

## Original Research Article

# Efficacy of Ketamine Hcl and Tramadol Hcl by epidural route for lower abdominal surgeries

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### ABSTRACT

**Background:** Pain pathway has profound implications for management of acute pain and provoked interest in the use of pre-emptive analgesia and new methods of postoperative pain management with new agents like opioid and non-opioid drugs either independently or in combination. The objective of the study was to study efficacy of Ketamine Hcl and Tramadol Hcl (preservative free) by epidural route for lower abdominal surgeries.

**Methods:** This study has been conducted on hundred patients in the age group of 20 to 50 years. These patients have undergone various lower abdominal surgeries, gynecological and surgical procedures. Failed epidurals, catheter kinking, catheter migration and dural puncture cases are excluded from the study. The patients were divided into two groups namely Group-A and Group-B, with 50 patients in each group.

**Results:** Both groups were similar in terms of age, sex and weight. In Group-A patients who received 30 mg of Ketamine, the mean time of onset of analgesia being 17.01+2.65 minutes compared to 12.18+2.28 minutes in Group - B patients who received 100 mg of tramadol, In Group-A the mean time of duration of analgesia is 6.75+0.46 hours compared to 9.36+0.84 hours in Group-B. Nausea and vomiting (24% vs. 2%), urinary retention (4% vs. 2%) was more in group B compared to group A patients. Backache was equal in both the group patients (6% vs. 6%). Pain on injection more in group A patients i.e. 8% compared to only 2% in patients who belonged to group B.

**Conclusions:** Epidural tramadol is superior to epidural ketamine for postoperative pain relief.

**Keywords:** Efficacy, Epidural, Ketamine, Surgeries, Tramadol

### INTRODUCTION

Recorded work suggests that 40% of patients complain inadequate pain relief following minor surgeries and most of the post-operative patients would say, "They would be upset if they had to undergo through that pain again". Pain during and after surgery is due to direct trauma caused to tissues by surgery but may also by reflex muscular spasm or visceral distension. Post-operative pain is of two types basically.<sup>1</sup> Postoperative pain is self-limiting phenomenon more severe during the first day

following surgery diminishing over the next 24 hours and minimum 3 to 4 days after surgery. Postoperative pain marked in operations of the upper abdomen and thorax, with decreasing severity in lower abdomen, head and neck and extremities.<sup>2</sup>

Morphine is the oldest and probably the most effective remedy for severe pain. Thomas Sydenham has rightly noted that among the remedies that have pleased Almighty to give man to relieve his suffering none is so universal and as efficacious as opium. Morphine or

opioid drugs by S.C. or I.M. route take long time for onset of actions so better mode of administering for quicker onset, longer duration, low side effects and low amount of drug requirement were searched. The one, which has satisfied most, if not all these criteria, is the epidural route.<sup>3,4</sup>

Many other factors affect the incidence and severity of post-operative pain. In elderly and very young the requirements appear to be reduced. There is little difference between sexes. Personality variations also contribute like stable patients with low neurotism may be expected to suffer less than the highly neurotic patients.<sup>4</sup>

There are two components of pain: the initial stimulus and the Psychological processing of this sensation. Surgery in particular produces biphasic insult on human body, which has implications for pain management. First of all, during surgery there is trauma to the tissues, which produces various stimuli and great nociceptive input. Secondly after surgery there is inflammatory process at the site which is also responsible for various inputs. Both the processes sensitize pain pathway. It has profound implications for management of acute pain and provoked interest in the use of pre-emptive analgesia and new methods of postoperative pain management with new agents like opioid and non-opioid drugs either independently or in combination.<sup>5</sup>

Hence, in this study ketamine Hcl and tramadol Hcl are used epidurally for relief of pain in the postoperative period.

## **METHODS**

This study has been conducted on 100 patients who are randomly selected in Government General Hospital, Kurnool. These patients are in the age group of 20 to 50 years from. The weight of the patients ranges from 35 to 65 kgs. All the patients are thoroughly examined in the pre anesthetic checkup.

The study period was December 2001 to December 2002 of sample size about 100 eligible patients and they were divided into two groups of 50 each.

### ***Inclusion criteria***

- Aged 20-50 years
- Weight 35-65 kg
- Fit for anesthesia
- Undergoing lower abdominal surgeries.

### ***Exclusion criteria***

- Any patient with cardiovascular disorder, respiratory diseases or any other systemic disorders is excluded from this study.

All the patients are in ASA I group.

Hospital ethics committee permission taken and the procedure thoroughly explained to the patient in simple words and informed consent were taken from them. These patients have undergone various lower abdominal surgeries, gynecological and surgical procedures. Failed epidurals, catheter kinking, catheter migration and dural puncture cases are excluded from the study. The patients were divided into two groups namely Group-A and Group-B, with 50 patients in each group.

No analgesic is given before or during the surgery. Just before starting the procedure, vital data is recorded.

### ***Investigations***

Routine laboratory investigations like Hb%, TC, DC, ESR, Blood grouping and typing, blood urea, blood sugar and urine for albumin, sugar and microscopy are done.

### ***Technique and management***

An intravenous infusion is started with 18-gauge I.V. canula. Ringers lactate solution is the preloading fluid. After premedication with 1mg midazolam patient is placed in left lateral position comfortably. Thighs are flexed as far as possible and head is also flexed. There is a pillow below the head.

Skin on back is cleaned with savlon and spirit in sequence. The cleaned area is draped with a fenestrated sterile towel.

The L2-L3 or L3-L4 space is identified and a skin wheal is raised with 0.5% xylocaine solution. The epidural space is identified by loss of resistance technique using air or saline. Four-quadrant aspiration and lack of resistance is done.

Tuohy needle of 18 gauge used to identify the epidural space. A sterile epidural catheter of 18 gauge is introduced through the epidural needle until 3-5 cm of epidural catheter is in the epidural space. The needle is removed and catheter is fixed. The placement of the catheter is confirmed by aspiration for absence of CSF or blood.

The postoperative analgesia is maintained in the postoperative ward. Group-A patients received 30 mg of preservative free ketamine diluted to 10 cc with normal saline and Group-B received 100 mg of preservative free tramadol diluted to 10 cc with normal saline. The postoperative analgesia is provided up to 48 hours and the average duration of analgesia of all top-up doses taken in each group. The top-up doses were given on the demand by the patients for analgesia. During first dose administration vital data and pain assessed by visual analogue score, are noted along with the time of onset of analgesia. As the analgesia started to wean off and on the patients demand for analgesia another top-up dose was given. The same parameters were noted, during top-up doses also.

The pain is assessed by visual analogue score mainly, the onset of analgesia has been calculated in minutes and the duration of analgesia is calculated in hours.

Visual Analogue Scale (VAS):

- 0=Absolutely no pain
- 0 - 10%=Minimal pain
- 10 - 30%=Mild pain
- 40 - 60%=Moderate pain
- 70 - 100%=Severe pain
- 100%=Maximal interface pain.

**Statistical analysis**

The data was entered in the Microsoft excel worksheet and analyzed using proportions.

**RESULTS**

**Table 1: Distribution of study subjects as per age.**

Age (Yr)	Group A	%	Group B	%
20-25	18	36%	19	38%
26-30	10	20%	10	20%
31-35	8	16%	4	8%
36-40	10	20%	8	16%
41-45	4	8%	5	10%
46-50	0	0%	4	8%

Table 1 shows distribution of study subjects as per age. The onset of analgesia, duration of analgesia and complications of postoperative pain relief by epidural ketamine and tramadol in 100 patients are compared in both the groups. The age group in both the groups within the range of 20 to 50 years. In Group A the age incidence is between 20-25 years (36%) followed by 26-30 years and 36-40 years (20% each). The age incidence in the Group B falls in the range of 20-25 years (38%), followed by 26-30 years (20%). Table 2 shows distribution of study subjects as per weight. The weight of the patients within the range of 35-65 Kgs. The weight of the patients in Group A in the range of 56-60 Kgs (32%), followed by the range of 46-50 Kgs (28%). Whereas in Group B the weight of the patients do in the range of 46-50 (32%) followed by 41-45 Kgs (24%).

**Table 2: Distribution of study subjects as per weight.**

Wt. (Kg)	Group A	%	Group B	%
35-40	6	12%	4	8%
41-45	4	8%	12	24%
46-50	14	28%	16	32%
51-55	6	12%	6	12%
56-60	16	32%	10	20%
61-65	4	8%	2	4%
>65	0	0%	0	0%

Table 3 shows distribution of study subjects as per sex. In this study majority (88% and 86%) are female patients. In group A there were 6 males whereas in group B there were 7 males. In group A there were 44 females whereas in group B there were 43 females. Thus, both the groups were found to have almost equal distribution of males and females and this is the pre-requisite for the comparative studies that both the groups should be similar in the baseline characteristics like this sex distribution. In both the groups, the proportion of males was very less compared to the proportion of the females.

**Table 3: Distribution of study subjects as per sex.**

Group	Male	%	Female	%
Group - A	6	12%	44	88%
Group - B	7	14%	43	86%

Table 4 shows distribution of study subjects as per onset of analgesia. Onset of analgesia: In Group-A patients who received 30 mg of Ketamine, adequate analgesia is achieved within 10-15 minutes in 16%, 15 - 20 minutes in 78% and 20-25 minutes in 6%. The mean time of onset of analgesia being 17.01+2.65 minutes. In Group -B patients who received 100 mg of tramadol, adequate analgesia is achieved within 5-10 minutes in 24%, 10-15 minutes in 64% and 15-20 minutes in 12%. The mean time of onset of analgesia being 12.18+2.28 minutes.

**Table 4: Distribution of study subjects as per onset of analgesia.**

Time interval in minutes	Group-A	%	Group-B	%
0-5	-	-	-	-
5-10	-	-	12	24%
10-15	8	16%	32	64%
15-20	39	78%	6	12%
20-25	3	6%	-	-
25-30	-	-	-	-

Table 5 shows distribution of study subjects as per duration of analgesia. In Group-A the duration of analgesia is in the range of 5-7 hours in 56% and 7-9 hours in 44% of patients. The mean time of duration of analgesia is 6.75 + 0.46 hours. In Group-B the duration of analgesia is in the range of 7-9 hours in 22%, 9-11 hours in 74% and 11-13 hours in 4% of patients. The mean time of duration of analgesia is 9.36+0.84 hours.

Table 6 shows distribution of study subjects as per complications. In Group-A, the complications observed are hallucinations in 12%, Drowsiness in 10%, pain on injection in 8%, Backache in 6%, urinary retention in 2%, and nausea and vomiting in 2% of patients. In Group-B the complications observed are nausea and vomiting in 24%, backache in 6%, urinary retention in 4% and pain on injection in 2% of patients.

Hallucinations are treated with inj. Midazolam 1 or 2 mg I.V., in patients with urinary retention bladder catheterization done and nausea vomiting has been treated with inj. Ondansetron 4 mg I.V. single dose (or) repeated if necessary.

**Table 5: Distribution of study subjects as per duration of analgesia.**

Time interval (hrs)	Group-A	%	Group-B	%
3-5	-	-	-	-
5-7	28	56%	-	-
7-9	22	44%	11	22%
9-11	-	-	37	74%
11-13	-	-	2	4%
13 Above	-	-	-	-

**Table 6: Distribution of study subjects as per complications.**

Time interval (hrs)	Group-A	%	Group-B	%
Nausea & vomiting	1	2%	12	24%
Hallucination	6	12%	0	0
Backache	3	6%	3	6%
Pain on injection	4	8%	1	2%
Urinary retention	1	2%	2	4%
Respiratory depression	-	-	-	-
Pruritus	-	-	-	-
Convulsions	-	-	-	-
Drowsiness	5	10%	-	-
Total	20	40%	18	36%

## DISCUSSION

In the present study 100 patients, undergoing lower abdominal surgeries, are randomly selected and divided into two groups "A" and "B". In Group-A, I have used Ketamine 30 mg in 10 ml of normal saline, through epidural catheter, basing on the studies conducted by Naguib M et al, Abdel Ghaffer ME et al, and Gebhardt B 8 who produced effective and safe analgesia with the same dose of epidural ketamine.<sup>6,7</sup>

In Group-B, I have used epidural tramadol 100 mg in 10 ml of normal saline, basing on the successful observations made by Dellikan AE et al.<sup>8</sup>

In both the groups the drug administered epidurally, whenever patients requested for analgesia. Strict aseptic precautions are maintained while injecting the drug through epidural catheters.

In Group-A the onset of analgesia (15-20 min with a mean of 17.01+2.65 min) is correlating with the onset of analgesia.

In Group-B the onset of analgesia (10-15 min with a mean of 12.18+2.289) has much similarity with onset of analgesia 10-15 minutes in Dellikan AE et al.<sup>9</sup>

The onset of analgesia in Group-B patients is quicker than Group-A patients ( $P < 0.05$ ). In both the groups the onset of analgesia is slightly decreased with subsequent doses.

Group-A patients have the duration of analgesia (6.75+0.46 hrs) in this study is much similar to the previous reports by Islas JA et al with only 4 mg of epidural ketamine had a mean duration of action of 4.06+1.34 hours.<sup>10</sup>

In the present study I have observed that the duration of analgesia with initial dose, in Group-A patients, is very much shorter. With subsequent doses the duration of analgesia has been improved and most of the patients fall in the range of 5-7 hours.

The duration of analgesia in Group-B patients in the present study (9.36+0.84 Hrs) has been correlating with Dellikan AE et al with 100 mg epidural tramadol had a mean duration of action of 9.36 hours.<sup>9</sup>

In Group-B also the duration of analgesia has been improved with subsequent top up doses and it is more prolonged than Group-A. Majority of patients are free from pain in the range of 9 - 11 hours.

Group-A patients required more number of top-up doses, which are in the range of 5-7 times, in the 48 hours of postoperative period, whereas Group-B patients requested only 3 or 4 times for analgesia in the same period. Group - B patients have prolonged duration of analgesia than Group-A patients ( $P < 0.05$ ). The quality of analgesia, which is assessed by visual analogue score, is good in Group-B than in Group-A patients. Group-B patients requested analgesia rarely after 24 hours of postoperative period, while Group-A patients required at least two top-up doses in the same postoperative period.

In Group-A majority of patients have suffered from A) hallucinations, in 6 (12%) patients previously reported by Vander AD et al, and Kumar D et al probably due to rapid systemic absorption of epidurally administered ketamine.<sup>11,12</sup> Pedraz JL et al, evaluated the same thing from their study.<sup>13</sup> Pain on injection in 4 (8%) patients and backache in 3 (6%) patients also seen in Naguib M et al 6 and Shigiara A et al studies.<sup>14</sup> Other side effects are Drowsiness in 5 (10%) patients, urinary retention and vomiting in only 1 (2%) patient.

In Group-B the major side effect is nausea and vomiting in 12 (24%) patients correlating with the studies of Fu YP et al and Prosser DP et al.<sup>15,16</sup> The other side effects are urinary retention in 2 (4%) patients, Dellikan AE et al 9 observed urinary retention in only one patient, pain on

injection complained by 3 (6%) patients and Backache complained by 1 (2%) patient.

In Group-A patients the percentage of side effects (40%) is more when compared with the percentage of side effects in Group-B (36%). In both the groups no patient had respiratory depression, haemodynamic instability, convulsions, pruritus, and required rescue analgesics.

In the present study Group-B patients have quicker onset of analgesia with prolonged pain free periods having better visual analogue pain scores and less amount of complications than Group-A. The duration of analgesia in Group-B patients is superior to Group-A patients.

## CONCLUSION

Epidural tramadol provided effective postoperative analgesia with quicker onset and prolonged duration of analgesia with least side effects. Majority of patients in this group are comfortable in the postoperative period for 48 hours. With epidural ketamine the patients have taken more time to become free from pain with shorter duration of analgesia with some side effects. Hence, finally concluded that epidural tramadol is superior to epidural ketamine for postoperative pain relief.

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