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Evaluate the Efficacy of Dexamethasone with Various Routes After Surgical Extraction of Mandibular Third Molar. Running Title: Efficacy of Dexamethasone with Various Routes.

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Keywords

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Abstract

Third molar impaction is believed to be one of the most commonly encountered Dental Anomaly which occurs due to human Evolution, lifestyle changes, habits which leads to decrease in size of Human Jaw. Prevalence of third molar impaction is higher in mandible as compared to maxilla. Surgical extraction of impacted third molars is one of the most routinely practiced minor surgical procedure in the Field of Oral and Maxillofacial Surgery. Surgical extraction of third molar are frequently associated with mild to severe complications depending upon the type, degree and location of the impacted tooth. Most commonly associated complications associated with surgical third molar extraction are Swelling, Trismus and Discomfort. To reduce these associated comorbidities, powerful anti-inflammatory agents such as Corticosteroids can be used. Dexamethasone is a long acting systemic corticosteroid acting on inflammatory mediators. Route of Administration of Dexamethasone is an important Factor to be taken into consideration to minimize the Post-Operative Complications. Here, in our study we have administered dexamethasone via different Modes such as Intravenous (IV), Intramassetric (IM), Sub mucosal(SM) and oral Route. The main Aim of this Study is to evaluate the expeditious path to reduce post-operative discomfort, Swelling and Trismus after surgical removal of third molar.

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1. Introduction

The most prevalent minor surgical procedure in oral surgery is the surgical extraction of impacted third molars.[1,2] An inflammatory reaction is triggered by this intrusive surgery, and it may appear mostly as discomfort, swelling, and trismus. The quality of life can occasionally suffer from mild to severe short-term transient impacts as a result of an amplified response.[3] These post-extraction morbidities frequently cause people to hesitate and express resistance to having the tooth removed.

In the field of minor oral surgery, there has been interest in finding ways to reduce these comorbidities. Surgical techniques can use a variety of flaps, bone-cutting methods, and sectioning methods, among others. These might not work in every therapeutic circumstance, though. As a result, extensive research has been done on pharmacological medications to lessen postextraction sequelae.[4]

The powerful anti-inflammatory effects of corticosteroids are mediated through the inhibition of phospholipase A2, a key enzyme in the arachidonic acid pathway. The synthesis of inflammatory mediators such interleukin 1, prostaglandins, and leukotrienes decreases when this route is inhibited.[5]

There have been positive findings from research looking at the impact of corticosteroids before or after third molar excision.[6-8] Dexamethasone has been used in oral surgery for years because of its potent mode of action and lengthy half-life.[9]Dexamethasone delivery methods for third molar surgery have been proposed in a number of ways. Dexamethasone delivery routes have been a source of debate because experts have yet to agree on the best strategy for minimising postextraction sequelae.[10-13]

Few studies have compared alternative methods for administering dexamethasone shortly postoperatively, including intravenous (IV), intramassetric (IM), submucosal (SM), and oral. The goal is to determine the quickest and most straightforward path to reduce postoperative discomfort and guarantee a prompt return to normalcy.

2. Material and Method

The Institutional Review Board and Ethical Committee gave their appropriate blessings and permits for the project. For statistically meaningful and trustworthy results, a total sample size of 60 patients was used. The patients were split into four groups using simple randomization. This was a three-month prospective randomised comparative clinical research. The trial was conducted in a single facility, and a single surgeon handled every procedure. One-way analysis of variance (ANOVA), with $P< 0.001$ considered significant, was the statistical method utilised.

Inclusion criteria

Patients in the age group of 18–45

Patients with symptomatic impacted mandibular third molars

Exclusion criteria

Patients with existing active infections

Patients with systemic disorders

Patients on long-term steroids

Pregnant and lactating women. Informed written consent was obtained from all the patients.

They were then randomly divided into four groups:

Group A: IV route

Group B: SM route

Group C: IM route

Group D: Oral route (tablets)

All patients had their initial preoperative evaluations. One surgeon performed the surgeries on each and every patient. The patients were made ready for surgery using normal aseptic and surgical techniques. Both lingual and conventional inferior alveolar nerve blocks were used. The tooth was delivered after sufficient bone cutting and tooth splits as was judged required after access was

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gained using a conventional Ward's incision. Efforts were made to cause the tissues as little damage as possible. Following extraction, the socket was liberally irrigated with 5% povidone iodine solution diluted with normal saline. Black Braided Silk 3-0 interrupted sutures were used to stitch the flap back together.

Group A patients: 8 mg dexamethasone IV was injected into the median cubital or the radial vein

Group B patients: 8 mg dexamethasone was injected around the operated site SM

Group C patients: 8 mg dexamethasone was injected into the massetric muscle (IM)

Group D patients: 8 mgs dexamethasone (Decmax® 8 mg) tablet given orally.

Standard postoperative instructions were given to the patients, who were instructed to apply an ice pack to the area sporadically for the following six hours. All patients received a combination of 500 mg of paracetamol three times per day for three days and three times per day of amoxicillin (500 mg) for five days. Following surgery, every patient was checked on on the first, third, and seventh postoperative days. To compare the mean values, one-way ANOVA and mean values with standard deviation were utilised as the statistical methods. If the healing was found to be sufficient, the sutures were removed on the seventh postoperative day.

The followings were assessed:

Swelling: Evaluated by a modification of the tape measuring method described by Schultze-Mosgau et al. Two measurements were made among four reference points: tragus, pogonion, and the corner of the mouth and ala of the nose. The preoperative sum of the two measurements was considered as the baseline for that side

Trismus: Measured as the difference in maximal mouth opening (taken as the distance between upper and lower central incisors, assessed by a measuring tape to the nearest mm) before and after the operation

Pain: Postoperative pain was evaluated using a visual analog scale (VAS) 10 mm long that ranged from 0= “no pain” to 10 = “the worse possible pain”

3. Result:

After surgical removal of the mandibular third molar we gave dexamethasone 8mg in 60 patients through four different routes (Oral, Intra muscular, Intra venues, Sub mucosal) and we have evaluated the pain, swelling and truisms on 1st, 3rd, and 7th day post operatively.

Out of 60 patients,

Pain

Table 1.1 shows After removal of tooth on 1st day patient had moderate pain in oral and intramuscular route with mean value of 5.20, and 5.40 respectively and mild to moderate pain with intra venues route with mean value of 3.47 and 3.13 respectively. Table 1.2 shows On 3rd day patient had mild pain in oral and intramuscular route with mean value of 4.13 and 3.40 respectively, and no pain observed in intravenous and sub mucosal route with mean value of 1.87 and 1.80 respectively. Table 1.3 shows On 7th day the all the patients had almost no pain in all the roots with mean value of 0.73 oral, 0.33 intramuscular 0.13 intra venues and 0.33 sub mucosal routes.

Table 1.1 Pain on 1st day

Medicine	N	1	2
Sub mucosal	15	3.13	
Intravenous	15	3.47	
Oral	15		5.2

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Intramuscular	15		5.4
Sig.		0.681	0.908

Table 1.2 Pain on 3rd day

Medicine	N	1	2
Sub mucosal		1.8	
Intravenous	15	1.87	
Oral	15		3.4
Intramuscular	15		4.13
Sig.	15	0.996	0.067

Table 1.3 Pain on 7th day

Medicine	N	1	2
Sub mucosal	15	0.13	
Intravenous	15	0.33	0.33
Oral	15	0.33	0.33
Intramuscular	15		0.73
Sig.		0.618	0.082

Swelling

Table 2.1 shows On 1st day patient had selling over two region out of corner of the mouth, ala of the nose, infra orbital region, tragus in oral and intra muscular route with mean value of 3.00 and 2.47 respectively and in intra venues and sub mucosal route only one region involve with mean value of 1.60 and 2.0 respectively. Table 2.2 shows On 3rd day swelling observes same in oral and intra muscular route as in 1st day with mean value of 2.53 and 3.00 respectively but no swelling observed in intravenous and sub mucosal route with mean value of 1.47 in both the routes . Table 2.3 shows On 7th day no swelling observed after various routes of dexamethasone.

Table 2.1 Swelling on 1st day

Medicine	N	1	2	3
Sub mucosal	15	1.6		
Intravenous	15	2	2	

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Oral	15		2.47	2.47
Intramuscular	15			3
Sig.		0.296	0.175	0.096

Table 2.2 Swelling on 3rd day

Medicine	N	1	2
Sub mucosal	15	1.47	
Intravenous	15	1.47	
Oral	15		2.53
Intramuscular	15		3
Sig.		1	0.269

Table 2.3 Swelling on 7th day

Medicine	N	1
Sub mucosal	15	0.13
Intravenous	15	0.27
Oral	15	0.4
Intramuscular	15	0.53
Sig.		0.096

Trismus

Table 3.1 shows On 1st day all patents had reduced mouth opening. Average mouth opening is 15 to 25 mm in oral and intra muscular route with mean value of 2.93, 2.80 respectively and 25 to 35 mm in intra venues and sub mucosal route with mean value of 2.27 and 2.07. Table 3.2 shows On 3rd day mouth opening reduced in which patient had treated with oral and intra muscular route with mean value of 2.27 and 2.73 respectively and almost adequate mouth opening in intra venues and sub mucosal route with mean value of 1.40 to 1.60. and Table 3.3 shows on 7th day all the patient had adequate mouth opening in all the routes with mean value of 1.13, 1.27, 1.13, 1.07 in oral, intra muscular, intra venues, and sub mucosal respectively.

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Table 3.1 Trismus on 1st day

Medicine	N	1	2	3
Sub mucosal	15	2.07		
Intravenous	15	2.27	2.27	
Oral	15		2.8	2.8
Intramuscular	15			2.93
Sig.		0.83	0.118	0.941

Table 3.2 Trismus on 3rd day

Medicine	N	1	2
Sub mucosal	15	1.4	
Intravenous	15	1.6	
Oral	15		2.27
Intramuscular	15		2.73
Sig.		0.784	0.138

Table 3.3 Trismus on 7th day

Medicine	N	1
Sub mucosal	15	1.07
Intravenous	15	1.13
Oral	15	1.13
Intramuscular	15	1.27
Sig.		0.436

4. Discussion

The surgical extraction of the third molar is one of the procedures maxillofacial surgeons perform most frequently. They have postoperative consequences, including discomfort, edoema, and trismus, much as other surgical procedure. The degree as well as severity of these are influenced by a number of factors, such as the patient's physiological response to the procedure, the length of the procedure, the amount of tissue ripped, and the amount of manipulation that was performed.[14 15] Although inflammation is a vital component of postoperative healing, an excessively strong response frequently leaves patients in severe pain. Because of the loose connective tissue and high level of vascularization in the craniofacial region, significant inflammatory reactions are commonly seen. [16]

Corticosteroids are a well-known adjunct for lowering fluid as well as blood transudation

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following surgery as well as tissue inflammatory mediators. A synthetic corticosteroid having powerful anti-inflammatory characteristics, dexamethasone is long-lasting and fairly selective. It exhibits a fundamental glucocorticoid impact and is approximately twenty five times more potent than hydrocortisone, six times more potent than prednisolone, four times more potent than methyl prednisolone and triamcinolone, as well as about equal in potency to betamethasone. [17] There is significant debate and ambiguity about how corticosteroids affect pain control. Studies suggest that corticosteroids lack any pronounced analgesic properties. Thrombboxane A2 (TXA2) levels stay the same after steroid therapy, despite prostaglandin PGE2 levels—the main pain mediators—not changing. The reduction in trismus and edoema is, nevertheless, frequently interpreted as a reduction in pain.

A reduction in pain has been reported by several authors[18] [19], but no numerically significant analgesic benefit has been found. Corticosteroids could be given intramuscularly, that is a manageably simple approach, to decrease exaggerated inflammatory responses. The procedure is painless since the injection site is close to the region that has already been anaesthetized. While their absorption is dependent on local blood flow where the injection is made as well as might also be hindered by the existence of infection as well as severe swelling, both the IM as well as SM routes ensure rapid local availability. A similar line of action was earlier proposed by Messer and Keller[20], who administered four mg of dexamethasone to the masseter muscle in three different sites and noticed a significant reduction in pain, edoema, and trismus. Local steroid therapy seems to be very advantageous since eicosanoids act locally on the tissues from which they are released. These eicosanoids influence vasodilation, capillary permeability, as well as chemotaxis. Steroids interact with such eicosanoids directly to reduce swelling. Moreover, ectopic neuroma firing in the injured nerve and signal transmission in nociceptive C fibres are directly inhibited by locally injected glucocorticoids. Repository drug forms are acceptable for intramuscular distribution because they have a sluggish absorption rate and a prolonged duration of action.

Research on intramuscular dosing show that when just one injection is given, either preoperatively or postoperatively, this route of administration could be effective. The ability of Iv infusion to ensure protracted pain control or betterment in edoema as well as trismus, nevertheless, is still in question. [22] IV administration offers a faster onset of action as well as greater absorption. Due to their perception that IV injections are yet another invasive procedure, some people are hesitant to get them. Giving IV injections could be challenging and challenging on its own in some situations. We found that the IV category seemed to have the minimal trismus during our examination. Pain is a profoundly subjective and difficult to evaluate issue because of its multivariate complexity, but still the VAS has a history of providing a trustworthy measure of pain. In our trial, there was numerically noteworthy pain reduction in the IV group on days one as well as three. The quicker onset of action as well as immediate plasma steroid levels of the IV route may help to elucidate this. As per Schmelzeisen as well as Frolich, a six mg dexamethasone pill given both pre- and postoperatively reduced inflammation on the first postoperative day. Markovic and Todorovic examined the amount of dexamethasone consumed six hours following surgery. In our experiment, we gave 8 mg dexamethasone pills immediately following surgery. In healthy individuals, oral dexamethasone has a bioavailability of seventy to seventy eight percent and scarcely undergoes first-pass metabolism. [23] The oral route is often more well-liked by individuals.

Whilst it might be stated that oral dexamethasone's lengthier period of action seems to have a longer onset of effect, several research have demonstrated that parenteral techniques produce outcomes which are comparable. At dosages of 8 mg, dexamethasone has been demonstrated to exhibit impacts similar to those of endogenous cortisol produced in reaction to tissue damage. In this study, pain and edoema were lessened in the IV group whereas mouth opening had been limited in the oral as well as IM categories. This might be as a result of the IV's increased plasma steroid concentrations, better absorption, and quicker onset of effect. [24] [25] Many writers have noticed that edoema has lessened with all injectable methods.

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Our research demonstrates that even using oral methods, overall results are equivalent as well as patient satisfaction is higher since it spares those who are needle phobic from injection.

5. Conclusion

Administration of dexamethasone has shown to be effective in reducing the unavoidable effects of third molar extraction. The usual route of administration, the IV, exhibits the highest effectiveness, the best pain management, and the quickest beginning of action. Localized routes, like SM, have their benefits and produce equivalent outcomes. Dexamethasone can be administered intramuscularly (IM) or orally, both of which have the highest patient acceptance and compliance rates. We suggest the SM and IV routes as efficient ways to provide dexamethasone following third molar extraction. Our findings might be further supported by additional research with larger sample numbers.

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