

Original Research Article

# Comparative study on efficacy of Ketorolac in the management of post-operative pain when administered intravenously or intramuscularly


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## Abstract

**Background:** In the earlier periods analgesia was restricted to surgical and immediate postoperative period. However, this was associated with a lot of morbidities to the patient in terms of surgical stress and increased requirements for analgesia as the pain persisted. Patient's attitude and concern about postoperative pain need to be addressed preoperatively. Early interventions are essential for better long-term outcomes. Because of the multiplicity of mechanisms involved in postoperative pain, a multimodal analgesia regimen, with a combination of opioid and non-opioid analgesic drugs is often used to enhance analgesic efficacy, reduce opioid requirements and its side effects.

**Aim of the study:** To compare the efficacy of ketorolac in the management of postoperative pain when administered intravenously or intramuscularly, to assess the efficacy of ketorolac by two routes of administration namely Intravenous (IV) and Intramuscular (IM).

**Materials and methods:** This comparative study was done in 2015 in Pondicherry Institute of Medical Sciences, Pondicherry. Totally 60 patients undergoing elective surgeries under ASA I/II was selected and they were divided into two groups of 30 patients each. Postoperatively the patients were examined at half hourly intervals for the first 6 hours for pain and it was graded using Visual Analogue Scale (VAS). If VAS score was > 3, inj. Tramadol 1mg/kg IV was given as rescue analgesic and the time was noted. Any adverse effect such as dizziness, vomiting, nausea was also

noted at half hourly interval for the first six hours following surgery. Total dosage and frequency of rescue analgesic tramadol in the 24 hour period were also calculated. Use of anti-emetics was noted.

**Results:** Postoperative VAS score between the two groups was comparable at zero hours and after the first hour. However, at the 4<sup>th</sup> and 5<sup>th</sup> hour, there was a statistically significant difference in the scores between the two groups showing a better analgesic effect with the intramuscular route of administration of ketorolac. The mean VAS score at the end of the 5<sup>th</sup> hour showed a statistical difference between the two groups ( $p=0.001$ ). Postoperative VAS score between the two groups was comparable. However, at the 4<sup>th</sup> and 5<sup>th</sup> hour, there was a statistically significant difference in the score between the two groups. The mean duration of analgesia produced by intramuscular routes was found to be high when compared with that of the intravenous route and is statistically significant ( $p=0.001$ ). The mean duration of analgesia produced by intramuscular routes was found to be high when compared with that of the intravenous route and is statistically significant. ( $p=0.001$ ).

**Conclusion:** We conclude that ketorolac can be used for postoperative analgesia in place of opioids in patients where opioid has to be avoided. Intramuscular administration provided more effective and prolonged pain relief when compared to intravenous administration.

## Key words

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Ketorolac, Visual Analog Score, Head Ache, Vomiting, ENT Surgery.

## Introduction

Pain threshold is that the level of stimulus at which the subject first recognizes pain or discomfort. Pain tolerance is that greater level of stimulus at which the subject requests stimulus cessation. Inadequate pain relief in the postoperative phase is a well-known problem worldwide [1]. The incidence of postoperative pain has been found to be between 25-76%. A lot of surveys over a long time show that many patients still suffer from moderate to severe postoperative pain despite an increased focus on pain and the development of new standards for pain management [2]. Aside from the suffering caused by insufficient pain relief, this is an issue with potential adverse physiological and psychological consequences for patients in addition to financial drawbacks for caregivers [3]. The patient may anticipate future medical intervention with greater anxiety if pain not managed effectively. As an Anesthesiologist it is our responsibility to ensure adequate postoperative analgesia to facilitate a smooth recovery to the patient. Post-operative pain is nociceptive in nature and may consist of the inflammatory, neurogenic and visceral component. Therefore multimodal analgesic techniques utilizing multiple drugs acting

through different analgesic mechanism has become increasingly popular [4]. The use of opioids by patient-controlled analgesia is popular but limited by side effects and by the fact that certain types of pain respond poorly to opioids. In the earlier periods, analgesia was restricted to surgical and immediate postoperative period. However, this was associated with a lot of morbidities to the patient in terms of surgical stress and increased requirements for analgesia as the pain persisted. Patient's attitude and concern about postoperative pain need to be addressed preoperatively [5]. Early interventions influence better long-term outcomes. Because of the multiplicity of mechanisms involved in postoperative pain, a multimodal analgesia regimen, with a combination of opioid and non-opioid analgesic drugs is often used to enhance analgesic efficacy, reduce opioid requirements and its side effects [6].

## Materials and methods

This comparative study was done in 2015 in Pondicherry Institute of Medical Sciences, Pondicherry. Totally 60 patients undergoing elective surgeries under ASA I/II was selected and they were divided into two groups of 30 patients each. Postoperatively the patients were

examined at half hourly intervals for the first 6 hours for pain and it was graded using Visual Analogue Scale. If VAS score was > 3, inj. Tramadol 1mg/kg IV was given as rescue analgesic and the time was noted. Any adverse effect such as dizziness, vomiting, nausea was also noted at half hourly interval for the first six hours following surgery. Total dosage and frequency of rescue analgesic tramadol in the 24 hour period were also calculated. Use of anti-emetics was noted.

### Inclusion criteria

Patients aged between 18 to 50 years, either sex, ASA status I/II undergoing elective surgery under General Anesthesia in this institution were included in this study.

### Exclusion criteria

Allergic to ketorolac, known case of peptic ulcer, hepatic and renal impairment, bleeding disorder, pregnant and breastfeeding females.

Both the groups of patients were explained about the study and an informed written consent was obtained. They were also explained about Visual Analogue Scale for the assessment of pain the day before the surgery. All patients were premedicated with oral Lorazepam 1mg, oral Ranitidine 150 mg, and oral Metoclopramide 10 mg on the night before and morning of surgery. On the table they were medicated with intravenous Glycopyrrolate 10mcg/kg, IV fentanyl 1mcg/kg and induced with IV Thiopental 3-5mg/kg and IV Vecuronium 0.1 mg/kg, and intubated with appropriate sized portex endotracheal tube. They were maintained with O<sub>2</sub>, N<sub>2</sub>O and sevoflurane and intermittent boluses of vecuronium. About 20 minutes prior to extubation inj. Ondansetron 4mg IV was given. At the beginning of skin suturing, Group IV was given Ketorolac 30 mg intravenously and for the other group Group IM was given ketorolac 30 mg intramuscularly At the end of surgery all patients were reversed with inj. Neostigmine 60mcg/kg IV and inj. glycopyrrolate 10 mcg/kg IV. The patients were then shifted to recovery room once they are fully

awake, obeying commands and hemodynamically stable.

### Parameters studied

Postoperatively the patients were examined at half hourly intervals for the first 6 hours for pain and it was graded using Visual Analogue Scale. If VAS score was > 3, inj. Tramadol 1mg/kg IV was given as rescue analgesic and the time was noted. Any adverse effect such as dizziness, vomiting, nausea was also noted at half hourly interval for the first six hours following surgery. Total dosage and frequency of rescue analgesic tramadol in the 24 hour period were also calculated. Use of anti-emetics was noted.

### Results

In this study, we have compared the post-operative analgesic efficacy of 30 mg of Ketorolac was given by two different routes namely intravenous and intramuscular route. The study population consists of 60 patients who underwent surgery under general anesthesia. Group 1 had 30 patients who were given intravenous administration of ketorolac. Group 2 had 30 patients who were given intramuscular administration.

Age distribution was as per **Table – 1**. Mean duration of surgery of patients in both IV and IM group were comparable and the difference was not statistically significant ( $p = 0.244$ ) as per **Table - 2**.

**Table – 1:** Age distribution.

Age in years	Route		Total
	IV	IM	
18 – 29	11	9	20
30 – 39	11	9	20
40 – 49	8	12	20

**Table – 2:** Comparison of mean duration of surgery between both groups.

Group	Mean duration of surgery (min)	P value
IV	99.80 ± 9.393	0.244
IM	102.53 ± 8.565	

**Table – 3:** Intensity of pain at the end of surgery.

VAS Score	IV	IM
0	20	21
1	10	9
MEAN VAS SCORE	0.33	0.30

**Table – 4:** Intensity of pain at the end of 1<sup>st</sup> hour.

VAS SCORE	IV	IM
0	21	20
1	9	10
MEAN VAS SCORE	0.30	0.33

**Table – 5:** Comparison of mean duration of analgesia between groups.

Group	Mean duration of analgesia (minutes)	p Value
IV	306.10 ± 18.729	0.001
IM	339.73 ± 19.071	

The mean VAS score was comparable at the end of surgery. There was no statistical significance (p = 0.781) as per **Table – 3**.

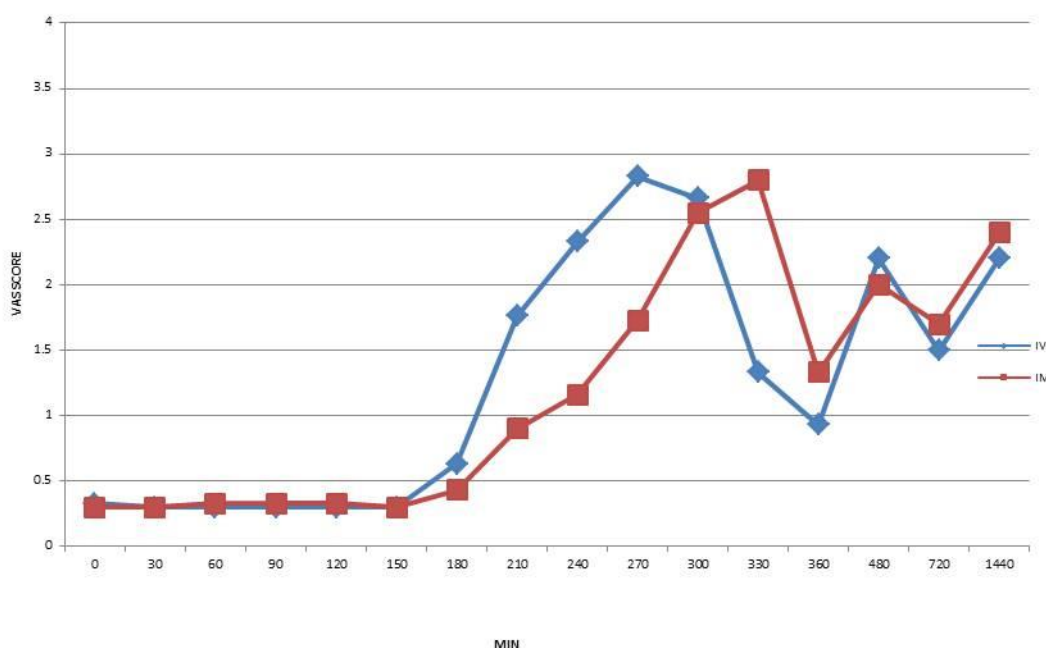
The mean VAS score was comparable at the end of the 1<sup>st</sup> hour. There was no statistical significance (p = 0.781) as per **Table – 4**.

Postoperative VAS score between the two groups was comparable. However, at the 4<sup>th</sup> and 5<sup>th</sup> hour, there was a statistically significant difference in the score between the two groups (**Graph – 1**).

The mean duration of analgesia produced by intramuscular route was found to be high when compared with that of the intravenous route and was statistically significant (p = 0.001) as per **Table – 5**.

**Graph – 1:** Comparison of intensity of pain at end of 4<sup>th</sup> and 5<sup>th</sup> hour.

**FIG-1 INTENSITY OF PAIN**



## Discussion

Postoperative pain is a major cause of morbidity in the postoperative period. Pain control in the postoperative period is essential for cardiac

stability, adequate respiratory function, the return of gastric function and psychological outcome of a patient. Good postoperative analgesia reduces the adverse effects [7]. Most commonly used

analgesics are opioids. Even though opioids are good analgesics they cause respiratory depression, pruritus, nausea, vomiting, and constipation. So in our study, we have compared Ketorolac 30 mg in two different routes as a primary analgesic for postoperative pain management. We also studied the adverse effect of the drug in both groups [8]. We compared the VAS score at zero hour, 1<sup>st</sup> hour, 4<sup>th</sup> hour and 5<sup>th</sup> hour between the two groups. At zero hour, all patients in both the groups had a score less than 2 which indicated good analgesic effect in both the groups. The mean VAS score of the two groups was analyzed and there was no statistically significant difference ( $p$ -value  $-0.781 > 0.05$ ) [9]. At the end of the first hour, all patients in both the groups remained under VAS score of 2 and the difference in the mean score between the groups were not statistically significant.  $p = 0.781$ . At the end of 4<sup>th</sup> hour, all patients in IM group maintained a VAS score of  $\leq 2$  whereas the majority of the patient in the IV group has a score  $\geq 2$ . The difference in mean scores between the two groups was statistically significant ( $p = 0.0001$ ) [10]. The incidence of headache in the IV group is 1 among 30 patients which is negligible whereas the incidence in the IM group is 4 among 30. The incidence of dizziness among patients who received IV Ketorolac is 2 out of 30 and in patients who received IM is 4 out of 30. The incidence of nausea in the IV group is 6 among 30 and in IM group is 9 among 30. The incidence of vomiting in the IV group is 2 among 30 patients and in IM group is 3 among 30 patients. The incidence of antiemetic use in IV group is 6 among 30 and with IM group is 9 among 30 [11]. Comparative analysis between the two groups did not show any statistically significant difference between the two groups with regards to the adverse effect like headache, dizziness, nausea, and vomiting [12]. Stanski DR, et al. in a meta-analysis of the perioperative single dose of ketorolac to prevent postoperative pain concluded that 60 mg IM route provided better analgesic effect than 60 mg IV [13]. In our study, we have found that the mean duration of analgesia produced by intravenous administration was 306.10 minutes whereas the

mean duration of analgesia produced by intramuscular administration was 339.73 minutes. There was a statistically significant difference between the groups [14, 15].

## Conclusion

The analgesic effect is similar in the first two to three hours postoperatively in both the groups but is significantly better when administered intramuscularly by the fourth and fifth hour than when administered intravenously. However, the incidence of adverse effects like nausea, vomiting, dizziness and headache were comparable in both groups. So we conclude that Ketorolac can be used for postoperative analgesia in place of opioids in patients where opioid has to be avoided. Intramuscular administration provided more effective and prolonged pain relief when compared to intravenous administration.

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