

**Research Article**

**Comparison of effect of intramuscular and submucosal dexamethasone on postoperative swelling after impacted lower third molar surgery**

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**ABSTRACT:**

This study compared the effects of dexamethasone given submucosally and intramuscularly on postoperative swelling after removal of impacted lower third molars in a preliminary randomized prospective clinical trial. 190 patients, each of whom required removal of a single impacted mandibular third molar under local anesthesia, were randomly allocated to one of 2 groups, A and B of 95 each. The 2 experimental groups were given dexamethasone 4 mg submucosally and intramuscularly. Swelling was measured by an independent examiner at baseline (preoperatively), and at 1, 3, and 7 days postoperatively. Both group A and B patients presented with slight increase in edema on 1<sup>st</sup> postoperative day and return to almost equal proportions on 7<sup>th</sup> postoperative day. Patients in group B showed significant reduction in edema on 3<sup>rd</sup> postoperative day as compared to group A, which showed slight increase. Dexamethasone 4 mg given submucosally is an effective way of minimizing swelling after removal of impacted lower third molars and is comparable with the intramuscular route. It offers a simple, safe, painless, non-invasive, and cost-effective treatment in moderate and severe cases

**Keywords:** dexamethasone, molar surgery and clinical trial

**INTRODUCTION:**

Third molar surgery remains the mainstay of most oral and maxillofacial surgery practices<sup>1</sup>. Prevalence of impacted teeth in adult population is 28.3%<sup>2</sup>. Out of these, mandibular third molars are most commonly encountered (82.5%)<sup>2</sup>. Inflammatory edema and pain is normal phenomenon induced after any surgical procedure including third molar surgery<sup>3</sup>. Although this inflammatory process is necessary for healing,

when exacerbated it may cause pain, swelling, and limited mouth opening<sup>4</sup>. These symptoms can affect quality of life of patients during the first days of the postoperative process<sup>5</sup>. Management of these symptoms is frequently based on pharmacological manipulation of local and systemic mediators of pain and inflammation<sup>6</sup>. Corticosteroids are well known drugs to control postoperative inflammation<sup>7</sup>. Previous studies

have shown that dexamethasone, a well-known corticosteroid, attenuates the inflammatory mediators released from the injured tissue and white blood cells<sup>8</sup>.

For its administration, different routes have been used<sup>9</sup>. In most instances Oral and maxillofacial surgeons are well-versed with parenteral routes of administration of these drugs, but general dental practitioners involved in such dentoalveolar surgery are not<sup>9</sup>. General Dental practitioners are trained and well-versed with administering the drugs via oral route<sup>9</sup>. Previous studies show that with the use of 4mg intramuscular dexamethasone swelling occurs upto 0.7mm+0.6 while 1.2+0.5 with submucosal dexamethasone<sup>11</sup>. This submucosal route of administration of Dexamethasone is convenient for the surgeon as the injection is given in close proximity to the operative field and for the patient as the injection is given into an anesthetized area<sup>9</sup>.

In pursuit of improved immediate postoperative quality of life of patients after third molar surgery, there is need to conduct clinical trials. So, this study is purposed to see the comparative effectiveness of these two routes of administration of Dexamethasone to decrease the postoperative swelling after the surgical removal of impacted mandibular third molars, and to suggest a better option regarding the route of administration of Dexamethasone.

#### **Patients and methods:**

This randomized prospective study was conducted at the Department of Oral and Maxillofacial Surgery, Fatima Memorial Hospital, Lahore and included 190 patients each of whom required removal of a single impacted mandibular third molar under local anesthesia. Inclusion criteria included partially impacted mandibular third molars with Class II or III occlusions and Pell and Gregory classification A, B, or C on the radiograph. Subjects were 18 years of age or older and had no pericoronitis or infection at the time of operation. Exclusion criteria included a history of immunocompromise; a history of allergy to the

drug used; recent use of any anti-inflammatory drugs or antibiotics; long-term use of any drug; pregnancy or lactation; those who refused to take part in the study; or those who used other drugs during the observation period.

#### **Operative technique:**

The same surgeon operated on all patients using a standard technique. Anesthesia was given through a standard inferior alveolar nerve block and long buccal nerve block using a solution of 2% lignocaine hydrochloride and adrenaline 1:100 000. Surgical access was by a standard triangular mucoperiosteal flap. Bone was then removed around the tooth with a round bur on a straight handpiece under continuous irrigation with dilute chlorhexidine solution. The crown or roots were sectioned when necessary. After complete extraction of the tooth (or its components), the socket was inspected, irrigated copiously, and the flap was sutured back with 2 interrupted 4/0 silk sutures. A small gauze pack was then applied to the site and the usual postoperative instructions were given to the patient. The duration of operation (minutes from incision to the last suture) was recorded.

#### **Postoperative treatment:**

Patients were randomly divided into 2 groups A and B of 95 patients each. The two treatment groups received dexamethasone 4 mg as submucosal and intramuscular injections, respectively. Both injections were given immediately postoperatively. Submucosal dexamethasone was given into the buccal vestibule near the site of operation. Randomization was done by lottery method.

#### **Assessment and follow up:**

Measurements of facial swelling was made preoperatively and on the first, third, and seventh postoperative days by an independent examiner. Facial swelling on the operated side was evaluated by 2 facial measurements: tragus-midline and gonion-lateral canthus using a tape measure. The

preoperative sum of the 2 values (mm) was taken as the baseline for that side.

**Data analysis:**

The outcome variable was postoperative swelling. All the data was entered in Statistical Package for Social Scienc, version 20 (SPSS, Inc, Chicago, IL, USA) and results were analyzed. The qualitative data i.e. gender was presented as percentages and frequencies. Whereas quantitative data i.e. age and swelling were presented as mean and standard deviation. Student ‘t-test’ was used to compare the postoperative swelling after two routes of administration of dexamethasone injection. Confounding variables like age, BMI and gender were controlled by stratification to see the effect of these on outcome. Post-stratification t-test was applied. *p*-value <0.05 was taken as significant.

**RESULTS:**

One hundred and ninety patients were included in this study. They were divided into two groups; group A and group B. Each group comprised 90 patients. Group A received 4mg Dexamethasone submucosally while Group B received the same dose intramuscularly. The mean age of group A patients was 24.53±3.31 years and those of group

B was 25.13±3.60 years. The majority of patients were in the age range of 18-25 years. 95 (50%) patients received 4mg Dexamethasone submucosally and 95 (50%) patients received 4mg Dexamethasone intramuscularly (Table 1).

There were 59 males (62.8%) and 35 females (37.2%) in group A with male to female ratio of 1.7:1. While in group B, 57 males (59.4%) and 39 females (40.6%) with male to female ratio of 1.5:1 (Table 2).

Both group A and B patients presented with slight increase in edema on 1<sup>st</sup> postoperative day and return to almost equal proportions on 7<sup>th</sup> postoperative day. Although patients in group B showed significant reduction in edema (Mean±SD, from 142.74±102.33 to 139.07±22.02) on 3<sup>rd</sup> postoperative dayas compared to group A (Mean±SD, from 133.80±18.31 to 139.38±20.74) which showed slight increase. (Table 3)

Student ‘t-test’ was applied, which showed statistically no significant difference between two groups in terms of postoperative swelling .

When the data was compared between submucosal (group A) and intramuscular (group B) groups, both age range and male to female ratio was found to be significant (*p*<0.05). (Tables 4-6).

**Table 1:** Distribution of patients according to age in group A and B (n = 190)

Group	N	Minimum	Maximum	Mean ± SD
A	95	19.00	35.00	24.53±3.31
B	95	18.00	35.00	25.13±3.60

**Key:** SD: Standard deviation

Group A 4mg Dexamethasone (Submucosal)

Group B 4mg Dexamethasone (Intramuscular)

**Table 2:** Distribution of patients according to gender in group A and B (n = 190)

Group		Frequency	Percent
A	Male	59	62.8
	Female	36	37.2
	Total	95	100.0
B	Male	57	59.4
	Female	38	40.6
	Total	95	100.0

**Key:** Group A 4mg Dexamethasone (Submucosal)

Group B 4mg Dexamethasone (Intramuscular)

**Table 3:** Stratification of swelling for group A and B (n = 190)

Group		Minimum	Maximum	Mean±SD
A	Swelling (preoperative)	110	250	133.80±18.31
	Swelling at 1st day postop	135	270	136.64±22.19
	Swelling at 3rd day postop	110	280	139.38±20.74
	Swelling at 7th day postop	112	260	131.93±22.90
B	Swelling (preoperative)	110	115	142.74±102.33
	Swelling at 1st day postop	113	125	146.53±103.81
	Swelling at 3rd day postop	120	290	139.07±22.02
	Swelling at 7th day postop	110	280	131.95±21.68

**Key:** SD Standard deviation

Group A 4mg Dexamethasone (Submucosal)

Group B 4mg Dexamethasone (Intramuscular)

**Table-4:** Comparison of swelling between group A and B (n = 190)

Swelling	Group	Mean±SD	p-Value
Swelling (preoperative)	A	133.80±8.41	0.405
	B	142.74±94.90	
Swelling at 1st day postop	A	136.64±3.09	0.367
	B	146.53±2.83	
Swelling at 3rd day postop	A	139.38±09.22	0.921
	B	139.07±92.47	
Swelling at 7th day postop	A	131.93±93.02	0.994
	B	131.95±36.93	

**Key:** Group A 4mg Dexamethasone (Submucosal)

Group B 4mg Dexamethasone (Intramuscular)

**Table-5:** Stratification of swelling according to genders

Swelling	Gender	Mean±SD	p-Value
Swelling (preoperative)	M	144.56±8.45	.145
	F	128.53±4.05	
Swelling at 1st day postop	M	140.32±33.75	.764
	F	143.70±2.69	
Swelling at 3rd day postop	M	142.22±22.73	.015*
	F	134.54±05.38	
Swelling at 7th day postop	M	135.43±04.83	.006*
	F	126.46±17.94	

**Key:** M= Male F= Female

**Table-6:** Stratification of swelling according to age groups

Swelling	Age_C	N	Mean±SD	p-Value
Swelling (preoperative)	18-25	120	131.23±3.29	.083
	26-35	70	150.47±6.05	
Swelling at 1st day postop	18-25	120	141.45±2.93	.964
	26-35	70	141.96±2.67	
Swelling at 3rd day postop	18-25	120	136.16±9.21	.009*
	26-35	70	144.49±3.03	
Swelling at 7th day postop	18-25	120	129.63±82.9	.061
	26-35	70	135.89±22.5	

**Key:** Age\_C= Age Category

N= Number of patients

1= 18-25 years

2= 26-35 years

## **DISCUSSION:**

Use of corticosteroids is a pharmacological approach often used for reduction of swelling after removal of impacted mandibular third molars<sup>12</sup>. Numerous papers have supported their systemic use in third molar surgery. Recently, Markiewicz et al., in a meta-analysis, concluded that giving corticosteroids perioperatively was of mild to moderate value in reducing postoperative inflammatory signs and symptoms<sup>13</sup>. Specifically, patients given corticosteroids had significantly less postoperative swelling than controls, both early (after 1–3 days) and late (after 4–7 days). However, the effect on postoperative morbidity, and the duration of the effect of the corticosteroids, varied, mainly as a result of lack of consensus about the optimal route, dose, timing, and duration of treatment in addition to differences in methods used to evaluate clinical variables. The submucosal route, however, has been reported on only isolated occasions and was not mentioned even in most recent reviews.

The corticosteroid selected should have few mineralocorticoid effects and good biological activity. Dexamethasone meets these requirements, as it 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. There have been many studies that have evaluated the effectiveness of dexamethasone in third molar surgery using different routes with variable results.

### **Intramuscular dexamethasone:**

Few studies have objectively evaluated the effect of dexamethasone as an intramuscular injection in third molar surgery, although this route is the one most likely to be used when a steroid injection is prescribed in outpatients. Intramuscular dosing studies have suggested that this route can be effective if a single dose is given either preoperatively or postoperatively<sup>14</sup>. Different studies have used this route for third molar surgery and reported variable results<sup>15</sup>; the effect

may be dose-dependent. Some authors suggested using dexamethasone 8–12 mg for the best results. In our study intramuscular dexamethasone resulted in significant reduction in swelling on postoperative days 1 and 3. These results are in agreement with those of previous studies.

### **Submucosal dexamethasone:**

The submucosal injection of dexamethasone has been reported to have a significant effect on edema in two previous studies,<sup>16,17</sup> both of which reported a significant reduction in edema in the immediate postoperative period compared with controls. We found that submucosal dexamethasone was associated with a significant reduction in swelling on days 1 and 3 postoperatively compared with controls, which agrees with the previous studies. These results add more strength to the concept that dexamethasone injected locally near the site of operation in a subtherapeutic dose (4 mg) is a valuable way to reduce edema in these patients.

### **Submucosal compared with intramuscular dexamethasone:**

To the best of our knowledge this is one of the few studies in which the effects of local and systemic steroids have been compared in third molar surgery. Both dexamethasone groups were associated with a significant reduction in the amount of swelling and the effects in the two groups were comparable. Overall, the comparable results obtained show that submucosal dexamethasone is an effective alternative to dexamethasone given systemically. The expertise of the surgeon, the discomfort caused to the patient, and the need for specific tools to give the drug are factors that may limit the use of the intramuscular route. In addition, the rate of absorption is highly dependent on the blood flow to the site. Submucosal dexamethasone, on the other hand, is quite simple, less invasive, painless, 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. Postoperative injection offers the advantage of concentrating the drug near the surgical area with less systemic absorption and no further manipulation of the tissues. This timing also allows the surgeon to assess the need for injected steroid accurately, according to postoperatively recorded surgical difficulty and duration of the intervention.

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