by a local ethical committee. Orthopantomograph radiographs were obtained for each patient.

All the patients received sub-mucosal injection of dexamethasone sodium phosphate (8mg) / 2ml peri-operatively into

buccal vestibule around the third molar region, after administering local anaesthetic solution. The standard surgical procedure was followed for all patients which included Ward's/Modified Ward's incision & Moore Gilbe collar technique for bone removal, with or without odontectomy, followed by delivery of the tooth using an elevator or forceps. This was followed by suturing with 3-0 silk suture.

Immediately after the operation, details of each operation were recorded, including the duration of surgery in minutes (from the first incision to the insertion of last suture). All patients in the study routinely received post-operative dose of oral antibiotics in a form of capsule Amoxicillin 500mg and tablet Metronidazole 400mg three times daily for 5 days and analgesics in a combination of tablet Ibuprofen 400mg and Paracetamol 325mg three times daily for 3 days.

The facial swelling was measured by means of suture material held with artery forceps. Three measurements (AB, AC, DE) was made between 5 fixed reference points Tragus (A), soft tissue pogonion (B) outer corner of mouth (C), lateral canthus of the eye (D) and angle of the mandible (E) preoperatively, on second day and seventh post operative day. The angle of mandible was marked by bisecting the angle formed by the external border of ramus of mandible and the lower border of mandible. The measurements were A-C, A-B, and D-E as shown in Fig. 1

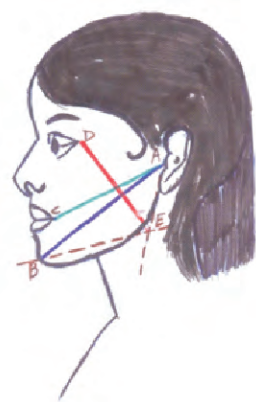


Fig- 1: Measurement between points A and C, A and B, D and E

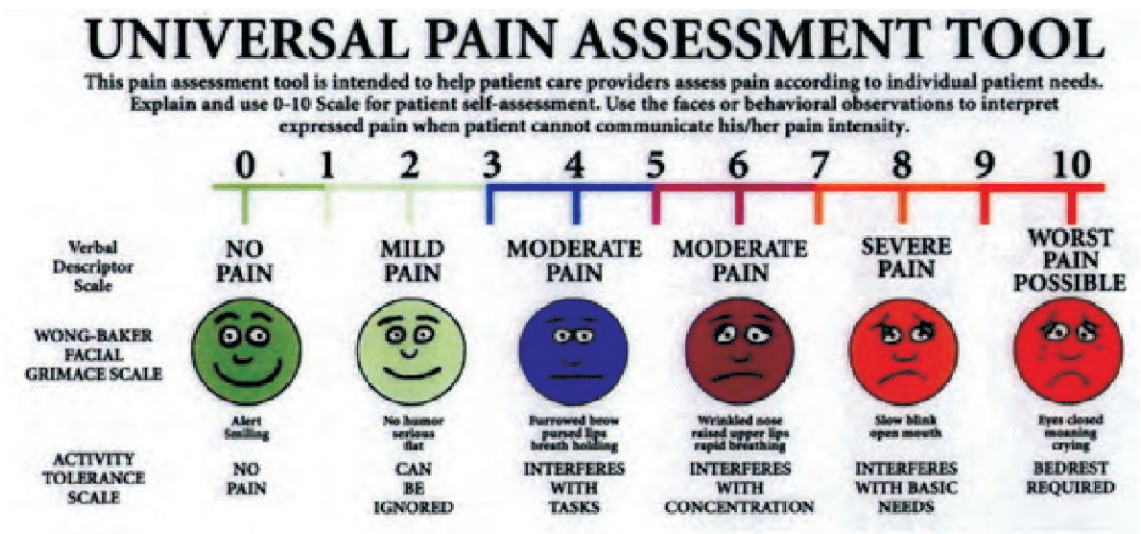


Fig. 2 Pain Scale

The preoperative measurements were considered as the baseline. The difference between each postoperative measurement and the baseline indicated the facial swelling for that day and recordings were done on 2nd and 7th postoperative days.

Trismus was evaluated by measuring the Inter-incisal Opening (IIO) at maximum opening of the jaws recorded preoperatively and on the second and seventh postoperative days. The difference between each postoperative measurement and the preoperative measurement indicated the trismus for that day.

Following each operation a questionnaire consisting of visual analogue scale of 10 units as shown in Fig. 2 concerning pain was marked by the patient. The patients was asked to mark preoperatively and immediate postoperative, on second and seventh postoperative days.

For each parameter (pain, trismus, swelling) were recorded for three consecutive times at an interval of 5 minutes and the mean of these three readings was taken the baseline reading

for that parameter. Similarly three readings for each parameter were recorded immediate postoperative period, second day postoperatively and, seventh day postoperatively and the mean of that parameter was compared to baseline reading.

The data obtained was subjected to statistical analysis using SPSS software version 16.0. The statistical tests used were paired student-t test for comparison of the mean values. p value of ≤ 0.005 was considered as significant.

Results

The outcome parameters were noted as postoperative pain, postoperative swelling, inter incisal opening. The follow up was done at immediate postoperative, 2nd and 7th post operative day .The results are shown as under Swelling was measured between 5 reference points as described in materials and methods.

The sum of all the three measurments was done on all the intervals and p values were statistically significant (p value=0.000) (table-1) when preoperative swelling measurements were compared to immediate post operatively, 2nd day and 7th day. High statistical significance

was found when immediate post operative and 7th day measurements were compared with 2nd day as swelling is maximum on the 2nd post operative day thereby implicating that submucosal injection of dexamethasone 8mg is effective in controlling postoperative swelling after removal of impacted third molar.

Trismus was evaluated by measuring the interincisal opening preoperatively, immediate post operatively, 2nd and 7th day postoperatively and the readings were subjected to paired t test. p-values were calculated by comparing immediate postoperative, 2nd day and 7th day readings with preoperative interincisal opening (0.024, 0.000, 0.000) and were non significant (Table 2). Thereby demonstrating that submucosal injection of dexamethasone when given perioperatively has no significant effect on reducing trismus after the removal of impacted mandibular third molars.

Pain was evaluated using VAS Scale preoperatively, immediate postoperatively, on 2nd and 7th postoperative day. The p values by comparing preoperative pain with immediate post operative, 2nd, 7th day were not significant ($p=0.343, 0.045, 0.758$) (Table 3).

Discussion

Surgical removal of impacted third molar is so often associated with considerable pain, swelling, dysfunction. By pharmacologically controlling the extent of inflammatory process, postoperative sequelae such as pain, swelling and trismus may be reduced in intensity or severity.¹²

Various studies in literature have supported their systemic use after third molar surgery. Recently; Markiewicz⁴¹ et al (2008) in a Meta analysis concluded that administering

corticosteroids perioperatively was of mild to moderate value in reducing postoperative inflammatory signs and symptoms. Submucosal route however has been reported in isolated occasions.^{1,41} Corticosteroid selected should have few mineralocorticoid effects and good biological activity. Dexamethasone meets these requirements as it has no mineralocorticoid activity.¹

Our study shows that the use of perioperative submucosal injection of dexamethasone sodium phosphate 8 mg significantly reduces postoperative facial edema at all intervals. High statistical significance was seen immediately postoperatively (p value = 0.000) similar to that reported by some studies.^{1,36,38,48}

Statistically significant difference was found on second postoperative day (p value = 0.000), when maximum facial swelling is expected which is in agreement with previous reports.^{1,9,36,48,49} On seventh post operative day too there was statistically significant difference (p value = 0.000) in facial swelling thereby implying that dexamethasone is effective even on 7th post op day in reduction of swelling this is in agreement with some studies.^{1,48} However it is in contrast to several studies which have not demonstrated any effect on the seventh day.^{36,49}

When dexamethasone is applied topically (submucosally / endoalveolar powder in high dosage) its anti-edema effect increases. The genesis of facial edema may be related to trauma to the soft tissues during the extraction and the length of the surgery. Intraoperative variables also interfere with post operative sequelae, the overall length of the intervention was shown to effect the edema and trismus whereas osteotomy time influenced the degree of postoperative trismus.³⁶ Direct application of the steroid in the traumatized

Table1(a,b): paired t test comparing the overall swelling (AB+AC+DE)

a

Pair		Mean	Std. Deviation	Std. Error Mean
Pair 1	PRE Swelling	12.17	2.240	.409
	IPO-Swelling	12.353	2.2741	.4152
Pair 2	PRE Swelling	12.17	2.240	.409
	2ND-Swelling	12.547	2.2670	.4139
Pair 3	PRE Swelling	12.17	2.240	.409
	7TH-Swelling	12.317	2.2482	.4105
Pair 4	IPO-Swelling	12.353	2.2741	.4152
	2ND-Swelling	12.547	2.2670	.4139
Pair 5	2ND-Swelling	12.547	2.2670	.4139
	7TH-Swelling	12.317	2.2482	.4105

b

				Paired Differences					
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	Df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	PRE Swelling - IPO-Swelling	-.1833	.1206	.0220	-.2284	-.1383	-8.328	29	.000
Pair 2	PRE Swelling - 2ND-Swelling	-.3767	.1716	.0313	-.4407	-.3126	-12.025	29	.000
Pair 3	PRE Swelling - 7TH-Swelling	-.1467	.1106	.0202	-.1880	-.1054	-7.264	29	.000
Pair 4	IPO-Swelling - 2ND-Swelling	-.1933	.1552	.0283	-.2513	-.1354	-6.822	29	.000
Pair 5	2ND-Swelling - 7TH-Swelling	.2300	.1291	.0236	.1818	.2782	9.761	29	.000

Table2(a,b): paired t-Test comparing inter-incisal opening

a

		Mean	Std. Deviation	Std. Error Mean
Pair 1	PRE-IIO	4.080	.6477	.2048
	IPO-IIO	3.960	.6653	.2104
Pair 2	PRE-IIO	4.080	.6477	.2048
	2ND-IIO	3.460	.7090	.2242
Pair 3	PRE-IIO	4.080	.6477	.2048
	7TH-IIO	3.760	.6186	.1956

b

				Paired Differences					
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	PRE-IIO - IPO-IIO	.1200	.1398	.0442	.0200	.2200	2.714	9	.024
Pair 2	PRE-IIO - 2ND-IIO	.6200	.2974	.0940	.4073	.8327	6.593	9	.000
Pair 3	PRE-IIO - 7TH-IIO	.3200	.1476	.0467	.2144	.4256	6.857	9	.000

Table3(a, b): paired t-Test comparing pain

a

		Mean	Std. Deviation	Std. Error Mean
Pair 1	PRE - PAIN	.60	.966	.306
	IPO-PAIN	1.00	1.054	.333
Pair 2	PRE - PAIN	.60	.966	.306
	2ND-PAIN	1.90	1.370	.433
Pair 3	PRE - PAIN	.60	.966	.306
	7TH-PAIN	.50	.850	.269

b

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PRE - PAIN - IPO-PAIN	-.400	1.265	.400	-1.305	.505	-1.000	9	.343
Pair 2	PRE - PAIN - 2ND-PAIN	-1.300	1.767	.559	-2.564	-.036	-2.327	9	.045
Pair 3	PRE - PAIN - 7TH-PAIN	.100	.994	.314	-.611	.811	.318	9	.758

tissues may thus reduce inflammation related events. This is in agreement with previous reports.^{1, 9,36,48,49} Thereby supporting the use of submucosal route of administration of dexamethasone.

In our study the trismus was assessed by measuring the interincisal mouth opening preoperatively, immediate postoperatively, 2nd and 7th day post operatively. Trismus was statistically not significant when preoperative values were compared with immediate post operative (p value= 0.024) however was significant when preoperative values were compared with 2nd day, 7th day (p value= 0.000), which is contrary to the results of study by Majid O W, Mahmmud W K (2010)¹, Majid O W (2011)⁴⁸ who found that the amount of trismus was significantly different between the dexamethasone and control group on day 1 of their study but not on the other intervals. Similar results were reported by Deo S P⁴⁹ (2011) on 2nd post op day and no difference on 7th post op day as in our study. However topical injection of dexamethasone did not produce any beneficial effect on the post operative trismus compared to controls.³⁶ This can be attributed to the fact that since, steroids do not exert direct effect on muscle contraction its reduction would be secondarily due to decrease in the degree of local inflammation.³⁶

Statistical analysis of our data revealed that post operative pain as measured by visual analogue scale, was found to be statistically not significant when preoperative values were compared with second and seventh post operative days (p value=0.343,0.045,0.758).

Contrary to our study results many studies have shown a decrease in post operative pain with dexamethasone, but a clear pathway for this pain has not been explained. It has also

been suggested that the swelling made the tissues tense and caused tension pain that was reduced when dexamethasone reduced the facial swelling. 8mg of dexamethasone significantly reduced facial swelling on 2nd postoperative day. This significant reduction probably led to reduced tissue tension related to pain.⁵¹

On the basis of present investigations, it is recommended to administer dexamethasone (8mg) perioperatively to reduce postoperative swelling, pain after third molar surgery and submucosal route being better than intravenous, intramuscular or oral route due to various advantages mentioned above. Future investigations using a larger sample size and split mouth technique are desirable.

On evaluation of results as described previously in discussion we found that there was significant reduction in postoperative swelling, trismus in the patients in whom dexamethasone was administered, however there was no significant difference in the amount of pain. With this information we can conclude that dexamethasone when administered preoperatively reduces the postoperative swelling in patients undergoing surgical removal of impacted lower third molar.

It is the postoperative swelling, trismus that the patients are most worried about when they have to undergo surgical removal of impacted mandibular third molar.

When compared with intramuscular and intravenous route, submucosal injection has certain advantages and better patient compliance due to the following reasons:

1. As injection is given in the previously anaesthetized area, patient will not feel the second prick there by resulting in better patient cooperation.

2. Submucosal route produces less systemic effects compared to intramuscular or intravenous or oral route. This is attributed to concentration the drug near the surgical area with less systemic absorption and thus fewer complications and no further manipulations of the tissues is required.

2. The expertise of surgeon, discomfort caused to the patient and the needs for specific tools to give the drugs are factors that limit the use of intramuscular or intravenous route.

3. It is quite simple, less invasive, painless, convenient to the surgeon, and the patient and offers low cost solution for the typical discomfort associated with the impaction of lower third molars.

Conclusion

On the basis of present investigations, it is recommended to administer dexamethasone (8mg) perioperatively to reduce postoperative swelling, trismus after third molar surgery and submucosal route being better than intravenous, intramuscular or oral route due to various advantages mentioned above. Future investigations using a larger sample size and split mouth technique are desirable.

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