

# A Comparative Study to Evaluate the Effects of Dexamethasone & Tube Drain on Post-Operative Sequelae After Surgical Extraction of Impacted Mandibular Third Molars – An In Vivo Study

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## Abstract

This study was conducted to compare the effectiveness submucosal dexamethasone and tube drain on post-operative sequelae following surgical extraction of impacted mandibular third molars. 20 patients who visited for surgical extraction of bilaterally impacted mandibular third molars are taken. All the patients included in the study received dexamethasone injection on one side (Group 1) and tube drain on the contralateral side (Group 2). A minimum of two weeks interval was given between the bilateral surgical procedures in all the individuals. Pain, swelling and trismus were recorded on 2<sup>nd</sup> and 7<sup>th</sup> post-operative days and the collected data was subjected to statistical analysis using Mann-Whitney test and t test. Results of the present study showed that there was no statistically significant difference in facial swelling and trismus between Group 1 (dexamethasone) and Group 2 (tube drain) on both 2<sup>nd</sup> and 7<sup>th</sup> post-operative days. This study showed that group 2 experienced more pain compared to group 1 and the difference in pain experience is statistically significant on both 2<sup>nd</sup> and 7<sup>th</sup> post-operative days. Our study showed that the 4 mg of submucosal dexamethasone is more effective than tube drain in reducing post-operative sequelae after surgical extraction of impacted mandibular third molar. Based on our clinical experience and study results we would like to conclude that submucosal dexamethasone should be preferred over tube drain in patients undergoing surgical extraction of impacted mandibular third molars to minimize post-operative sequelae. Further we recommend use of tube drain in clinical situations like completely impacted tooth, presence of infection or risk of infection because of systemic disorders and patients in whom steroids are contraindicated.

**Key words:** Dexamethasone, Tube Drain, Third Molars

## Introduction

The surgical extraction of impacted mandibular third molar is the most frequent intervention in oral surgery<sup>1</sup>. This procedure is often associated with significant post-surgical sequelae that may have both biological and social impact<sup>2</sup>. Besides complications such as dysaesthesia, infection, dry socket and fracture of mandible; patients frequently complain of pain, swelling and limitation in mouth opening due to the inflammatory response following the surgical injury to both soft and hard tissues.<sup>3</sup> In spite of meticulously planned and executed surgical procedure, pain, swelling and trismus are inevitable and make it more frustrating and annoying to both the patient and surgeon<sup>1</sup>. Reducing or minimizing these post-operative sequelae after mandibular third molar surgery seems a laudable goal, particularly if the clinical healing is not compromised<sup>1</sup>. Several methods such as ice packs,<sup>4</sup> ultrasound,<sup>5, 6</sup> enzyme preparations<sup>7</sup>, non-steroidal anti-inflammatory drugs, steroids and surgical drains have been used to minimize the occurrence of post-operative

pain, swelling and trismus. An ideal agent used after mandibular third molar surgery should alleviate pain, swelling and trismus to a minimum level, promote healing but should not have unwanted effects. A single agent which can meet all the above criteria does not exist. From time to time oral surgeons have devised several methods to minimize these sequelae to a tolerable level<sup>8</sup>. Primary and secondary closure of incision after the mandibular third molar surgery has been compared by many authors. Conflicting opinions have been expressed in the literature concerning these two types of wound closure. Some authors are in favour of primary closure of the socket based on the fact that it reduces the possibility of delayed healing, infection and patient's discomfort. Whereas other authors have reported that primary closure of socket causes greater pain and swelling due to reduced drainage of the inflammatory fluid from the socket as compared to secondary closure. Hence attempts have been made to close the wound primarily and leaving a surgical drain to gain advantages of both primary and secondary closure.<sup>13, 24, 25, 26, 27</sup> In recent years a lot of literature has been published regarding the use of dexamethasone and tube drain in impacted mandibular third molar surgeries. Steroids are among the most potent anti-inflammatory drugs. The exact mechanism by which the glucocorticosteroids inhibit inflammation is not fully understood, however the primary mechanisms were thought to involve, effects on leukocytic movement and functions.

It is now evident that glucocorticosteroids control the expression of many genes involved in the inflammatory process.<sup>1, 9, 10</sup> Among the steroids Dexamethasone has been used extensively in Oral and Maxillofacial Surgery due to its high potency, no mineralocorticoid effect and long shelf life<sup>11</sup>. Various regimen and routes of administration have been proposed in the literature<sup>12, 13, 14, 15</sup>. Recent studies are in favour of 4-8 mg single dose of dexamethasone administered through submucosal route<sup>12, 14, 15</sup>.

The use of a drain (dressing) inserted post-operatively in the socket has been a controversial and still unresolved issue. Many different kinds of medicated<sup>16, 17, 18, 19, 20</sup> (gauze dressing saturated with a bismuth-iodoform-paraffin paste, bacitracin and neomycin, Vaseline, whitehead's varnish and chlortetracycline ointment) and non-medicated dressing or drains<sup>25, 26, 27, 28, 29</sup> such as tube and rubber drains have been used to control the post-operative sequelae following surgical extraction of impacted mandibular third molars with variable success rates. There is no doubt regarding the effectiveness of dexamethasone and tube drain when compared to control group as literature expresses this fact very well. The purpose of the present study is to compare the effects of dexamethasone and tube drain on post-operative sequelae after surgical extraction of impacted mandibular third molars.

## **Materials And Methods**

### **Source of Data:**

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### **Sample Size:**

20 patients who required surgical extraction of bilaterally impacted mandibular third molars were included in this study.

### **Inclusion Criteria:**

1. Patients with-in the age group of 18 – 35.
2. Patients requiring surgical removal of bilaterally impacted mandibular third molars with close surgical difficulty index.
3. Patients with no signs of pericoronitis.

### **Exclusion Criteria:**

1. Medically compromised patients.
2. Pregnant and lactating patients.
3. Chronic use of medication that obscure assessment of the inflammatory responses (E.g., Antihistamine, NSAIDS, steroids, and antidepressants).

4. History of allergy to drugs used in the study.
5. History of antibiotic and anti-inflammatory drugs within two weeks before the surgical procedure.
6. Surgical complication making the procedure non-comparable.

**Methodology**

All the patients included in the study received dexamethasone injection on one side (Group 1) and tube drain on the contralateral side (Group 2). A minimum of two weeks interval was given between the bilateral surgical procedures in all the individuals.

1. Clearance from the ethical committee was obtained for the proposed study.
2. Written informed consent.
3. Presurgical clinical and radiographic examination.
4. A mouth rinses with 15 ml of 0.2% Chlorhexidine solution for one minute before and immediately after the surgery.
5. Surgical procedure:
  - 2% Lignocaine HCl with 1:200000 adrenaline was used to achieve local anaesthesia.
  - In Group 1 submucosal injection of 4 mg dexamethasone was administered into the buccal vestibule.
  - Ward’s incision was placed.
  - Osteotomy and Odontosection (if required) were performed with round and straight fissure bur respectively under continuous irrigation with sterile saline solution.
  - In Group 2 Silicon tube drain (infant feeding tube no. 06) of 1.5 cm length were inserted into the extraction socket through the vestibular releasing incision and secured with sutures for next three days
  - Primary closure was obtained in both the groups using 4-0 silk suture.
1. Cap. Augmentin 625(Amoxicillin 500 mg + Clavulanic acid 125 mg) was prescribed two times daily for five days. Tab. Paracod (Paracetamol 650 mg + codeine 30) mg was given immediately after surgery and later when required for pain relief.
2. 2% Chlorhexidine 8th hourly for 1 week.
3. Group 2 patients were recalled on the third post-operative day for drain removal.

**Methods of Collection of Data**

Patients were evaluated

1. Preoperatively for:
  - a. Maximum mouth opening- interincisal distance was measured.
  - b. Recording facial measurement- distance from tragus to corner of mouth and soft tissue pogonion
2. On 2nd and 7th Postoperative days for:
  - a. Pain- Postoperative pain was evaluated by the number of analgesics required by the patient and pain was rated using a 9 point visual analog scale (VAS). Patients were advised to take analgesics as soon as their pain reached a moderate level.
  - b. Swelling- Swelling was evaluated by using flexible measuring tape as described by Edward et al. Two measurements were taken between three reference points, from tragus to soft tissue pogonion and corner of the mouth.
  - c. Trismus- Trismus was measured as maximum interincisal distance using a Vernier Caliper.

**ASSESSMENT OF STUDY GROUP 1**

CHARACTERS	PREOPERATIVE	2 <sup>nd</sup> DAY PREOPERATIV	7 <sup>th</sup> DAY PREOPERATIV
FACIAL MEASURMENT			
MAXIMUM MOUTH OPENING			
VISUAL ANALOG SCALE SCORE			
NUMBER OF ANALGESIC TAKEN			

**STUDY GROUP 1: PREOPERATIVE SUBMUCOSAL INJECTION OF DEXAMETHASONE**  
**ASSESSMENT OF STUDY GROUP 2**

CHARACTERS	PREOPERATIVE	2 <sup>nd</sup> DAY PREOPERATIVE	7 <sup>th</sup> DAY PREOPERATIVE
FACIAL MEASUREMENT			
MAXIMUM MOUTH OPENING			
VISUAL ANALOG SCALE SCORE			
NUMBER OF ANALGESIC TAKEN			

**STUDY GROUP 2: TUBE DRAIN AFTER EXTRACTION**



**Figure 1: Armamentarium**



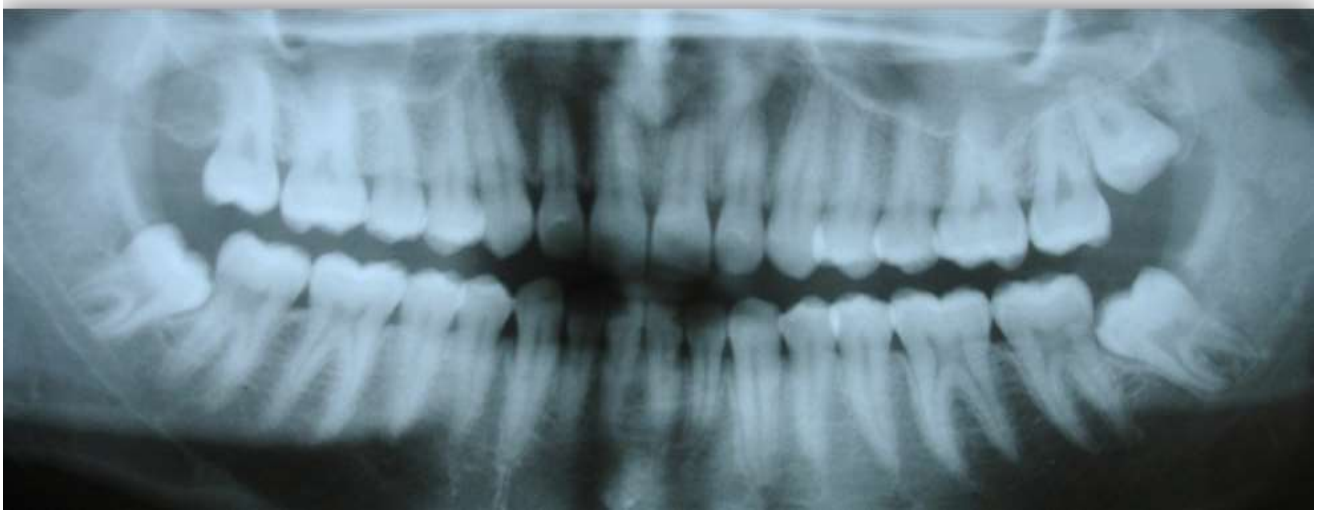
**Figure 2: Mouth opening (interincisal distance)**



**Figure 3: Facial measurement from tragus to corner of the mouth**



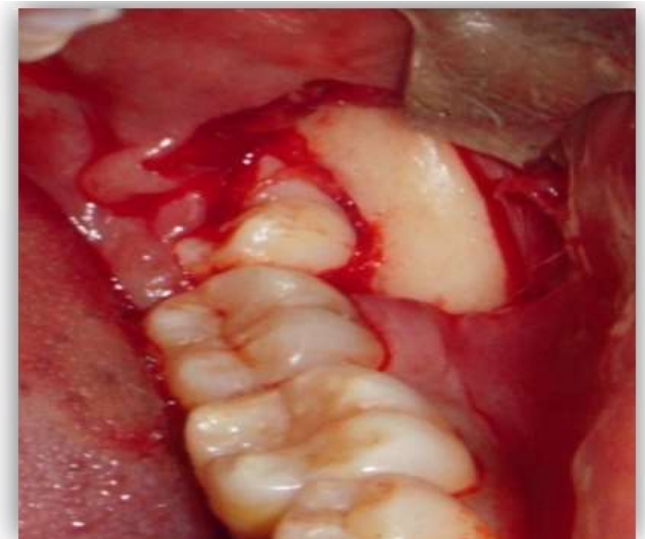
**Figure 4: Facial measurement from tragus to soft tissue pogonion**



**Figure 5: OPG showing bilaterally impacted mandibular third molars**



**Figure 6: Pre-operative view**



**Figure 7: Incision and exposure of impacted tooth**



**Figure 8: Tooth socket after delivery of impacted tooth**



**Figure 9: Placement of tube drain & primary closure of the socket**

**Results**

20 patients requiring surgical extraction of bilaterally impacted mandibular third molars participated in the present study. Out of 20 patients 13 (65%) were male and 7 (35%) were female. Age of the patients varied from 18 to 26 years (average, 22 years). Out of 40 impacted mandibular molars, 30 (75%) were mesioangular, 4 (10%) were horizontal and 6 (15%) were distoangular. Tube drain was placed on 20 sites 10 (50%) on right side and 10 (50%) on left side.

**Table 1 and Graph 1** shows the comparison of VAS score on 2nd and 7th post-operative days between group 1 (dexamethasone group) and group 2 (tube drain group). Mann-Whitney test was used to find out if there is any significant difference between Group 1 and Group 2 with respect to VAS score. Results of the present study shows that there is a significant difference between Group 1 and Group 2 with respect to VAS score on 2nd Post Op Day (P<0.001) and also on 7th Post Op Day (P<0.05). Higher mean and median VAS score is recorded in Group 2 compared to Group 1 on 2nd & 7th Post Op Day and this difference is found to be statistically significant.

**Table 2 and Graph 2** shows the comparison of number of analgesics taken on 2nd and 7th post operative days between group 1 (dexamethasone group) and group 2 (tube drain group). Mann-Whitney test was used to find out if there is any significant difference between Group 1 and Group 2 with respect to number of analgesics taken. Results of the present study shows that there is a significant difference between Group 1 and Group 2 with respect to number of analgesics taken on 2nd Post Op day (P<0.001) and also on 7th Post Op Day (P<0.05). The mean (and median) number of analgesics taken is found to be higher in Group 2 compared to Group 1 on 2nd & 7th Post Op Day and this difference is found to be statistically significant.

**Table 3 and Graph 3** shows the comparison of facial measurements on 2nd and 7th post operative days between group 1 (dexamethasone group) and group 2 (tube drain group). t- test was used to find out if there is any significant difference between Group 1 and Group 2 with respect to number of analgesics taken. Results of the present study shows that there is no significant difference between Group 1 and Group 2 with respect to Facial measurement on the 2nd Post Op day (P>0.05). The mean facial measurement in Group 2 is found to be higher than Group 1 but the difference is statistically insignificant. The mean difference in facial measurement on 7th Post Op day between Group 1 and Group 2 is also not statistically significant (P>0.05).

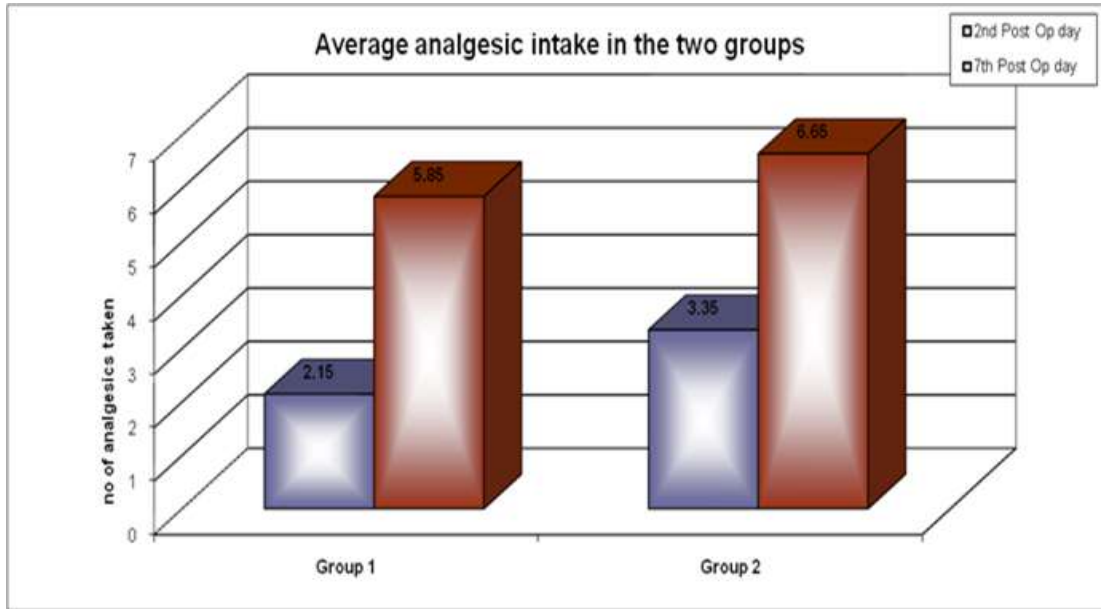
**Table 4 and Graph 4** shows the comparison of mouth opening on 2nd and 7th post-operative days between group 1 (dexamethasone group) and group 2 (tube drain group). t- test was used to find out if there is any significant difference between Group 1 and Group 2 with respect to mouth opening. Results of the present study shows that there is no significant difference between Group 1 and Group 2 on 2nd Post op day as well as on 7th Post op day (P>0.05). Mean mouth opening (in cms) is found to be more in Group 1 on 2nd and 7th Post Op day as compared to Group 2 but the difference is statistically insignificant.

**TABLE: 1**

Parameter	Day	Group 1		Group 2		Z	P-value
		Mean±SD	Median	Mean±SD	Median		
VAS Score	2nd Post Op day	3.70±0.80	4.00	5.90±0.97	6.00	-5.068	<0.001*
	7th Post Op day	0.65±0.67	1.00	1.15±0.67	1.00	-2.242	0.040*

\* Denotes a significant difference

**GRAPH – 1**

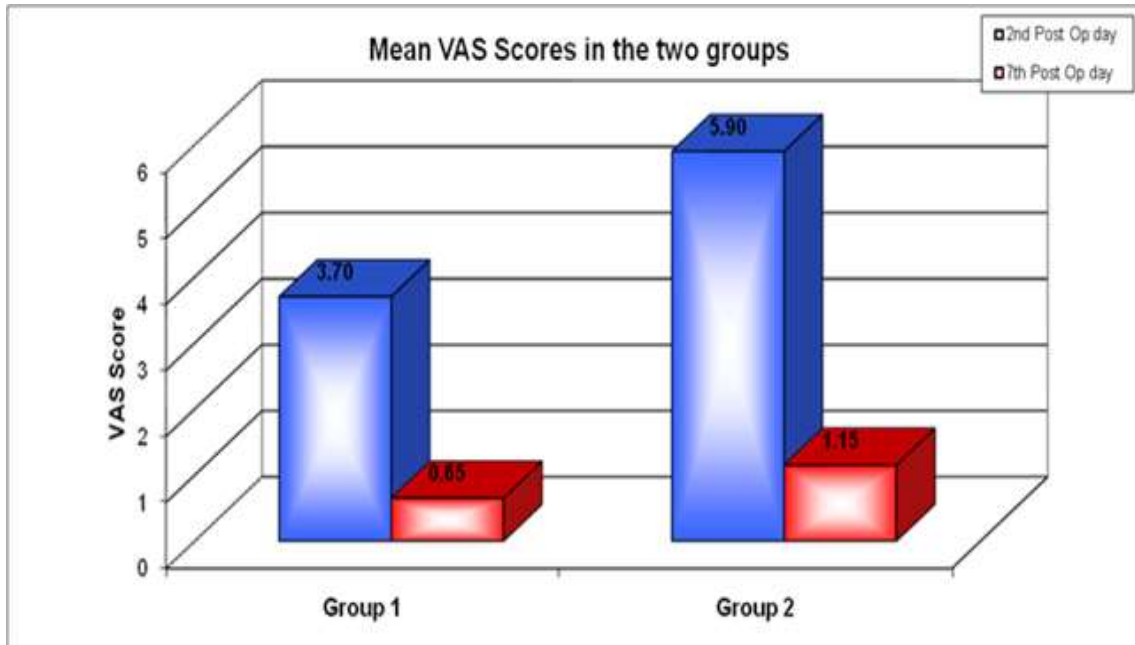


**TABLE 2**

Parameter	Day	Group 1		Group 2		Z	P-value
		Mean±SD	Median	Mean±SD	Median		
Number of analgesic taken	2nd Post Op day	2.15±0.67	2.00	3.35±0.88	3.50	-3.859	<0.001*
	7th Post Op day	5.85±0.87	6.00	6.65±0.93	7.00	-2.582	0.013*

\* Denotes a significant difference

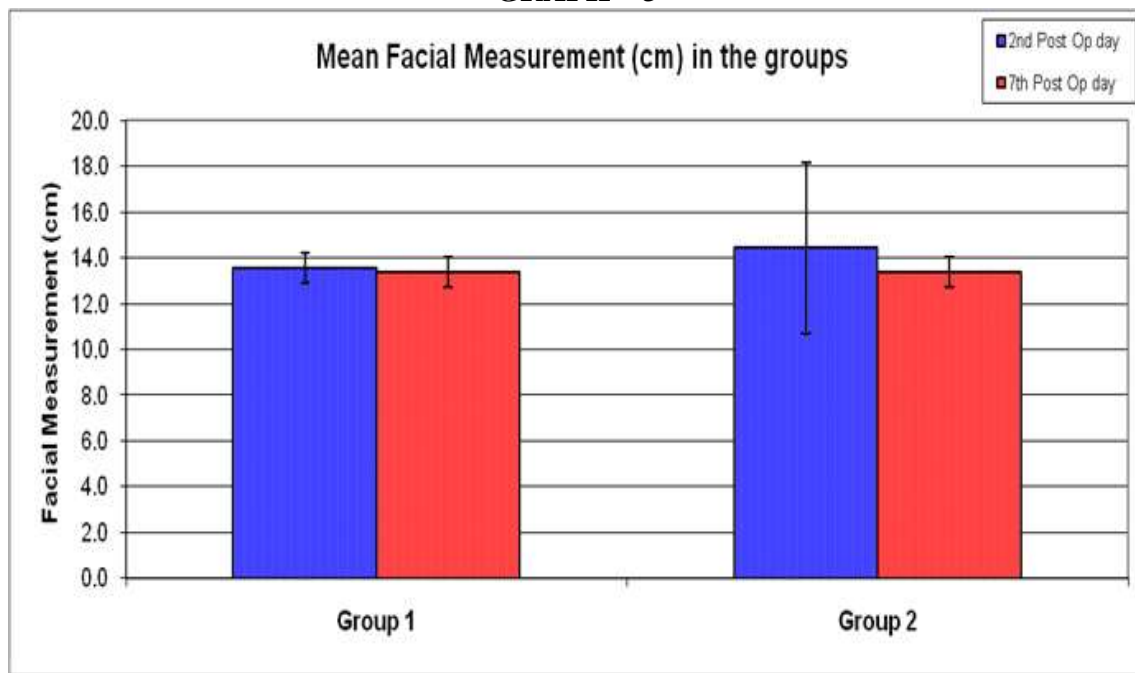
**GRAPH – 2**



**TABLE – 3**

Parameter	Day	Group 1 Mean±SD	Group 2 Mean±SD	Mean Difference	Z	P-value
Facial measurement (cms)	2nd Post Op day	13.57±0.67	14.42±3.72	-0.850	-1.005	0.321
	7th Post Op day	13.37±0.67	13.36±0.65	0.005	0.024	0.981

**GRAPH – 3**

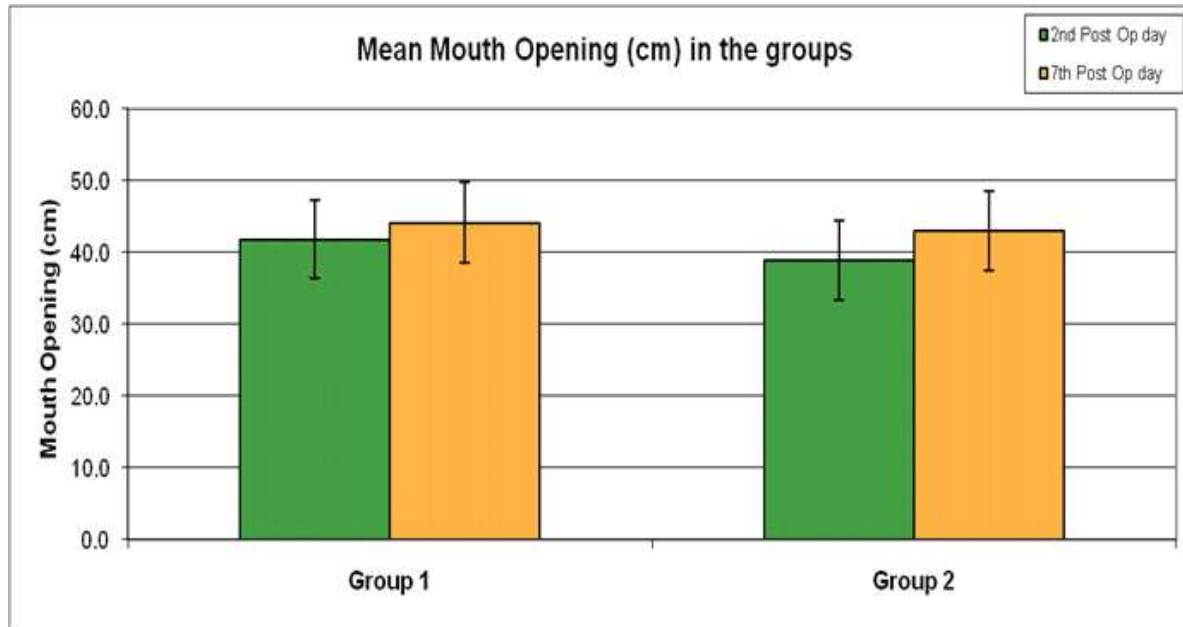


**TABLE - 4**

Parameter	Day	Group 1 Mean±SD	Group 2 Mean±SD	Mean Difference	Z	P-value
Mouth opening (cms)	2nd Post Op day	41.85±5.48	38.90±5.69	2.950	1.670	0.103
	7th Post Op day	44.15±5.59	43.00±5.59	1.150	0.650	0.519



**GRAPH – 4**



## Discussion

Tissue injury after surgical extraction of impacted mandibular third molar induces a complex series of interaction between local inflammatory and general neurohormonal responses, which clinically manifest as pain, swelling and trismus.<sup>3</sup> Reducing or minimizing these post-operative sequelae after third molar surgery, seems a laudable goal, particularly if the clinical healing is not compromised<sup>1</sup>. In recent years a lot of literature has been published regarding the use of submucosal dexamethasone and tube drain for reduction of post operative sequelae following surgical extraction of impacted mandibular third molars. Our study aims to compare the effectiveness of these two methods on post operative sequelae following surgical extraction of impacted mandibular third molars. There is no doubt regarding the effectiveness of dexamethasone and tube drain when compared to control group as literature expresses this fact very well. In our study we directly compared these two methods in same individual without having a control group to simplify the statistical analysis and minimize patient related factors which can affect results of our study. In the present study 20 healthy patients within age group of 18-35 were included to minimize age related variables. To minimize patient related factors; patients with signs of pericoronitis, medically compromised, pregnant and lactating and those who were on medications that can obscure the assessment of the inflammatory response, were not included in the study.<sup>12</sup> In the present study we included the patients who required surgical extraction of bilaterally impacted mandibular third molars with same surgical difficulty variables, calculated by Pederson difficulty index. This is in contrast to the authors like Giovanni Battista<sup>14</sup> Paulo Roberto et al.<sup>28</sup> and Felix et al.<sup>29</sup> where cases requiring surgical extraction of one side of mandibular third molar were included in the study. Different methodologies have been used to record intensity of pain which can be categorized as quantitative assessment (Verbal Rating Scale, Visual Analog Scale, number of analgesics used by patient) and qualitative assessment (McGill pain questionnaire)<sup>9</sup>. In our study pain was evaluated using VAS and number of analgesics used by the patient<sup>12</sup>. Post-surgical facial edema is hard to quantify accurately because it involves 3 dimensions of measurement with an irregular, convex surface and manifest itself internally as well as externally. In contrast to other studies<sup>12, 15, 26, 28, 29, 30</sup> we have followed the facial measurement method proposed by Giovanni Battista et al.<sup>14</sup> we did not include the areas of face which do not swell after the third molar surgery to minimize the change in the actual linear measurement. Although this method is not as accurate as computerized tomography scanning or magnetic resonance imaging for making precise

measurements of the facial soft tissue volume, it is a simple, non invasive, cost effective and time-saving method, which provides numerical data for determination of soft tissue contour change<sup>29</sup>. In our study 4 mg submucosal dexamethasone was administered preoperatively as per the protocol proposed by Giovanni Battista et al<sup>14</sup> in contrast to other studies<sup>1, 12, 15, 32</sup> where intramuscular or intravenous route was used. Submucosal route was preferred in our study to achieve higher effective drug concentration at the site of surgery.<sup>1, 14</sup> Dexamethasone was administered once the local anaesthesia was achieved which was more comfortable for the patients as compared to intravenous injections. Intramuscular injection has not shown better results over intravenous injections. The effectiveness of oral administration of steroid depends on patient's compliance and requires repeated dosing.<sup>32</sup> In accordance with the other studies<sup>12, 14</sup> a combination of paracetamol 650 mg and codeine phosphate 30 mg was used as analgesic in our study, which does not modify platelet aggregation, coagulation time or neutrophilic action. Results of our study showed that the intensity of pain was highest at 2nd post op day in both the groups and gradually diminished over a period 7 post operative days. This observation is in line with the experience of other authors<sup>14, 29, 30, 31</sup>. Several authors<sup>26, 27, 28</sup> have reported no effect of tube drain on the reduction of pain intensity over an observation period of seven days. On the other hand Zandi M<sup>31</sup> and Edward et al<sup>12</sup> showed a significant reduction of pain in experimental group in which dexamethasone was used. Results of the present study shows a low VAS score and reduced number of total analgesics consumption in dexamethasone group as compared to the tube drain group which is statistically significant and is in accordance with Zandi M.<sup>31</sup> Results of our studies are in accordance with the F.Graziani et al<sup>1</sup> who reported that dexamethasone reduces pain after surgery. They observed statistically insignificant decrease in patient's pain perception and total number of analgesics consumption as compared to control group. Felix et al<sup>29</sup> reported significantly more pain in rubber drain group in the first 72 hours compared to the control group and stated that the significant difference could be because of the local irritation which patient might have interpreted as pain. Whereas Zandi M<sup>31</sup> stated that the use of rubber drain is more comfortable with lower risk of retrograde infection as compared to the tube drain. In our study the severity of pain and more number of analgesic consumption in tube drain group seems to be because of less flexibility of the tube drain which caused more local irritation as compared to rubber drain used in other studies<sup>29, 31</sup>. None of our patients developed infection, but they frequently complained of local irritation due to the tube drain. Development of swelling starts shortly after the surgery and reaches to its maximum after 24-48 or 48-72 hours according to Laskin and Peterson respectively. The swelling gradually subsides and disappear after approximately 1 week provided normal healing occurs.<sup>13</sup> We observed a decrease in facial swelling from 2nd to 7th post op day which is in accordance with the other studies<sup>14, 29, 30</sup>. Several authors have reported a reduction in facial swelling with the use of dexamethasone<sup>1, 12</sup> and tube drain.<sup>26, 27, 28</sup> Results of our comparative study is in accordance with the results of Melike et al.<sup>30</sup> who reported statistically insignificant difference between intravenous steroid and tube drain group in relation to facial swelling. In contrast to our study Zandi M<sup>31</sup> reported significantly less facial swelling in steroid group. Most probable reason for this difference in result is the regimen of the steroid used in their study. Compared to our study where we used a single dose of 4 mg submucosal dexamethasone preoperatively, Zandi M used 8 mg of intravenous dexamethasone preoperatively and three tablets of 5 mg methylprednisolone every 12th hour. In our study, we followed the regimen proposed by Giovanni Battista<sup>14</sup> and used 4 mg submucosal dexamethasone preoperatively. In a recent comparative study Jose Rodriguez et al<sup>15</sup> reported a significant reduction in facial swelling with 8 mg as compared to 4 mg of intravenous dexamethasone. Trismus develops more slowly than swelling and reaches to its maximum after 2-3 days. Post-operative pain and trismus are closely related, indicating that pain is the major cause for reduced mouth opening apart from the other minor causes leading to trismus after mandibular third molar surgeries<sup>13, 33</sup>. Variable results have been published in relation to trismus when drains were used. Saglam<sup>27</sup> and Flexi et al<sup>29</sup> reported improvements in mouth opening, whereas Sutas et al<sup>26</sup> and Paulo Robert<sup>28</sup> reported no improvement in mouth opening as compared to control group. Various authors like F.Graziani et al<sup>1</sup> and Edward et al<sup>12</sup> reported a significant reduction in trismus with submucosal and intravenous administration of dexamethasone respectively as compared to the control group. Results of our study are in accordance with Zandi M<sup>31</sup> who has reported no difference in trismus in both steroid and drain groups. Whereas results of Melike et al<sup>30</sup> are in contrast to the results of our

study, where the author reported a significant reduction in trismus in the steroid group. However; the author has not mentioned the reason behind this finding and in conclusion, recommends use of both steroid and tube drain based on patient's preference. Various authors are in agreement that, it is better to avoid any kind of pharmaceutical products like steroids when the same objective can be achieved with physical method like tube drain, because drugs can have side effects besides its advantages<sup>24, 27, 31</sup>. Administration of steroids always have systemic side effects such as, suppression of defense mechanism with diminished resistance to infection, hypertension, hyperglycemias; but the extent to which steroids affect physiology of the body is still unknown. Steroid administration is contraindicated in cases such as diabetes, active infection, ocular herpes simplex, tuberculosis, primary glaucoma and acute psychosis.<sup>1, 10, 12</sup> Tube drain is a simple, drug free and cost effective method. The use of drain has some disadvantages such as, increase in surgical time, blockage of the drain with clot or food debris, it requires an additional appointment for removal and gives feeling of foreign body in the mouth. Drain acts as a two-way conduit and the use of it must be weighed against possible ensuing infection. The presence of drain in surgical wound for more than three days may cause delayed healing.<sup>26, 28</sup> During our study we experienced that tube drain placement is a very simple and effective method but the correct orientation of the tube in the surgical site is very important. Learning curve with tube drain placement is very steep and with experience of few cases we were able to place tube drain at a faster pace. Surgeons have two ways to secure the tube drain, either suturing it to the adjacent soft tissues or tying it to the adjacent tooth with a suture material. In our study the problem of tube blockage was not encountered, instead many patients complained salty, blood tinged fluid draining from the tube. Making multiple openings in the part of the tube which is inside the surgical site assisted better drainage. In this regard our experience with infant feeding tube no. 06 has been very good. We used 1.5 to 2 cm length of the tube which provided adequate drainage for the third molar surgical site. Our results with tube drain was better in cases of completely impacted teeth whereby placing one suture distal to second molar can close the surgical site completely, resulting in accumulation of inflammatory fluid leading to increase in post operative sequelae. Some authors have suggested socket drainage in cases where there is presence of infection or risk of infection because of systemic disorders<sup>27</sup>. Tube drain becomes a good alternative because in many such conditions corticosteroid may be contraindicated. We tried to compare the results of our study with that of other authors and found that their studies were carried out with different drugs, doses, administration routes and methodology, making comparison difficult. A limitation of our study design is that neither the patient nor the surgeon was blinded to the use of steroid or the tube drain. We followed specific protocols in our study, like selection of patients requiring surgical extraction of bilaterally impacted mandibular third molars with close surgical difficulty index and single operator to minimize the potential bias, thereby eliminating operator and patient related variability. The present study showed that, there was statistically significant difference in pain between dexamethasone and tube drain groups. But there was no statistically significant difference in facial swelling or mouth opening between the two groups.

## Conclusion

The present study was conducted on 20 patients who required surgical extraction of bilaterally impacted mandibular third molars with closed surgical difficulty index. We compared the effect of submucosal dexamethasone and tube drain after surgical extraction of mandibular third molars. Results of our study showed that patients experienced more pain on the side where tube drain was placed, compared to the side where submucosal injection of dexamethasone was administered. The effect of tube drain and submucosal dexamethasone on facial swelling and trismus were similar. Based on our clinical experience and study results we would like to conclude that submucosal dexamethasone should be preferred over tube drain in patients undergoing surgical extraction of impacted mandibular third molars to minimize post operative sequelae. Further we recommend use of tube drain in clinical situations like completely impacted teeth, presence of infection or risk of infection because of systemic disorders and patients in whom steroids are contraindicated.

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