

# To study the efficacy of pre-emptive analgesia for pain management in surgical impaction of mandibular third molar

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## Abstract

**Introduction:** Various types, positions and class of 3<sup>rd</sup> molars cause different diseases of soft tissues and hard tissues. Surgical extraction of 3<sup>rd</sup> molars is thus the treatment of choice. Post operative complications after the extraction of third molars poses a fear among the patients to go for the surgery and to avoid it, they delay the surgery leading to more serious complications. This study aims to find out ways to reduce the post operative complications after removal of 3<sup>rd</sup> molars.

**Material and Methods:** Patients who reported to department of dentistry, GMC Kathua, with complaint of impacted mandibular 3<sup>rd</sup> molar and were willing to participate in the study were included. A total of 90 patients participated in the study which were divided into 3 groups randomly. Patients were given pre-emptive analgesia as paracetamol, diclofenac, and control. Patients were examined pre, intra and post operatively for different parameters and results were analyzed.

**Results:** Mesio-angular type (37%) of impaction was the most common type present. Class 1 (49%), level B (68%) in Pell and Gregory classification were present more oftenly than others. Statistically significant results were found in reduction of VAS score, post operative swelling, number and duration of analgesia consumed, number of rescue injections given in groups where the pre-emptive analgesia was used. These groups achieved pre operative maximal incisal opening faster than the control group.

**Discussion-** The use of pre-emptive analgesia before extraction of 3<sup>rd</sup> molars reduces the complications associated with it, therefore its use should be encouraged and should be made a regular protocol. This will in turn result in less post operative sequelae.

**Keywords:** 3<sup>rd</sup> molars, pre-emptive, impaction, complications

## Introduction

Pre-emptive analgesia has been defined as treatment that starts before surgery, prevents the establishment of central sensitisation caused by incisional injury and prevents establishment of central sensitisation caused by incisional and inflammatory injuries <sup>[1]</sup>. It works as an antinociceptive treatment preventing altered central processing which is responsible for

amplification of post operative pain [2].

Removal of third molar is a common procedure in oral surgery practice. Surgery is invasive in nature and oftenly is associated with postoperative pain, swelling and trismus which can increases the patient's suffering and anxiety. It can also disrupt the homeostasis of the circulatory and endocrine systems [3, 4, 5].

Postoperative pain management in case of 3<sup>rd</sup> molar extraction is an important factor to be taken into consideration. It can be prevented by inhibiting the initial neural cascade which leads to hypersensitivity produced by noxious stimuli [6, 7, 8, 9]. Pre-emptive analgesia thus play a very important role in management of postoperative pain.

Many preemptive agents have used for effective pain control [10, 11, 12]. In our study we have compared the efficacy of IV Diclofenac and IV paracetamol in the management of post operative complications following 3<sup>rd</sup> molar extraction.

### **Objectives of the study**

1. To measure the efficacy of Injection Paracetamol as preemptive analgesic for pain control in surgical impaction of mandibular third molar
2. To measure the efficacy of Injection diclofenac as preemptive analgesic for pain control in surgical impaction of mandibular third molar
3. To compare the efficacy of Injection Paracetamol and Injection diclofenac for pain control in surgical impaction of mandibular third molar.
4. To measure and compare the extension of analgesia of Injection paracetamol and Injection diclofenac

### **Materials and Methods**

The study will be conducted in the department of dentistry, GMC Kathua.

90 patients who require surgical impaction of mandibular third molar will be divided randomly into 3 groups.

**Group A:** Injection Paracetamol

**Group B:** Injection Diclofenac

**Control group:** Saline.

After taking informed consent, the patients will be allocated in to three different groups randomly by a separate investigator. Drug blinding will be done and the patient will be given drug by staff nurse. Record will be maintained and will be given to principal investigator to remove bias. Patients will receive Injection Paracetamol 1g IV infusion in Group A, Injection diclofenac 75 mg IV in Group B, Normal Saline IV in the control group. The analgesic will be received I hour before the incision. All the patients will undergo standard method of surgical impaction of mandibular third molar under local anesthesia. The procedure involves incision, reflection, bone guttering, extraction of the tooth and suturing. This procedure will be done by the same surgeon. Patients were assessed during surgery, 2 hours, 1st, 2nd, 3rd and 7<sup>th</sup> day post operatively.

### **Clinical parameters**

1. Efficiency of preemptive analgesia in group A, group B and control group based on VAS score (figure 1).
2. Extension of preemptive analgesia in group A, Group B and control group based on VAS score
3. Need for post operative analgesic.

4. Quantity of analgesics consumed on Post operative days
5. Number of post operative days analgesics consumed.
6. Patients will be assessed for swelling and trismus post operatively.

#### **Four measurements were made between five measurement points (fig 2a – 2d)**

- a. The distance between the lateral corner of the eye and angle of mandible. (fig 2a)
- b. The distance between the tragus and soft tissue pogonion. (fig 2b)
- c. The distance between the tragus and outer corner of mouth. (fig 2C)
- d. The distance between the angle of mandible and soft tissue pogonion. (fig 2d)

#### **The mean of these four measurements were calculated to assess the swelling post operatively**

1. Time taken during the surgery will be assessed
2. Patient vitals will be recorded during the surgery
3. Quantity of local anesthesia used with number of rescue injections.
4. Assessment of type, level, class and grade of impaction.<sup>13</sup>

#### **Winter's classification**

1. Vertical- The long axis of 3rd molar is parallel to the long axis of the second molar. (10 to -10 degree)
2. Mesio-angular- The impacted tooth is tilted towards the 2nd molar in mesial direction, (11 to 79 degree)
3. Disto-angular- The long axis of 3rd molar is angled distally posteriorly away from the 2nd molar. (-11 to -79 degree)
4. Horizontal- The long axis of the 3rd molar is horizontal. (80 to 100 degree)

#### **Pell and Gregory classification**

1. **Position A impaction:** The occlusal plane of the impacted tooth is the same as the second molar.
2. **Position B:** The occlusal plane of impacted third molar is between the occlusal plane and the cervical line of the second molar.
3. **Position C:** The occlusal plane of the impacted third molar is below the cervical line of the second molar.

#### **Inclusion Criteria**

1. Patients between the ages of 18- 45years who require surgical impaction of mandibular third molar.
2. Patients willing to participate in the study.

#### **Exclusion Criteria**

1. Patients allergic to NSAIDS
2. Patients who have uncontrolled systemic diseases.
3. Patients on blood thinners, who have undergone angioplasty, bypass surgery.
4. Patients not willing to participate in the study.

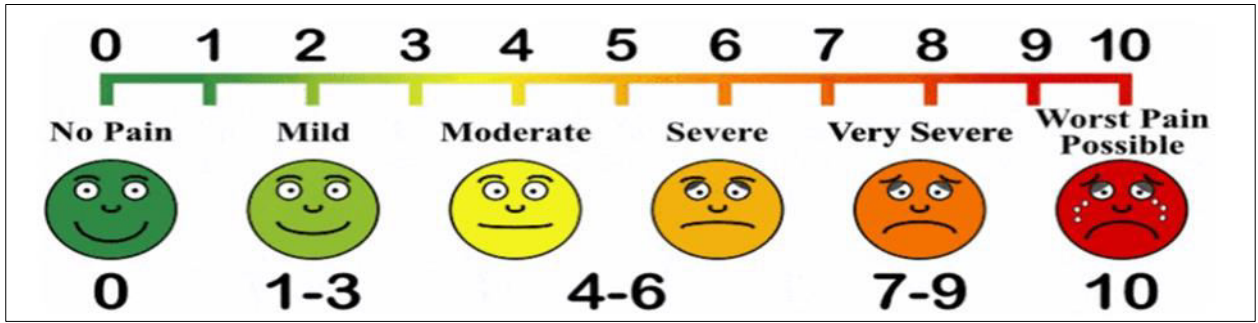


Fig 1: VAS Score



Fig 2a: The distance between the lateral corner of the eye and angle of mandible



Fig 2b: The distance between the tragus and soft tissue pogonion



Fig 2c: The distance between the tragus and outer corner of mouth



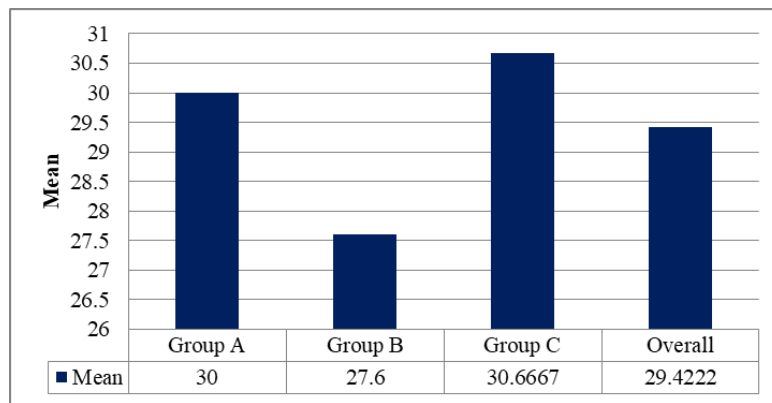
**Fig 2d:** The distance between the angle of mandible and soft tissue pogonion

**Results**

A total of 90 patients were included in the study, with 30 patients each in Group A, B, C. mean age of patients in Group A was 30 years std. deviation 6.83803, Group B was 27.6 years std. deviation 5.3537, Group C was 30.6667 years std. deviation 7.31712. Average age group in all the three groups was 29.4222 years std. deviation 6.61625. Table 1 Graph 1.

**Table 1:** Mean descriptive statistics of age of the participants

Age	Mean	Std. Deviation	Minimum	Maximum
Group A	30	6.83803	19	49
Group B	27.6	5.3537	20	38
Group C	30.6667	7.31712	19	48
Overall	29.4222	6.61625	19	49



**Graph 1:** Mean descriptive statistics of age of the participants

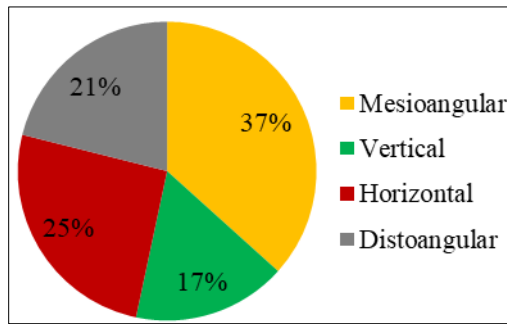
Number of males and females in group B and C were the same. Table 2

**Table 2:** Group wise frequency distribution of gender

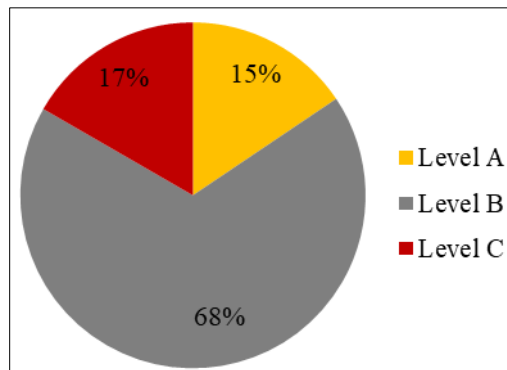
	Gender	Frequency	Percent
Group A	Male	17	56.7
	Female	13	43.3
Group B	Male	15	50
	Female	15	50
Group C	Male	15	50
	Female	15	50

Mesio-angular impaction was the most common impaction present among the population (33 cases out of 90) graph 2, 3, 4. In Pell and Gregory classification Position B and Class 1

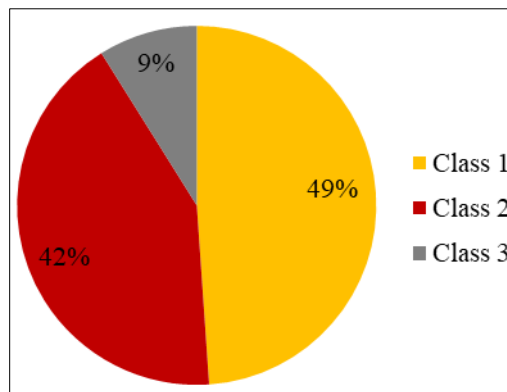
predominated the rest of them. Group wise distribution of the type, position and class of impaction is mentioned in tables 3, 4, 5 respectively.



**Graph 2:** Overall frequency distribution of participants based on impaction type



**Graph 3:** Overall frequency distribution of participants based on impaction level



**Graph 4:** Overall frequency distribution of participants based on impaction class

**Table 3:** Group wise frequency distribution of impaction type

	Impaction type	Frequency	Percent
Group A	Mesioangular	12	40
	Vertical	6	20
	Horizontal	7	23.3
	Distoangular	5	16.7
Group B	Mesioangular	13	43.3
	Vertical	3	10
	Horizontal	8	26.7
	Distoangular	6	20
Group C	Mesioangular	8	26.7
	Vertical	6	20
	Horizontal	8	26.7

	Distoangular	8	26.7
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**Table 4:** Group wise frequency distribution of impaction level

	Impaction level	Frequency	Percent
Group A	Level A	8	26.7
	Level B	15	50
	Level C	7	23.3
Group B	Level A	3	10
	Level B	23	76.7
	Level C	4	13.3
Group C	Level A	3	10
	Level B	23	76.7
	Level C	4	13.3

**Table 5:** Group wise frequency distribution of impaction class

	Impaction class	Frequency	Percent
Group A	Class 1	13	43.3
	Class 2	16	53.3
	Class 3	1	3.3
Group B	Class 1	18	60
	Class 2	10	33.3
	Class 3	2	6.7
Group C	Class 1	13	43.3
	Class 2	12	40
	Class 3	5	16.7

Maximum number of rescue injections were given in Group C cases (7). Quantity of rescue injections used was 1 in all the cases. In group B rescue injection was used in only one case whereas in Group A no rescue injection was used. Table 6

**Table 6:** Group wise frequency distribution of number of rescue injections

	Number of rescue injections	Frequency	Percent
Group A	Nil	30	100
Group B	Nil	29	96.7
	1	1	3.3
Group C	Nil	23	76.7
	1	7	23.3

In group C 22 patients continue to receive analgesics even after 5 days postoperative, out of which 3 patients had analgesics till one week. Table 7

**Table 7:** Group wise frequency distribution of days of analgesia number

	Days of analgesia number	Frequency	Percent
Group A	1	5	16.7
	2	16	53.3
	3	9	30
Group B	2	9	30
	3	16	53.3
	4	5	16.7
Group C	3	1	3.3
	4	7	23.3
	5	11	36.7
	6	8	26.7

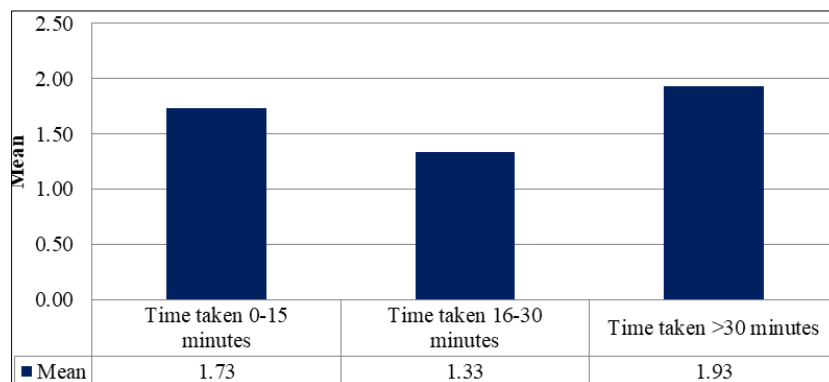
	7	3	10
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Quantity of analgesia consumed was more in group C cases. Table 8

**Table 8:** Group wise frequency distribution of quantity of analgesia consumed

	Quantity of analgesia consumed	Frequency	Percent
Group A	2	5	16.7
	3	4	13.3
	4	10	33.3
	5	5	16.7
	6	4	13.3
	7	2	6.7
Group B	3	1	3.3
	4	3	10
	5	8	26.7
	6	11	36.7
	7	5	16.7
	8	1	3.3
Group C	9	1	3.3
	7	3	10
	8	1	3.3
	9	3	10
	10	2	6.7
	11	5	16.7
	12	4	13.3
	13	3	10
	14	6	20
	15	2	6.7
	16	1	3.3

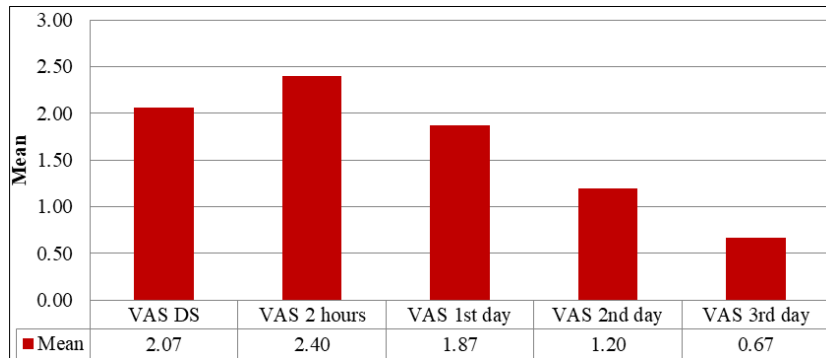
Intra group comparison of time taken during surgery, vas score, swelling and maximal incisal opening was done. Graphs 5- 16



Sig. - 0.000\*

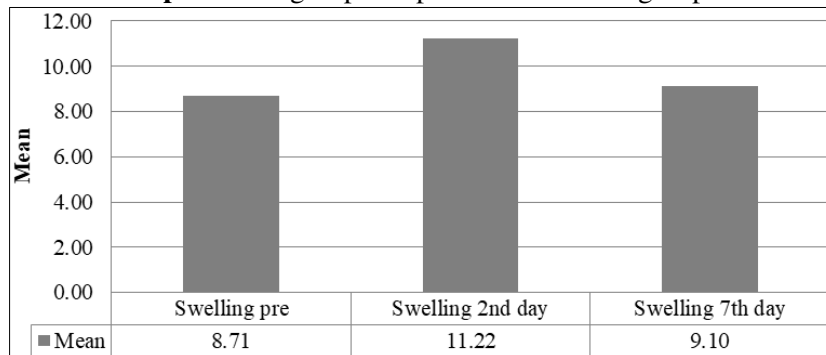
**Graph 5:** Intragroup comparison of time taken in group A





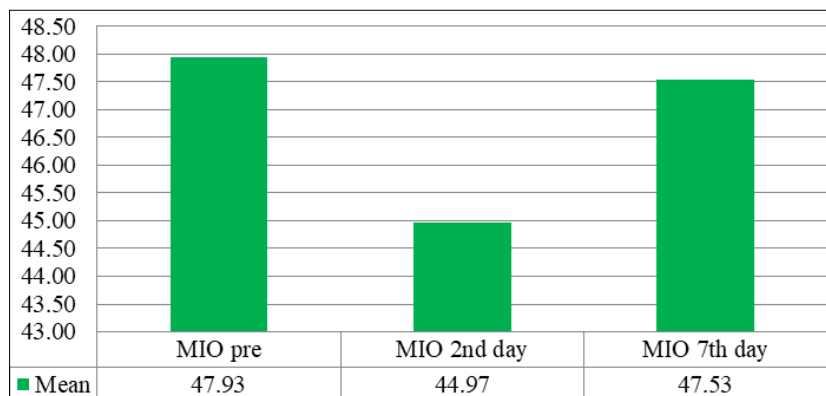
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**Graph 6:** Intragroup comparison of VAS in group A



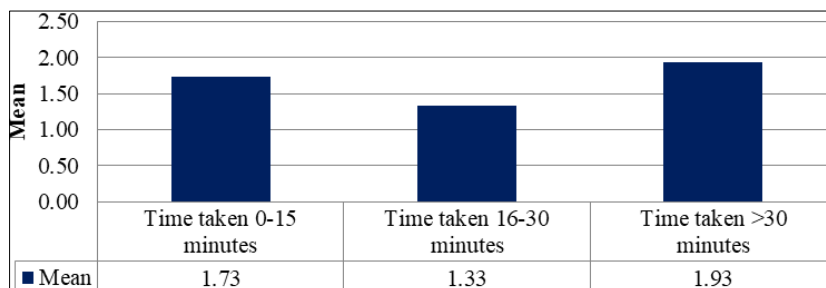
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**Graph 7:** Intragroup comparison of swelling in group A



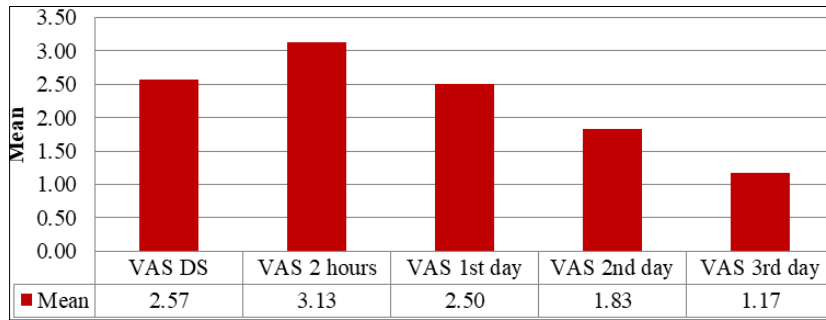
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**Graph 8:** Intragroup comparison of MIO in group A



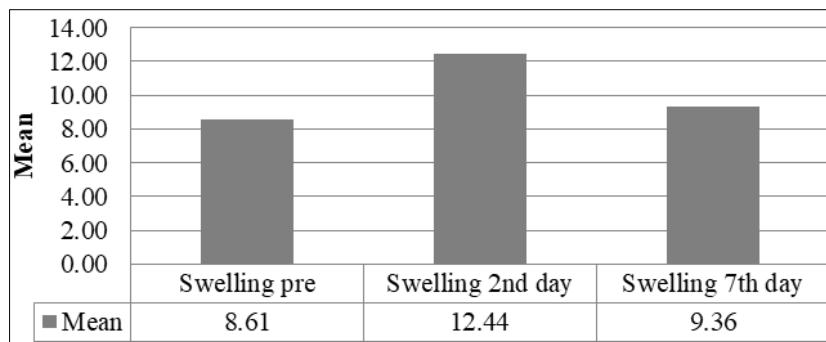
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**Graph 9:** Intragroup comparison of time taken in group B



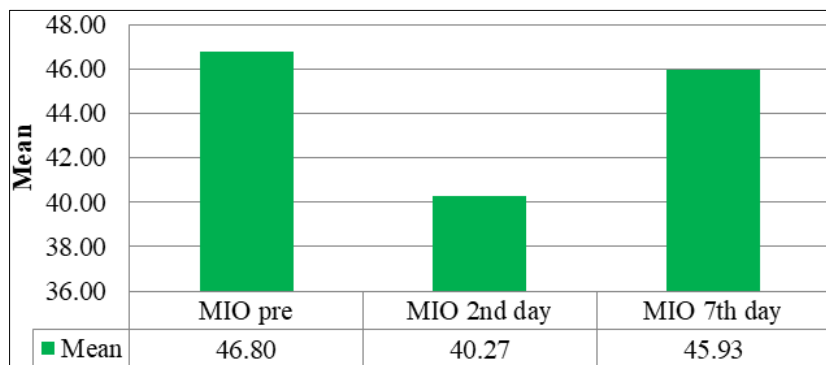
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**Graph 10:** Intragroup comparison of VAS in group B



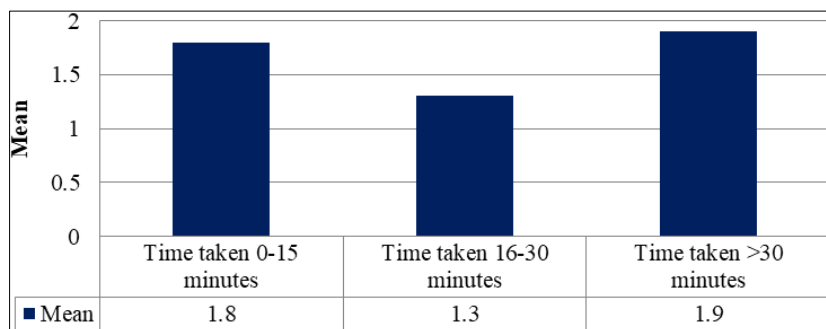
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**Graph 11:** Intragroup comparison of swelling in group B



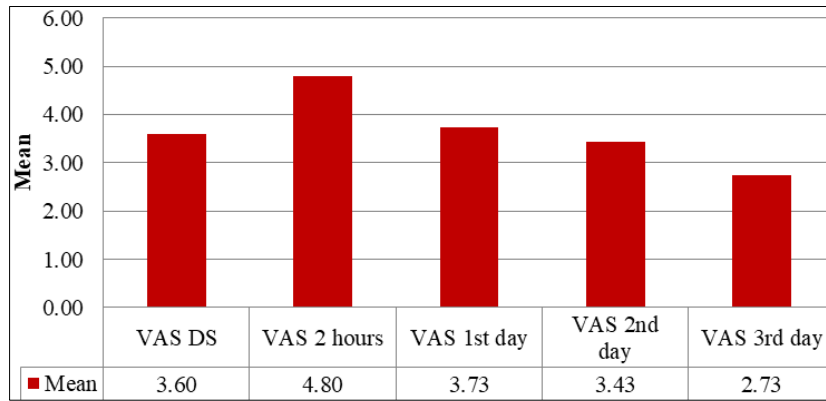
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**Graph 12:** Intragroup comparison of MIO in group B



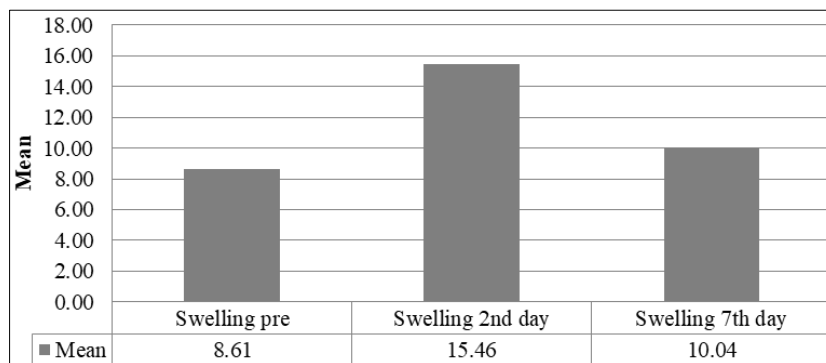
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**Graph 13:** Intragroup comparison of time taken in group C



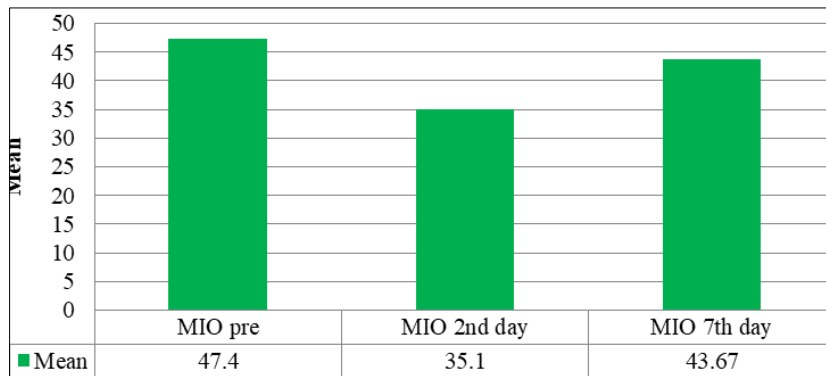
Sig. - 0.01\*

**Graph 14:** Intragroup comparison of VAS in group C



Sig. - 0.000\*

**Graph 15:** Intragroup comparison of swelling in group C



Sig. - 0.000\*

**Graph 16:** Intragroup comparison of MIO in group C

Inter group comparison of Group A, B, C was done for Number of rescue injections, days and quantity of analgesia consumed. Statistically significant results were found as in group A and B showed significantly less rescue injections with less number and days of analgesics consumed. There was no significant difference in the spo2 values between the groups but pulse values were again significantly less in Group A and B. table 9

**Table 9:** Intergroup comparison of the parameters

		Mean	Std. Deviation	95% Confidence Interval for Mean		Minimum	Maximum	Sig.
				Lower Bound	Upper Bound			

Number of rescue injections	Group A	0.00	0.00	0.00	0.00	0.00	0.00	0.00 2*
	Group B	0.03	0.18	-0.03	0.10	0.00	1.00	
	Group C	0.23	0.43	0.07	0.39	0.00	1.00	
	Total	0.09	0.29	0.03	0.15	0.00	1.00	
Days of analgesia number	Group A	2.13	0.68	1.88	2.39	1.00	3.00	0.00 0*
	Group B	2.87	0.68	2.61	3.12	2.00	4.00	
	Group C	5.17	1.02	4.79	5.55	3.00	7.00	
	Total	3.39	1.53	3.07	3.71	1.00	7.00	
Quantity of analgesia consumed	Group A	4.17	1.46	3.62	4.71	2.00	7.00	0.00 0*
	Group B	5.77	1.25	5.30	6.23	3.00	9.00	
	Group C	11.60	2.54	10.65	12.55	7.00	16.00	
	Total	7.18	3.69	6.40	7.95	2.00	16.00	
SpO2	Group A	97.27	0.63	97.04	97.50	96.40	98.50	0.19 9
	Group B	97.58	0.79	97.28	97.87	96.30	99.00	
	Group C	97.30	0.75	97.02	97.58	95.90	98.70	
	Total	97.38	0.73	97.23	97.53	95.90	99.00	
Pulse	Group A	81.33	3.58	80.00	82.67	73.00	89.00	0.00 0*
	Group B	83.97	4.18	82.41	85.53	75.00	93.00	
	Group C	93.70	6.43	91.30	96.10	82.00	103.00	
	Total	86.33	7.21	84.82	87.84	73.00	103.00	

There was no statistically significant difference in the time taken during surgery in all the three groups. Table 10.

**Table 10:** Intergroup comparison of the time taken

		Mean	Std. Deviation	95% Confidence Interval for Mean		Minimum	Maximum	Sig.
				Lower Bound	Upper Bound			
Time taken 0-15 minutes	Group A	1.73	0.45	1.57	1.90	1.00	2.00	0.79 2
	Group B	1.73	0.45	1.57	1.90	1.00	2.00	
	Group C	1.80	0.41	1.65	1.95	1.00	2.00	
	Total	1.76	0.43	1.67	1.85	1.00	2.00	
Time taken 16-30 minutes	Group A	1.33	0.48	1.15	1.51	1.00	2.00	0.95 2
	Group B	1.33	0.48	1.15	1.51	1.00	2.00	
	Group C	1.30	0.47	1.13	1.47	1.00	2.00	
	Total	1.32	0.47	1.22	1.42	1.00	2.00	
Time taken >30 minutes	Group A	1.93	0.25	1.84	2.03	1.00	2.00	0.86 1
	Group B	1.93	0.25	1.84	2.03	1.00	2.00	
	Group C	1.90	0.31	1.79	2.01	1.00	2.00	
	Total	1.92	0.27	1.87	1.98	1.00	2.00	

VAS score was calculated during surgery, 2hours, 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> day post operatively. Results were statistically significant as group A showed minimum VAS score for the patients. Table 11.

**Table 11:** Intergroup comparison of the VAS scores

		Mean	Std. Deviation	95% Confidence Interval for Mean		Minimum	Maximum	Sig.
				Lower Bound	Upper Bound			
VAS DS	Group A	2.07	0.52	1.87	2.26	1.00	3.00	0.00 0*
	Group B	2.57	0.57	2.35	2.78	2.00	4.00	
	Group C	3.60	0.50	3.41	3.79	3.00	4.00	

	Total	2.74	0.83	2.57	2.92	1.00	4.00	
VAS 2 hours	Group A	2.40	0.72	2.13	2.67	1.00	3.00	0.00 0*
	Group B	3.13	0.86	2.81	3.45	2.00	5.00	
	Group C	4.80	0.85	4.48	5.12	3.00	6.00	
	Total	3.44	1.29	3.17	3.71	1.00	6.00	
VAS 1st day	Group A	1.87	0.63	1.63	2.10	1.00	3.00	0.00 0*
	Group B	2.50	0.73	2.23	2.77	2.00	5.00	
	Group C	3.73	0.87	3.41	4.06	2.00	5.00	
	Total	2.70	1.08	2.47	2.93	1.00	5.00	
VAS 2nd day	Group A	1.20	0.61	0.97	1.43	0.00	2.00	0.00 0*
	Group B	1.83	0.79	1.54	2.13	1.00	4.00	
	Group C	3.43	1.07	3.03	3.83	1.00	5.00	
	Total	2.16	1.26	1.89	2.42	0.00	5.00	
VAS 3rd day	Group A	0.67	0.55	0.46	0.87	0.00	2.00	0.00 0*
	Group B	1.17	0.53	0.97	1.36	0.00	2.00	
	Group C	2.73	0.98	2.37	3.10	1.00	5.00	
	Total	1.52	1.13	1.28	1.76	0.00	5.00	

Pre operative swelling showed little difference among all the three groups. Swelling on 2<sup>nd</sup> day was less in patients of group A whereas on 7<sup>th</sup> day group A and B showed less values than group C. table 12.

**Table 12:** Intergroup comparison of the swelling

		Mean	Std. Deviation	95% Confidence Interval for Mean		Minimum	Maximum	Sig.
				Lower Bound	Upper Bound			
Swelling pre	Group A	8.71	0.85	8.40	9.03	7.23	9.85	0.835
	Group B	8.61	0.69	8.35	8.86	7.54	9.90	
	Group C	8.61	0.79	8.31	8.90	7.22	9.98	
	Total	8.64	0.77	8.48	8.80	7.22	9.98	
Swelling 2nd day	Group A	11.22	1.17	10.78	11.65	8.22	13.64	0.000 *
	Group B	12.44	0.97	12.08	12.80	10.22	13.87	
	Group C	15.46	1.92	14.75	16.18	10.89	18.73	
	Total	13.04	2.27	12.56	13.51	8.22	18.73	
Swelling 7th day	Group A	9.10	0.80	8.81	9.40	7.62	10.64	0.001 *
	Group B	9.36	0.76	9.08	9.64	8.10	10.53	
	Group C	10.04	1.15	9.61	10.47	8.12	12.98	
	Total	9.50	0.99	9.29	9.71	7.62	12.98	

Statistical analysis of maximal incisal opening showed non-significant pre operative values. Significant difference was seen in 2<sup>nd</sup> day and 7<sup>th</sup> day post operatively. Group A and B patients showed highest rate of recovery as they achieved pre operative mouth opening quickly as compared to group C. table 13.

**Table 13:** Intergroup comparison of the MIO

		Mean	Std. Deviation	95% Confidence Interval for Mean		Minimum	Maximum	Sig.
				Lower Bound	Upper Bound			
MIO pre	Group A	47.93	3.74	46.54	49.33	41.00	55.00	0.5
	Group B	46.80	3.12	45.63	47.97	42.00	53.00	
	Group C	47.40	4.21	45.83	48.97	35.00	54.00	
	Total	47.38	3.70	46.60	48.15	35.00	55.00	
MIO 2nd day	Group A	44.97	4.75	43.19	46.74	37.00	55.00	0.000 *
	Group B	40.27	4.27	38.67	41.86	32.00	48.00	

	Group C	35.10	6.12	32.82	37.38	23.00	46.00	
	Total	40.11	6.47	38.76	41.47	23.00	55.00	
MIO 7th day	Group A	47.53	3.84	46.10	48.97	41.00	55.00	0.001 *
	Group B	45.93	3.11	44.77	47.09	40.00	52.00	
	Group C	43.67	4.57	41.96	45.37	31.00	50.00	
	Total	45.71	4.16	44.84	46.58	31.00	55.00	

## Discussion

Preemptive analgesia has been defined as treatment that prevents the establishment of central sensitization caused by incisional and inflammatory injuries which covers the period of surgery and the initial post-operative period as well <sup>[14]</sup>.

Intravenous paracetamol is an effective analgesic <sup>[15, 16]</sup>. Although its intravenous use has some hemodynamic effects, <sup>[17, 18, 19]</sup> those were not seen in our patients as only single infusion was given.

Paracetamol is a non-opioid agent, and acts upon the central nervous system by way of central cyclooxygenase inhibition. It has an indirect influence on the serotonergic system as well. 20 It causes inhibition of prostaglandin (PG) synthesis and analgesics effects are through an active metabolite influencing cannabinoid receptors.<sup>21</sup> Paracetamol intravenous administration has been used as an effective pre-emptive medication in many studies <sup>[22, 23, 24]</sup>. Diclofenac sodium is effective in pain management. After extraction it shows good pain control <sup>[25]</sup>. Diclofenac is derived from its chemical name 'Dichloronilino phenylacetic acid and was first synthesized as Voltaren by Ciba-Geigy in 1973. It causes an inhibition of prostaglandin synthesis by inhibiting COX-1 and COX-2 <sup>[26, 27]</sup>.

In our study we compared the pre-emptive effects of paracetamol, diclofenac and placebo before surgical impaction of 3<sup>rd</sup> molars. The mean age of patients having impacted 3<sup>rd</sup> molars were 29.4222 years. The results of which were consistent with the previous studies <sup>[28, 29]</sup>. The most common type of impaction present was mesio-angular impaction (37%) according to winter classification <sup>[30, 31, 32]</sup>. It was followed with horizontal (25%), disto-angular (21%) and vertical (17%) type of impaction.

In Pell and Gregory classification system, level B was found in 68%, level A in 15% and level C was found in 17% of cases. Class 1 was found in 49%, class 2 in 42% and class 3 was found in 9% of the cases. Blondaeu *et al.* <sup>[33]</sup> found similar results in which level B was the most common type of impaction present whereas results of Monaco *et al.* <sup>[34]</sup> were vice versa which showed level A to be the most common present.

This study shows that the preemptive administration of intravenous paracetamol is more effective in the control of pain during and after extraction of 3<sup>rd</sup> molars. The number of rescue injections of local anesthesia given were nil in group A whereas in group B there was a need of rescue injection in one case. Control group required rescue injection in 7 participants which is far more than in Group A and B. In group A and B due to the preemptive effects of both paracetamol and diclofenac required subsequently minimal post operative analgesics compared with control group C. These results were in accordance to the previous studies in literature <sup>[35, 36, 37]</sup>.

Swelling measured as a mean of four values was lowest in group A as compared with other groups, with mildly lower values to group B and a subsequently very much lower values than group C. According to the VAS scores, pain intensity was also seen to be lower in the paracetamol group and the results were statistically significant. VAS score was much high in group C which cemented the role of paracetamol as preemptive analgesia in efficacy for the pain control after removal of impacted 3<sup>rd</sup> molar <sup>[38]</sup>.

Major advantage of acetaminophen is the low side effects when compared with other non-opioid analgesics. These drugs are relatively safe in pregnant females to be used for the treatment of postoperative pain <sup>[39]</sup>. Systematic reviews have found that hypersensitivity reactions are rare with the use of paracetamol <sup>[40]</sup>.

## Conclusion

Preemptive analgesics plays a pivotal role in lowering postoperative discomfort and pain in patients undergoing 3<sup>rd</sup> molar extractions. Two different drugs were used in our study along with control group. The results were good for both the drugs that were used but IV paracetamol was better than IV diclofenac as preemptive analgesia.

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