

Effects of Pre-operative Submucosal Dexamethasone Injection on the Postoperative Swelling and Trismus Following Surgical Extraction of Mandibular Third Molar

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ABSTRACT

Objective: To determine the effects of pre-operative submucosal dexamethasone injection on postoperative swelling and trismus following surgical extraction of mandibular third molar.

Study Design: Randomized controlled trial.

Place and Duration of Study: Department of Oral and Maxillofacial Surgery, Armed Forces Institute of Dentistry (AFID), Rawalpindi, from October 2009 to March 2010.

Methodology: A total of 100 patients aged 18 - 40 years with good periodontal health and mesioangular impaction were divided in two treatment groups (50 in each group). Group-A received prophylactic 4 mg submucosal dexamethasone intraoral injection and Group-B acted as control group. Facial swelling and trismus were assessed at baseline, 2nd and 7th postoperative days. Data was analyzed using SPSS-10.

Results: There were 35 (70%) males and 15 (30%) females in group-A and 34 (68%) males and 16 (32%) females in group-B. Surgical time ranged from 30 - 50 minutes (mean = 40.62 ± 4.886 minutes) for group-A and 33 - 50 minutes (mean = 42.12 ± 4.543 minutes) for group-B. Administration of dexamethasone had statistically significant effect in reduction of swelling and trismus on second postoperative day ($p < 0.05$) in group-A.

Conclusion: Pre-operative 4 mg submucosal dexamethasone injection was significantly effective in reduction of postoperative swelling and trismus.

Key Words: Swelling. Trismus. Third molar extraction. Dexamethasone.

INTRODUCTION

Third molars are the most commonly impacted teeth.¹ They are present in 90% of the population with 33% having at least one impacted third molar.² Surgical extraction of impacted third molar is one of the most commonly performed procedure in oral surgery that is often associated with significant postsurgical sequelae as pain, swelling and trismus due to the inflammatory response.³ Surgical insult to the tissue results in vasodilation, migration of leukocytes and plasma transudation via endothelial gap junctions.⁴ Corresponding clinical manifestation includes swelling (*tumor*), redness (*rubor*), increase in temperature (*calor*), pain (*dolor*) and loss of function (*functio laesa*).⁵

Dexamethasone has been extensively used during past few years in oral surgery owing to its high potency and longer half life.⁶ It has predominant glucocorticoid action.⁷ Dexamethasone blocks phospholipase-A₂ thereby reducing levels of prostaglandins, leukotrienes involved in the pathogenesis of pain, edema and

subsequent trismus.⁸ Short-term and low dose use with convenient submucosal route has shown to have minimum adverse effects like immunosuppression.⁹

Impacted third molar associated with caries, pericoronitis, cystic pathologies are mostly surgically extracted resulting in significant swelling, pain and trismus. This increases patient's postoperative morbidity. The use of corticosteroids help to reduce these morbidities, has gained wide acceptance during the recent years. Low dose (4 mg), submucosal route of administration of dexamethasone in mandibular third molar surgical site improves patient's quality of life without restricting routine activities and fear of immunosuppression.

The aim of the study was, therefore, to determine the effects of pre-operative submucosal dexamethasone injection on postoperative swelling and trismus following surgical extraction of mandibular third molar.

METHODOLOGY

It was a randomized control study conducted at Department of Oral and Maxillofacial Surgery, AFID, Rawalpindi, from October 2009 to March 2010. It included patient with good periodontal health between 18 and 40 years of age with mesioangular impacted 3rd molar position-B, class-2. Patients having significant medical history with chronic use of medicines that obscure assessment of the inflammatory response and

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lactating / pregnant women were excluded from the study. A total of 100 patients with impacted mandibular third molars were randomly divided into two equal groups (50 patients in each group). Sample size was calculated by using a WHO sample size calculator taking level of significance 5%, power of test 80%, standard deviation 4.50, population mean μ_0 88.63 and anticipated population mean μ 91.19.¹⁰

Approval for the study was taken from the Ethical Committee, AFID. A complete medical history, oral examination including radiographic evaluation was carried out. A written and informed consent was taken from the patient. Inferior alveolar, lingual and buccal nerve block using a solution of 2% lignocaine hydrochloride and epinephrine 1:100,000 (2 cartridges) was administered. One group (group-A) randomly received submucosal 4 mg dexamethasone (Decadron, Merck) injection 2 - 3 minutes pre-operatively. Group not receiving any dexamethasone acted as control (group-B). Full thickness mucoperiosteal envelop flap was raised. After osteotomy and tooth sectioning, tooth was extracted. Flap was re-positioned using 3.0 silk sutures. The duration of surgery was recorded. Measurements were performed at baseline on 2nd and 7th postoperative days by a trained observer who was blind regarding the intervention site. Trismus was measured as the interincisal distance (IID) with vernier caliper in millimeters (mm). Swelling was measured with measuring tape from ear lobe-corner of mouth and outer canthus of eye-angle of mandible. Using Statistical Package for Social Sciences (SPSS) version 10, mean and standard deviation was measured for time of surgical procedure, age, swelling and trismus. While frequencies/percentages were computed for gender. Independent sample t-test was used to compare pre-operative and postoperative measurements of swelling and trismus. Paired t-test was used to compare swelling

and trismus on 2nd and 7th day with baseline. P-value < 0.05 was considered significant.

RESULTS

Patients age in group-A at the time of surgery ranged from 19 to 40 years with mean age of 27.92 ± 5.931 years. Patients age in the group-B ranged from 20 to 40 years with mean age of 28.28 ± 5.202 years. Duration of surgical procedure ranged from 30 minutes to 50 minutes (mean= 40.62 ± 4.886 minutes) in group-A and 33 minutes to 50 minutes (mean= 42.12 ± 4.543 minutes) in group-B. There were 35 (70%) males and 15 (30%) females in group-A. Group-B had 34 (68%) males and 16 (32%) females.

Swelling from earlobe-corner of mouth plane at baseline was 10.36 ± 0.631 cm for group-A and 10.38 ± 0.697 cm for group-B. The difference was statistically insignificant ($p > 0.05$, Table I). The swelling from outer canthus-angle of mandible plane at baseline in group-A was 10.40 ± 0.571 cm and in group-B it was 10.36 ± 0.598 cm. This difference was statistically insignificant ($p > 0.05$, Table I).

Swelling on 2nd postoperative day in earlobe-corner of mouth plane was 11.34 ± 0.626 cm for group-A and 13.04 ± 0.856 cm for group-B. This difference was statistically significant ($p < 0.05$, Table I). Swelling from outer canthus-angle of mandible plane on second post-operative day was 11.44 ± 0.577 cm (group-A) and 12.90 ± 0.735 cm (group-B). The difference was statistically significant ($p < 0.05$, Table I).

On 7th postoperative day, swelling from earlobe-corner of mouth plane in group-A was 10.40 ± 0.639 cm and 10.48 ± 0.614 cm for group-B. This difference was statistically insignificant ($p > 0.05$, Table I). Swelling from outer canthus-angle of mandible plane was $10.40 \pm$

Table I: Comparative analysis of swelling.

Day	Variable / group (Gp)	Mean \pm SD	p-value
Baseline swelling	Earlobe-corner of mouth (cm) Gp-A	10.36 ± 0.631	0.807
	Earlobe-corner of mouth (cm) Gp-B	10.38 ± 0.697	
	Outer canthus-angle of mandible (cm) Gp-A	10.40 ± 0.571	0.7330
	Outer canthus-angle of mandible (cm) Gp-B	10.36 ± 0.598	
2nd postoperative day swelling	Earlobe-corner of mouth (cm) Gp-A	11.34 ± 0.626	< 0.0001
	Earlobe-corner of mouth (cm) Gp-B	13.04 ± 0.856	
	Outer canthus-angle of mandible (cm) Gp-A	11.44 ± 0.577	<0.0001
	Outer canthus-angle of mandible (cm) Gp-B	12.90 ± 0.735	
7th postoperative day swelling	Earlobe-corner of mouth (cm) Gp-A	10.40 ± 0.639	0.5247
	Earlobe-corner of mouth (cm) Gp-B	10.48 ± 0.614	
	Outer canthus-angle of mandible (cm) Gp-A	10.40 ± 0.639	0.5018
	Outer canthus-angle of mandible (cm) Gp-B	10.48 ± 0.544	
Baseline trismus	Interincisal distance (mm) Gp-A	46.44 ± 2.915	0.591
	Interincisal distance (mm) Gp-B	46.14 ± 2.642	
2nd postoperative day trismus	Interincisal distance (mm) Gp-A	35.90 ± 3.694	< 0.0001
	Interincisal distance (mm) Gp-B	31.72 ± 5.466	
7th postoperative day trismus	Interincisal distance (mm) Gp-A	46.30 ± 2.697	0.4106
	Interincisal distance (mm) Gp-B	45.84 ± 2.867	

Table II: Comparative analysis of variables with baseline.

Variables	Baseline - postoperative day	Group-A	Group-A (p-value)	Group-B	Group-B (p-value)
Trismus	Baseline - 2nd day	46.44 ± 2.915	< 0.0001	46.14 ± 2.642	< 0.0001
		35.90 ± 3.694		31.72 ± 5.466	
	Baseline - 7th day	46.44 ± 2.915	0.197	46.14 ± 2.642	0.066
		46.30 ± 2.697		45.84 ± 2.867	
Swelling (I) earlobe - corner of mouth	Baseline - 2nd day	10.36 ± 0.631	< 0.0001	10.38 ± 0.697	< 0.0001
		10.34 ± 0.626		13.04 ± 0.856	
	Baseline - 7th day	10.36 ± 0.631	0.322	10.38 ± 0.697	0.255
		10.40 ± 0.639		10.48 ± 0.614	
Swelling (II) outer canthus - angle of mandible	Baseline - 2nd day	10.40 ± 0.571	< 0.0001	10.36 ± 0.598	< 0.0001
		11.44 ± 0.577		12.90 ± 0.735	
	Baseline - 7th day	10.40 ± 0.571	0.322	10.36 ± 0.598	0.110
		10.40 ± 0.639		10.48 ± 0.544	

0.639 cm in group-A and 10.48 ± 0.544 cm in group-B. This was again statistically insignificant ($p > 0.05$, Table I).

Interincisal mouth opening at baseline was 46.44 ± 2.915 mm in group-A and 46.14 ± 2.642 mm in group-B. Difference was statistically insignificant ($p > 0.05$, Table I). On second postoperative day, group-A patient's interincisal distance was 35.90 ± 3.694 mm and group-B had 31.72 ± 5.466 mm interincisal distance. The difference was statistically significant ($p < 0.05$, Table I). On 7th day, group-A interincisal distance was 46.30 ± 2.697 mm and group-B interincisal distance was 45.84 ± 2.867 mm. Difference was statistically insignificant ($p > 0.05$, Table I).

When swelling and trismus of both groups on 2nd and 7th postoperative days was compared with baseline statistically significant difference on postoperative swelling and trismus was noticed on second postoperative day ($p < 0.05$, Table II). No significant difference was observed on the 7th postoperative day for swelling and trismus of both groups ($p > 0.05$, Table II).

DISCUSSION

Surgical extraction of impacted third molars is a traumatic procedure.⁹ As this area is highly vascularized and predominantly constituted by loose connective tissues, therefore, the liberation of inflammatory exudates/mediators and subsequent swelling, trismus and pain are most frequent.¹⁰ By pharmacologically controlling the extent of the inflammatory process, the intensity or severity of postoperative sequelae such as pain, swelling and trismus may be reduced. One technique that has been proposed for reduction of postoperative inflammation is the administration of corticosteroids. Cortisol has the capacity to interfere with the physiologic processes of inflammation and, thus, suppress the development of inflammatory sequelae. Therefore, in literature, emphasis on the use of submucosal dexamethasone injection have been reported for significant reduction of swelling and trismus.¹¹⁻¹³

This study showed that prophylactic administration of dexamethasone injection through intraoral submucosal route has statistically significant effect in reduction of swelling and trismus ($p < 0.05$, Table II). These results are in accordance to those of Laureano and his colleagues.¹⁰ Also Markiewicz and his colleagues found that use of corticosteroids reduced edema and improved the range of mouth opening.¹⁴ Similarly, Deo reported significant reduction in swelling and trismus with submucosal dexamethasone use.¹⁵ The study of Majid proved that dexamethasone 4 mg showed a significant reduction in swelling ($p < 0.05$).¹⁶ All these results support my research findings. Grossi and colleagues observed that on the second postoperative day, facial edema showed a statistically significant reduction.⁹ Graziani *et al.* showed test side treated with dexamethasone had greater reduction of swelling and trismus ($p < 0.05$).⁶ Bamgbose and colleagues observed that treatment with dexamethasone (pre-operative 8 mg and postoperative 4 mg IV) and diclofenac provided relief of postsurgical pain with swelling ($p < 0.05$).¹⁷ Moore and colleague's study on pre-emptive effect of rofecoxib and dexamethasone 10 mg (intravenous) demonstrated reduction of postoperative swelling and trismus ($p < 0.05$).¹⁸ All of the above mentioned research results on swelling and trismus are similar to my study results ($p < 0.05$, Table I and II).

Ora, local/submucosal route¹⁹ or parenteral/intramuscular route for dexamethasone administration achieves similar results.¹⁶ However, submucosal route is a simple, safe, painless, non-invasive, and cost-effective.¹⁶ No reports in the literature have been found about the complications from the use of a single dose of corticosteroid.²⁰

CONCLUSION

The results of this study have shown that the administration of 4 mg dexamethasone injection is effective in reduction of post-operative swelling and trismus. It can thus be, safely used pre-operatively as single dose through intraoral submucosal route.

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