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Comparison between local infiltration and intramuscular dexamethasone in surgical extraction of molar teeth

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***Abstract*---**Background: A tooth extraction is a procedure to remove a tooth from the bony socket. It is usually done by a general dentist, oral surgeon ect. Most common cause of tooth extraction is badly decayed tooth, periodontitis, impaction. The extraction of impacted third molars is one of the most common operative procedure in oral surgery. The surgical removal of impacted third molars involves trauma to the soft and bony tissue that can result in considerable pain, swelling and trismus Corticosteroids such as dexamethasone may inhibit the inflammatory sequelae after third molar surgery. Materials and methods: The study was conducted on total of 30 subjects, with age group above 18 years. The patients were divided into two groups. Each group contained 15 subjects, group A subjects received local infiltration of dexamethasone 4 mg near the surgical site on buccal vestibule and group B subjects received intramuscular dexamethasone 4 mg in deltoid muscle before operation. Results: The results obtained show that submucosal dexamethasone is an effective alternative to dexamethasone given systemically. Conclusion: The submucosal dexamethasone associate with a significant reduction in

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swelling on 1-2days. This study has shown that a dexamethasone injected submucosally is better than intramuscularly in third molar surgery.

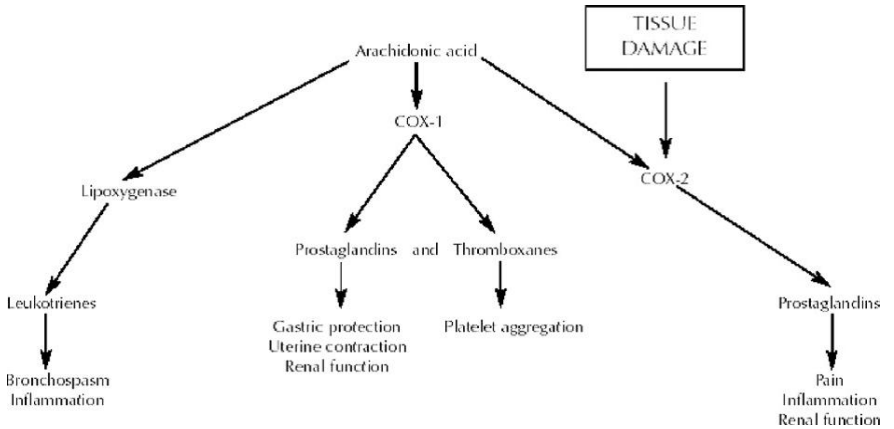
***Keywords*---**molar teeth, submucosal dexamethasone, surgical extraction.

Introduction

The extraction of impacted third molars is one of the most common operative procedure in oral surgery. The surgical removal of impacted third molars involves trauma to the soft and bony tissue that can result in considerable pain, swelling and trismus[1]. These postoperative sequelae can cause distress to the patient and affect the patient's quality of life after surgery. Postoperative swelling and edema may be due to the mediators of the inflammatory response. These symptoms are not observed immediately after surgery but rather begin gradually, peaking 48 hours after the extraction. Corticosteroids such as dexamethasone may inhibit the initial step in this process and have been extensively used in varying regimens and routes to lessen inflammatory sequelae after third molar surgery.[1] The use of corticosteroids can decrease the severity of postoperative sequelae in many patients and therefore decrease morbidity after oral surgery. Careful surgical technique is effective in limiting tissue damage and swelling; therefore, attention should be taken to avoid prolonged periods of tissue elevation and retraction.

Inflammation

Inflammation is the body's attempt at self-protection; the aim being to remove harmful stimuli, including damaged cells, irritants, or pathogens - and begin the healing process.The word inflammation comes from the Latin *"inflammo"*, meaning *"I set alight, I ignite"*. When something harmful or irritating affects a part of one's body, the body's response is to try to remove it by setting inflammatory response. The cardinal signs of inflammation are pain, heat, redness, swelling, and loss of function[2]. The inflammatory process is necessary if healing is to occur, but often excessive inflammation causes the patient unnecessary pain, edema, and trismus.



Third molar removal is one of the most common surgical procedures carried out in the oral surgery. Routine sequelae after third molar removal include edema, trismus, and pain. These side effects are manifestations of the body's natural response to surgical insult. Perioperative administration of systemic corticosteroids is a pharmacologic approach used commonly to reduce postoperative morbidity after surgery

Aims and Objectives

The aim of this study is to compare the efficacy of local infiltration of 4mg dexamethasone near the surgical site in buccal vestibule versus dexamethasone 4 mg injected intramuscularly and to evaluate its effect on on postoperative pain, swelling and trismus.

Methods of Collection of Data and Methodology

The study was conducted in the Department of Oral & Maxillofacial Surgery, Jaipur Dental College, Jaipur. A total of 30 subjects, with age group 18 year and above were randomly selected and included in the study after obtaining the informed consent. Subject should be healthy, having no history of any systemic disease or other immuno-compromised condition. Detailed history was taken and thorough clinical examination was done, the patients were divided into two groups. Each group contained 15 subjects, group A subjects received local infiltration of dexamethasone 4 mg near the surgical site on buccal vestibule and group B subjects received intramuscular dexamethasone 4 mg in deltoid muscle before operation. Patients aged 18 years and above with impacted third molars were included in the study. Medically compromised patients, immunocompromised patients, patients who refused to take part in the study and pregnant and lactating females were excluded from the study. The patients were selected according to the laid criteria as per the inclusion and exclusion criteria. Investigations included were: - Routine hematological investigation, X-Ray and Orthopantomogram.

Patients were randomly divided into 2 groups of 15 patients each, groups A patient received dexamethasone 4mg as local infiltration near the surgical site on buccal vestibule and group B received intramuscular injection in deltoid muscle respectively. Both injections were given immediately postoperatively. Along with Dexamethasone, all patients were prescribed amoxicillin 500 mg every 8 h orally for 5 days, and Diclofenac 50 mg + Paracetamol 325 mg orally as required. They were also advised to do chlorhexidine mouth rinse twice daily starting on the day after operation for next 5 days. Clinical parameters like pain, swelling, trismus were evaluated (using visual analog scale, distance from soft tissue pogonion to tragus of ear and the distance from outer canthus of eye to angle of mandible, and by measuring the distance between incisal edges of upper & lower central incisors using divider and scale respectively)

Statistical Evaluation of Clinical Parameters

At the end of the study all the recorded data were compiled and statistically evaluated. For statistical analysis, Medcalc (version 14.0.0) software was used.

For evaluation of patient for age, pain, swelling and mouth opening, the data were presented as mean with standard deviation (SD) and "*unpaired 't' test*" was used. For evaluation of pain, "*Mann-Whitney Test*" was used. A *p* value of less than or equal to 0.05 was statistically significant.

Results

The study was conducted on 30 patients who were equally divided in two groups. Group A consisted of 15 patients in whom 4 mg dexamethasone was locally infiltrated near the surgical site in buccal vestibule immediately after surgical extraction of impacted 3rd molar. Group B consisted of 15 patients in whom 4mg dexamethasone was injected intramuscularly immediately after extraction of impacted 3rd molar surgery was done with suturing. The 30 patients included in this study were of age ranging from 18-50 years in both the groups, with mean of 29.18±7.39 in Group A, and 28.63±9.38 in Group B. On application of statistical test this difference was not found significant (P > 0.05). [Table-1, Graph-1]

Postoperatively mean pain score in Group A on 1st day was 1.53±0.51 which was similar to Group B (P > 0.05). On 3rd day it reduced to 0.88±0.61 in Group A, while it increased to 1.63±0.49 in Group B. This difference was statistically significant (P < 0.01). On 7th day it again reduced to 0.43±0.50 in Group A, and it also reduced to 1.10±0.59 in Group B. This difference was statistically significant (P < 0.001). On 15th day mean pain score was reduced to 0.050.22 in Group A, and also in Group B to 0.38±0.59. This difference was statistically significant (P = 0.002). [Table-2, Graph-2]

Swelling was measured preoperatively, on the operative day & on 1st, 3rd, 7th, and 15th day respectively. The mean swelling in Group A on 1st day was 11.24±1.00 cm, while that of Group B was 11.79±0.95 cm. This difference was statistically significant (P = 0.013). On 3rd day it increased to 11.87±0.96 cm in Group A, while it increased to 12.58±0.75 cm in Group B. This difference was statistically significant (P < 0.01). On 7th day it reduced to 11.50±0.91 cm in Group A, and it also reduced to 12.54±0.71 cm in Group B. This difference was statistically significant (P < 0.001). On 15th day mean swelling was reduced to 11.21±0.92 cm in Group A, and also in Group B to 11.77±0.85 cm. This difference was statistically significant (P = 0.002). [Table-3, Graph-3]

Postoperatively the mouth opening in Group A on 1st day was 38.25±3.83 mm, while that of Group B was 38.58±3.10 mm. This difference was statistically insignificant (P = 0.677). On 3rd day it reduced to 30.85±3.55 mm in Group A, while it reduced to 25.43±3.26 mm in Group B. This difference was statistically significant (P < 0.01). On 7th day it started increasing to 35.4±3.26 mm in Group A, and it also increased to 31.50±2.30 mm in Group B. This difference was statistically significant (P < 0.001). On 15th day mean mouth opening was increased to 38.80±2.96 mm in Group A, and also in Group B to 37.15±1.93 mm. This difference was statistically significant (P = 0.004). [Table-4, Graph-4]

Table 1. Distribution of patient included in this study according to age in two groups

	Group	N	Mean	Std. Deviation	'p' Value*
Age	A	15	29.18	7.39	0.772
	B	15	28.63	9.38	

*Unpaired't' test

Graph 1. Distribution of patient according to age in two groups

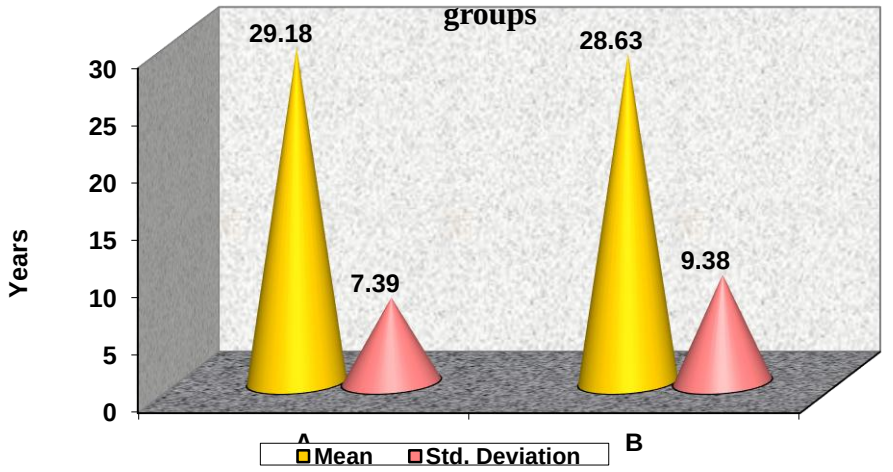


Table 2. Pain analysis according to the group of patients Comparison of VAS at different time interval

Time Interval	Group	N	Mean	Std. Deviation	Median	'p' Value*
1st day	A	15	1.53	0.51	2	1.000
	B	15	1.53	0.51	2	
3rd day	A	15	0.88	0.61	1	<0.001
	B	15	1.63	0.49	2	
7th day	A	15	0.43	0.50	0	<0.001
	B	15	1.10	0.59	1	
15th day	A	15	0.05	0.22	0	0.002
	B	15	0.38	0.59	0	

*Mann-Whitney Test

Graph 2. Pain analysis according to the group of patients

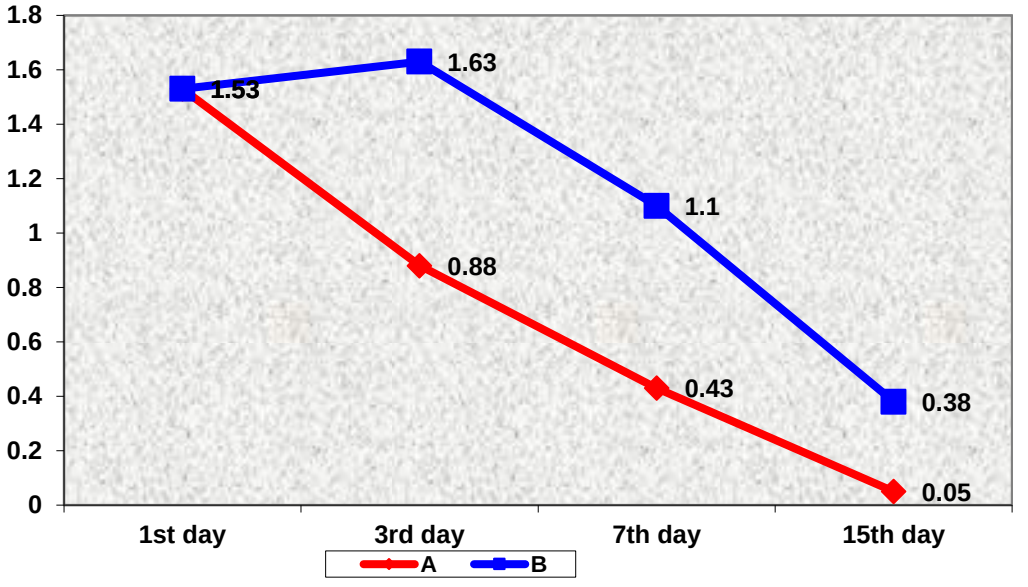


Table 3. Analysis of swelling according to the group of patients
Comparison of swelling at different time interval

Time Interval	Group	N	Mean	Std. Deviation	'p' Value*
1st day	A	15	11.24	1.00	0.013
	B	15	11.79	0.95	
3rd day	A	15	11.87	0.96	<0.001
	B	15	12.58	0.75	
7th day	A	15	11.50	0.91	<0.001
	B	15	12.54	0.71	
15th day	A	15	11.21	0.92	0.006
	B	15	11.77	0.85	

*Unpaired't' test

Graph 3. Analysis of swelling according to the group of patients

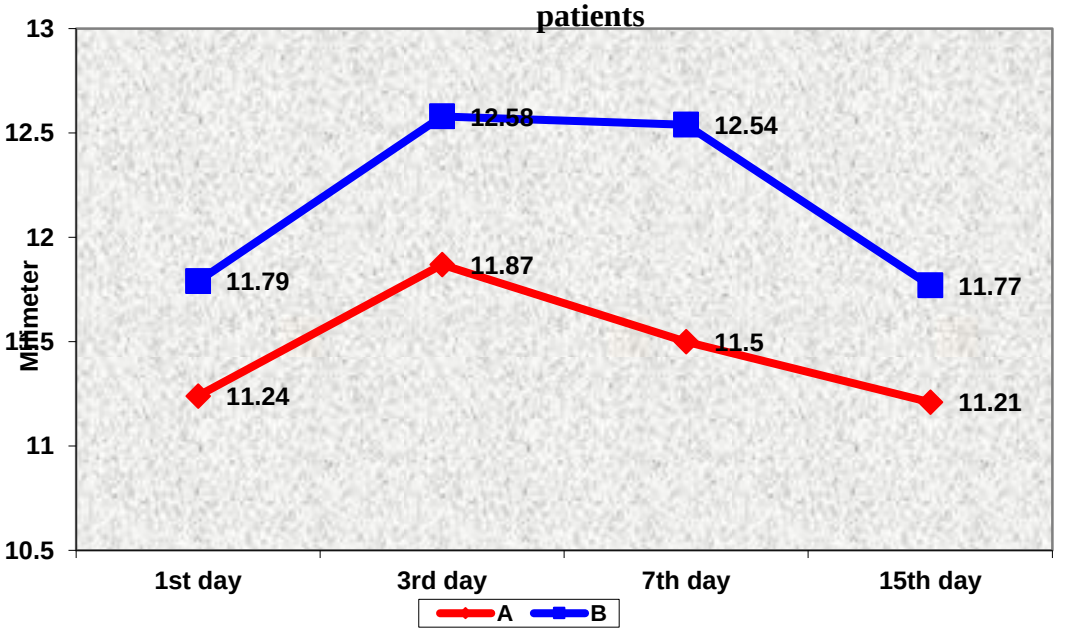
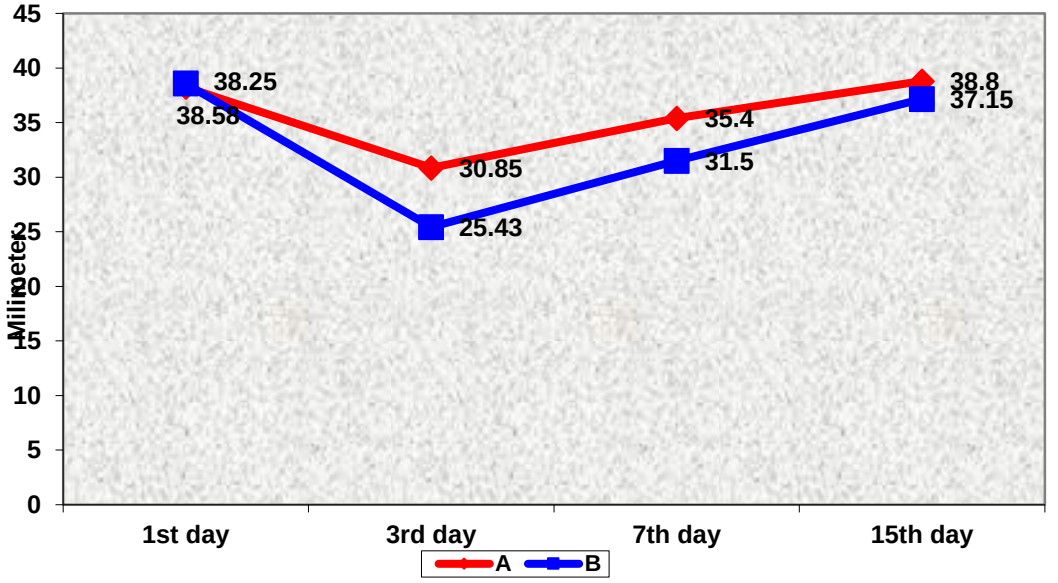


Table 4. Mouth opening according to the group of patients
Comparison of mouth opening at different time interval

Time Interval	Group	N	Mean	Std. Deviation	'p' Value*
1st day	A	15	38.25	3.83	0.677
	B	15	38.58	3.10	
3rd day	A	15	30.85	3.55	<0.001
	B	15	25.43	3.26	
7th day	A	15	35.40	3.26	<0.001
	B	15	31.50	2.30	
15th day	A	15	38.80	2.96	0.004
	B	15	37.15	1.93	

*Unpaired't' test

Graph 4. Mouth opening according to the group of patients



Discussion

The present study compared the effect of dexamethasone injected intramuscularly and given submucosally near the surgical site on postoperative pain, swelling, trismus. Perioperative use of corticosteroids is a pharmacological approach often used for reduction of oedema, trismus, and pain after removal of impacted mandibular third molars[3,4,]. 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. Specifically, patients given corticosteroids had significantly less postoperative swelling and trismus than controls, both early (after 1–3 days) and late (after 4–7 days). In addition, those who took corticosteroids reported less pain early but not late postoperatively than control groups. 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.[6,7,8] 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.[9]

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. In our study intramuscular dexamethasone resulted in significant reduction in swelling on postoperative days 1 and 3 and significant reduction in pain scores, but had no significant effect on trismus compared with controls. These results are in agreement with those of previous studies.[6,8,10]

Submucosal dexamethasone

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 oedema in these patients.[11] An interesting finding was the significant reduction of trismus on day 1, which may have been the result of the higher concentration of dexamethasone achieved immediately at the site of injury. Further research, however, is needed to confirm these results. Grossi et al., in the other study, gave an injection of dexamethasone just before the operation and after the anaesthetic had been given. The raising of the flap and manipulation of tissue during the operation may have affected the concentration of drug injected and impeded its absorption.[12] Knowing that the effect of dexamethasone on pain is dose dependent, we assume that a higher dose is required when the drug is given preoperatively to achieve clinically effective analgesia.

Submucosal compared with intramuscular dexamethasone

Both dexamethasone groups were associated with a significant reduction in the amounts of swelling and pain, and submucosal dexamethasone had a significant effect on trismus, but the effects in the two groups were comparable for all variables. Although there is wide consensus about their effect on swelling, the role of corticosteroids in preventing postoperative pain is controversial. The overall trend was reduction in the severity of pain from the 1st, 3rd, 7th and 15th postoperative days in group A, while in group B there was increase in pain on 3rd day and then reduction from 7th, and 15th postoperative days, which was also statistically significant ($P<0.05$). Our results correlated with those authors.

In our study, the trend of swelling was same as in literatures. In the submucosal dexamethasone group it was comparatively less than that of the intramuscular dexamethasone group. From the present study it was evident that dexamethasone injected submucosally has relation with severity of mouth opening. Mouth opening on 1st postoperative day in both the group was about same ($P>0.05$). While the condition differed from 3rd postoperative day to 15th postoperative day i.e. condition improved more rapidly in sutureless technique group than that of conventional suturing group, which was also statistically significant ($P<0.05$).

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,[6,13] 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.

Conclusion

The result showed that postoperative pain, swelling and mouth opening, after removal of impacted mandibular third molar is better when dexamethasone is injected submucosally near the surgical site than when it is injected intramuscularly. 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 oedema in these patients. These results are in agreement with those reported in literature. This study has shown that a dexamethasone injected submucosally is better than intramuscularly in third molar surgery.

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