

## The efficacy of intralesional dexamethasone versus intravenous dexamethasone in surgery for impacted third molars: A randomized controlled trial

### ABSTRACT

**Objectives:** A randomized prospective double-blind study was conducted to determine the efficacy of sub-mucosal local infiltration vs. intravenous dexamethasone in reducing postoperative pain, swelling and trismus after surgical removal of impacted mandibular third molars.

**Materials and Methods:** Forty five patients were included in the study and were randomly divided into three groups. Each group consisted of 15 patients for which the first and second groups were given 8 mg of dexamethasone intrlesionally & intravenously respectively, at 30 minutes prior to surgery; the third group served as control. Duration of facial swelling was evaluated subjectively by the patients themselves. Severity of postoperative pain was quantified by counting the number of analgesics taken by the patients during and after surgery (six subsequent days). Postoperative trismus was determined by measuring the maximum incisal opening before surgery and on the seventh day.

**Results:** Results showed that duration of postoperative edema was almost the same in the three test groups. During surgery, the intravenous dexamethasone group showed a significantly lesser pain than the other two groups; the intralesional dexamethasone group showed less marked pain than the control group. Additionally, patients who had taken steroids had a marked increase in the incisal opening postoperatively over the control group. Trismus was significantly reduced in the methylprednisolone group as compared to the dexamethasone group.

**Conclusion:** It is concluded that both preoperative local infiltration and intravenous administration of dexamethasone significantly reduced postoperative pain and trismus after surgical removal of mandibular third molars. An intravenous dexamethasone is more effective in reducing postoperative inflammatory sequelae than its intralesional route.

**Keywords:** Dexamethasone, intralesional, intravenous, third molars

### INTRODUCTION

The role of corticosteroids in minimizing the cascade of inflammatory response has been researched extensively<sup>[1,2]</sup> in surgical removal of third molars, which is one of the most commonly performed oral surgical procedures,<sup>[3]</sup> leading to an array of complications in the form of pain, swelling, and trismus, though controversy regarding the same still exists.<sup>[4,5]</sup> However, an array of other studies depicts a marked improvement in postoperative pain and trismus with corticosteroid administration.<sup>[6-9]</sup> Recently, various studies were conducted to analyze the use of corticosteroid pre- and postoperatively with mixed results. The hypothesis behind the use of steroids is its action on arachidonic acid metabolism and thus is its action on pain-causing prostaglandins, but its

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action locally is still debatable. With this background, the current study was undertaken to comparatively evaluate postoperative swelling, pain, and trismus in patients undergoing postsurgical removal of impacted third molars.

## MATERIALS AND METHODS

Patients reporting to the Maxillofacial Surgery Department of King George's Medical University requiring removal of impacted mandibular molar were taken into account. All cases included were asymptomatic young adults in the age group of 20–40 years. The lower third molar position was classified with the help of orthopantomogram as horizontal, mesioangular, distoangular, and vertical. Only mesioangular impacted mandibular third molars, in accordance with Winter's classification for impacted third molars, were considered for the study. The study was approved from Institutional Ethical Committee and Written informed consent was taken and the procedure was explained in detail to the patients in the language they could understand.

### Randomization and allocation concealment

Forty-five trial patients were distributed equally into three groups by computer-generated random numbers. Further concealment of the allocation was done by centralized allocation system.

Three groups were created with the above considerations:

- Group A patients were administered dexamethasone sodium phosphate injection intraperitoneal (IP) 8 mg intravenously 30 min preoperatively
- Group B patients were administered dexamethasone sodium phosphate injection IP 8 mg intralesionally (submucosally) 30 min preoperatively
- Group C patients were the control group and were not administered any steroid.

### Criteria of assessment

- a. Mouth opening (extent of trismus)
- b. Postoperative edema (swelling)
- c. Pain.

### Exclusion criteria

- Patients with any systemic problem
- Pregnant or lactating mothers
- Operative procedure.

Patients in all the three samples were operated in semi-recline position, with standard sterilization protocol followed. The interincisal distance between maxillary and mandibular first incisors was noted in millimeters. Local anesthesia was provided with 2% lignocaine hydrochloride and 1:100,000

adrenaline. Surgical removal of the third molars was done by chisel and mallet with intermittent saline irrigation, by the same operating surgeon. Postoperative medications included amoxicillin 500 mg tid, metronidazole 400 mg tid a day, and a combination of ibuprofen 400 mg and paracetamol 325 mg tid, a day for 5 days.

### Evaluation

Postoperative assessment was done on the 5<sup>th</sup> day of the surgical procedure. The maximum interincisal distance was calculated in millimeters. The difference between the pre- and post-interincisal distance was used to depict the severity of trismus. The patient recorded the time of onset and regression of postoperative edema. Pain evaluation was done by calculating the number of analgesic pills consumed in the 4 postoperative days.

Data were depicted as mean values and standard deviation. ANOVA was used to compare the differences among the three groups.

## RESULTS

Patients were divided into three groups. Each group comprised 15 patients with mean age of 24.4, 25.2, and 23.3 years, respectively. The three groups did not show any statistically significant differences; hence though the groups were randomized, they were still comparable. The difference in age and sex of patients in the three groups was not statistically significant as shown in Table 1.

### Assessment of trismus, pain, and swelling

While comparing the duration for which facial swelling lasted in all the three groups, it was seen to be almost similar in all the groups and was reported to be maximum on the 2<sup>nd</sup> postoperative day. The swelling altogether lasted for 4–5 days. However, it was noted that significantly lesser medication was used in Group A during surgery than that of Group B and Group C. However, no significant difference was reported in the total number of analgesics being taken postsurgery in all the three groups [Table 2].

There was a significant improvement in maximum mouth opening on the 7<sup>th</sup> postoperative day in Groups A and B as compared to Group C ( $P < 0.05$  and  $P < 0.001$ , respectively). Again, as reported in Table 3, it is obvious that Group B presented with a statistically significant increase in the incisal opening compared to Group A on the 7<sup>th</sup> postoperative day ( $P < 0.02$ ).

## DISCUSSION

The anti-inflammatory properties of glucocorticoids are well

established and published even though the mechanism of its action is still not well documented. It is considered that corticosteroids induce decrease in permeability of capillary endothelium which results into reduction of edema and inflammation by decreasing the amount of fluid, proteins, macrophages, and inflammatory cells entering in the area of tissue injury.<sup>[10,11]</sup>

Glucocorticoids have been regularly used for the last 30 years or more to minimize the postoperative complications following the extraction of impacted third molars.<sup>[12]</sup> Significant reduction in pain, swelling, and trismus<sup>[4,5]</sup> had been well documented in studies, while on the other hand, few studies have concluded that the postoperative use of glucocorticoids does not have any tangible benefits.<sup>[6,9]</sup> These studies, however, are difficult to compare because variable steroids were under evaluation using dissimilar study designs along with variable methods of evaluation of pain and swelling.

Moreover, it is well established that the dosage and type along with the route of administration and duration of usage can play a significant role on the effect of the agent. It is the clinicians' expertise and clinical know-how that decide the route of administration for the drug. Although it is the oral administration of glucocorticoids that results in its rapid action and almost complete absorption, repeated doses are necessary for the maintenance of optimal or adequate blood concentration throughout the immediate postoperative period.<sup>[13]</sup> Instantaneous blood level is attained by intravenous route, but added armamentarium and expertise is required.<sup>[4,8,12]</sup> Intramuscular route of drug administration has shown effective results in a single dose, administered either pre- or postoperatively.<sup>[7,14]</sup> All

these conducted studies point out that high dosage of glucocorticoids when administered can result in a significant repository effect for the first 5 postoperative days without any requirement of additional dose. However, the additional armamentarium along with patient discomfort and need for experienced clinicians made these routes of drug administration less popular.

In this study, it is expected that repository effect similar to intramuscular route can be obtained by local infiltration of steroid in the submucosa around the surgical site chosen. Moreover, submucosal infiltration forbids the usage of any added armamentarium and does not need any added clinical expertise or experience for the procedure. These added benefits can be considered as the advantages of submucosal technique over intravenous or intramuscular routes of drug administration.

A variety of corticosteroids have been explored till date.<sup>[13]</sup> In this study, dexamethasone which is highly potent along with high biological interminable potency and minimal sodium retention has been chosen.

Since three-dimensional volumetric changes are involved with swellings, evaluation of facial swellings following surgical procedures is most perplexing. In order to access the degree of postoperative swelling, various techniques have been introduced.<sup>[8,15-17]</sup> However, most of these techniques lack sensitivity needed for the discernment of significant difference in swellings, at least more accurate than that estimated by patients on their own.<sup>[18]</sup>

In the present study, the decision to make patients evaluate themselves is deliberate, since our major concern was to note the duration of postoperative swelling. Moreover, we lack knowledge concerning any other objective technique to evaluate the degree of intraoral swelling as ascertained or comprehended by patients themselves. This study clearly points out that no matter what route of administration of steroids is followed, they result in a more effectual reduction in the duration of swelling when compared to the control. Appraisal of trismus and pain was less cumbersome because these depend

**Table 1: Basic data of patients evaluated**

Group	Females	Males	Mean age in years
A (intravenous dexamethasone)	9	6	24.4
B (intralesional dexamethasone)	9	6	25.2
C (control)	8	7	23.3

**Table 2: Pain medications taken after surgery in the three groups (Values represent mean±standard deviation of number of pills per patient)**

Time	Group A (Intravenous dexamethasone)	Group B (Intralesional dexamethasone)	Group C (Control)
Day of surgery	3.7+-1.1	2.2+-0.4	5.9+-1.8
Total postoperative period	10.8+--.9	11.1+-6.3	11.3+-7.2

**Table 3: Differences in Incisal opening in the three groups (Values represent mean±standard deviation of differences in millimeters between operative and postoperative measurements)**

Time after surgery	Group A (Intravenous dexamethasone)	Group B (Intralesional dexamethasone)	Group C (Control)
Seventh day	8.5+-5.9	5.6+-3.1	12.3+-7.4

mainly on patients' cooperation. However, these two entities relate to each other and result from surgical trauma. In a single variable, trismus can demonstrate the most comprehensive assessment of postoperative inflammatory reaction.<sup>[18]</sup> Due to the lack of complete early recovery, the clinical estimation of trismus was done on the 7<sup>th</sup> postoperative day. Groups A and B patients presented with a significant reduction in trismus as compared to the control group. However, the two study groups showed difference on the effect on maximum mouth opening reduction which was calculated pre- and postoperatively. Less reduction in incisal mouth opening was reported in Group B as compared to Group A on the 7<sup>th</sup> postoperative day.

The study group patients showed a lower degree of pain as compared to the control group, but only on the day of surgical procedure not considering any other days following the surgery. This can be explained based on the fact that steroids are rapidly metabolized following surgery and therefore a single dose cannot provide continuous effect. Again, when the day of surgery is considered, Group B patients presented with less significant pain compared to Group A.

Results from this study point out that patients receiving intralesional steroids experienced lesser amount of pain and trismus as compared to those who received steroids through intravenous route. This observation can be explained by the fact that intralesional steroids result in an increase in local concentration along with the provision of repository effect. Moreover, intralesional steroids are also capable of bypassing first-pass metabolism up to some extent when compared to intravenous steroids.

## CONCLUSION

Considering previous studies which advocate the combination of long-acting anesthetics with nonsteroidal anti-inflammatory agents toward the reduction of postoperative pain, it can be considered that future clinical trials should be done and promoted to compare the combined effect of steroids, on-steroidal anti-inflammatory drugs, and long-acting anesthetics in the reduction of postoperative sequelae. In addition to this, sensitive measuring techniques that can quantitatively describe the reduction in postsurgical swelling are the need of the hour.

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## Conflicts of interest

There are no conflicts of interest.

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