

Role of Submucosal Injection of Methylprednisolone into the Masseter Muscle on Oedema after Impacted Tooth Surgery

Nishu Vakil^{1*}, Sabina Bashir², Abhishek Singh³, Balbir Kaur⁴

¹Department of Periodontology, Indira Gandhi Government Dental College,ammu and Kashmir India

²Department of Forensic Medicine, MM Institute of Medical Sciences, Mullana Haryana India

³Department of Community Medicine, SHKM Government Medical College, Haryana India

⁴Professor and Head, Department of Forensic Medicine, Nepal Medical College Teaching Hospital, Nepal

*Corresponding author: Dr. Nishu Vakil

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Abstract

Original Research Article

Background: Surgical removal of the mandibular third molars is the most common surgical procedure in oral and maxillofacial surgery. **Aim:** To test the role of submucosal injection of methylprednisolone into the masseter muscle on oedema after impacted tooth surgery. **Methods:** Study subjects were divided into Group I (no steroids), Group II (Local Submucosal injection), Group III (oral tablets), Group IV (i.v. injection) and Group V (Intramuscular Injection). Oedema was evaluated in comparison to the preoperative values on day 2 and day 7 following the surgical procedure as mean swelling score. **Results:** At the end of day 2, mean swelling score was found to be maximum in Group I (118.43 ± 9.02) whereas minimum in Group V (108.95 ± 5.08). There was a statistically significant difference in mean swelling score at day 2 between the study and test groups. At the end of day 7, mean swelling score was found to be maximum in Group I (111.07 ± 8.72) whereas minimum in Group IV (109.14 ± 3.52). **Conclusion:** Local submucosal administration of methylprednisolone into the masseter muscle provided better results as compared to control. At par results were observed with oral administration and i.v. injection of methylprednisolone following lower third molar surgery among study subjects.

Keywords: Methylprednisolone, impacted molar, intramuscular, oedema.

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INTRODUCTION

Surgical intervention of the impacted third molar is probably the most common surgery performed by oral and maxillofacial surgeons. Reduction in the post-operative squeal remains the key concern for both the surgeon and the patient. Corticosteroids are drugs that act by inhibiting body's inflammatory response to injury leading to reduction in fluid transudation and hence oedema [1-3]. These medications can be given by various routes like intramuscular, intravenous, oral or sub mucosal. Though various routes have been reported but there has been no clear practice as to which route provides most effective and quick relief.

Orally and intravenously administered glucocorticoids requires frequent dosing to maintain blood level. Intramuscular administration allows the use of repository (acetate) drug forms, which provide a slow absorption and a prolonged duration of effect [4, 5]. The locally administered steroids acts directly on eicosanoids and hence prevent inflammatory processes.

A locally applied glucocorticoid has direct

inhibitory effect on signal transmission in nociceptive C-fibers and ectopic neuroma discharge in injured nerve [6, 7].

It is difficult to find any study comparing the pros and cons of intra masseter muscle administration of the glucocorticoids during surgical removal of lower third molars. Therefore, the present study was to evaluate the efficacy of single dose methylprednisolone acetate when injected into the masseter muscle via the intrabuccal approach, preoperatively, one hour before surgery or post-operatively, immediately following the surgical removal of lower third molars under local anesthesia, in controlling swelling of facial soft tissues.

METHODS

This prospective study was conducted at outpatient Department of Oral and Maxillofacial Surgery of a dental hospital of Jammu region. In this study one hundred adult patients from both sexes in whom removal of an impacted lower third molar was required. The inclusion criteria were: healthy subjects, aged over 18 years who had bilateral symmetrically

impacted mandibular third molars and required extraction of both the lower third molars. Exclusion criteria were history of immunocompromised disease, a history of allergy to amide type of local anaesthesia, bisulphide; contraindication of corticosteroids; recent use of anti-inflammatory drugs or antibiotics within past 1 month; pregnant and lactating women; long term use of any drug; or those who used other drugs during the observation period.

Group I subjects received no preoperative or postoperative anti-inflammatories or steroids. Group II subjects received a single dose of injection methylprednisolone 20 mg/ml into the masseter muscle after suturing of the surgical wound. Group III subjects received a single 20-mg dose of methylprednisolone in the form of an oral tablet taken 1 hour before the procedure. Group IV subjects received a single dose of methylprednisolone 20 mg/ml i.v. in the immediate postoperative period. Group V subjects received a single dose of methylprednisolone 20 mg/ml i.m. in the immediate postoperative period. Subject's fulfilling these inclusion criteria were included in the study. The treatment was then divided into following groups. Group I: Controls, Group II: Local injection of methylprednisolone, Group III: Oral methylprednisolone, Group IV: Intravenous injection of methylprednisolone, and Group V: Intramuscular injection of methylprednisolone.

Patients were operated by the same standard technique; mouthwash with 0.2% chlorhexidine was given prior to local anaesthesia. Local anaesthesia of the inferior alveolar nerve and lingual nerve, and terminal infiltration of the buccal fold was performed using 2% lidocaine hydrochloride and 1:200,000 adrenaline. Only one third molar was removed from each patient. Surgical access was standardized and involved a linear incision on the alveolar ridge aligned with the buccal region of the second molar, combined with a vertical incision. A standard triangular flap and the retentive bone around the third molar were removed

under irrigation with 0.9% saline solution. After the extraction was completed, irregular bone borders were removed, and the alveolus was irrigated with 10 ml 0.9% saline solution. The surgical site was sutured with 3–0 silk. All subjects received standard post-operative instructions. Amoxicillin 500 mg p.o. every 8 hours during 7 days or erythromycin 500 mg p.o. every 8 hours during 7 days for patients allergic to penicillin; diclofenac sodium 50 mg p.o. every 8 hours during 3 days, and 0.12% chlorhexidine mouth rinses twice a day for 15 days. The intraoral sutures were removed on postoperative day 7.

Oedema was evaluated in comparison to the preoperative values on day 2 and day 7 following the surgical procedure as mean swelling score. Oedema was assessed using following facial lines; a. the distance from the external canthus of the eye to the gonion angle, b. the distance from the lower border of the tragus to the mouth commissure on the operated side, c. the distance from the lower border of the tragus to the soft pogonion.

Written and informed consent was obtained from study subjects. Permission of ethical committee was obtained from the Institutional Ethics Committee. All the questionnaires were manually checked and edited for completeness and consistency and were then coded for computer entry. After compilation of collected data, analysis was done using Statistical Package for Social Sciences (SPSS), version 21 (IBM, Chicago, USA). The results were expressed using appropriate statistical variables.

RESULTS

At the end of day 2, mean swelling score was found to be maximum in Group I (118.43 ± 9.02) whereas minimum in Group V (108.95 ± 5.08). There was a statistically significant difference in mean swelling score at day 2 between the study and test groups (Table 1).

Table-1: Comparison of mean swelling scores among groups at 2nd day

Groups	Mean swelling score \pm S.D.	P value
Group I: Controls	118.43 ± 9.02	<0.05
Group II: Local injection of methylprednisolone	110.08 ± 8.76	
Group III: Oral methylprednisolone	111.35 ± 6.53	
Group IV: Intravenous injection of methylprednisolone	109.24 ± 5.26	
Group V: Intramuscular injection of methylprednisolone	108.95 ± 5.08	

At the end of day 7, mean swelling score was found to be maximum in Group I (111.07 ± 8.72) whereas minimum in Group IV (109.14 ± 3.52). There

was no statistically significant difference in mean swelling score at day 2 between the study and test groups (Table 2).

Table-2: Comparison of mean swelling scores among groups at 7th day

Groups	Mean swelling score \pm S.D.	P value
Group I: Controls	111.07 ± 8.72	>0.24
Group II: Local injection of methylprednisolone	109.36 ± 4.14	
Group III: Oral methylprednisolone	110.95 ± 4.85	
Group IV: Intravenous injection of methylprednisolone	109.14 ± 3.52	
Group V: Intramuscular injection of methylprednisolone	110.63 ± 3.16	

DISCUSSION

Steroids are among the most potent anti-inflammatory drugs, the most powerful of which are glucocorticoids [8]. This property of corticosteroids have led to their wide spread use during third molar removal [9]. When single dose of glucocorticoid is given parenterally and preoperatively in combination with orally administered non-steroidal anti-inflammatory drugs, during the surgical removal of third molar, results in greater pain relief than did the administration of non-steroidal anti-inflammatory drugs alone [10].

Corticosteroids exert potent antiinflammatory action, and have been used in different dosing regimens and administration routes to lessen the inflammatory effects of third molar surgical removal. Methylprednisolone is usually administered via the intramuscular or intravenous route, though the possibility of topical (intraalveolar) application has been described, with a reduction in morbidity and possible side effects [11]. Methylprednisolone has been used in a number of studies. This drug is five times more potent than cortisol, with scant associated saline retention and an intermediate duration of action [12].

Glucocorticoids are effective in controlling acute and chronic inflammation, as they interfere with multiple signaling pathways in inflammatory response phenomena (phospholipase A2, COX-2, etc) [13]. Swelling can be quantified in different ways. One of the most commonly used methods is that of Amin and Laskin [14], which uses suture thread grasped with two mosquito forceps to measure distances at the following reference points: from the external palpebral angle to the gonial angle on the operated side; from the lower margin of the tragus to the external angle of the oral commissure; and from the lower margin of the tragus to the midpoint of the chin symphysis. Another approach is that developed by Grossi *et al.* [1], involving a modification of the technique of Schultze-Mosgau [15], measuring the distance from the external portion of the tragus to the mouth, and from the tragus to the pogonion thereby increasing the objectivity of the measurements.

Esen *et al.* found facial swelling to be up to 42% less intense 48 hours after surgery in the group administered methylprednisolone [16]. Table 3 shows the different studies analyzing the effects of CS upon postoperative swelling. However, Leone *et al.* [17] found that 32% of the patients in the methylprednisolone group failed to show statistically significant reductions in swelling ($p=0.09$).

In our study, subjects were divided into Group I (no steroids), Group II (Local Submucosal injection), Group III (oral tablets), Group IV (i.v. injection) and Group V (Intramuscular Injection). Oedema was

evaluated in comparison to the preoperative values on day 2 and day 7 following the surgical procedure as mean swelling score. At the end of day 2, mean swelling score was found to be maximum in Group I (118.43 ± 9.02) whereas minimum in Group V (108.95 ± 5.08). There was a statistically significant difference in mean swelling score at day 2 between the study and test groups. At the end of day 7, mean swelling score was found to be maximum in Group I (111.07 ± 8.72) whereas minimum in Group IV (109.14 ± 3.52).

Kocer G studied the efficacy of supraperiosteal injection of 20 mg of methylprednisolone compared with 20 mg oral tablet form and 20 mg i.v. injection in the prevention of postoperative pain and oedema associated with inflammation. All three routes of administration demonstrated best efficacy in comparison to the control regarding trismus. While oral administration and i.v. injection of MP achieved similar results, masseter injection provided best results in reducing oedema and trismus when compared with the control following lower third molar surgery [18].

Another systematic review dissected 34 articles to come to a conclusion on the efficacy of corticosteroids following third molar surgery. Based on their review, the authors concluded that swelling and trismus have a significant impact while reduction of pain following administration of steroids is still debatable [19].

CONCLUSION

In the light of findings of this investigation, it is clear that local submucosal administration of methylprednisolone into the masseter muscle provided better results as compared to control. At par results were observed with oral administration and i.v. injection of methylprednisolone following lower third molar surgery among study subjects. Further larger controlled trials are needed to support our findings.

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