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## A comparative evaluation of lumbar epidural block using 0.5% bupivacaine and 0.5% bupivacaine with ketamine

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### Abstract

Epidural block with bupivacaine alone can provide analgesia in the early post operative period but as the block wears off, systemic analgesics like non steroidal anti inflammatory drugs (NSAID) or parental opioids are often required to relieve the pain. Epidural administration of opioids is an effective way of pain control in the post-operative period, but they are not free of side effects, the most serious of which is delayed respiratory depression. There is considerable evidence implicating Ketamine in the spinal inhibition of nociceptive transmission when administered epidurally. This study is intended to compare the sensory and the motor block between two groups.

**Keywords:** Epidural, block, bupivacaine, ketamine

### Introduction

Epidural block with bupivacaine alone can provide analgesia in the early post operative period but as the block wears off, systemic analgesics like non steroidal anti inflammatory drugs (NSAID) or parental opioids are often required to relieve the pain [1-3]. Epidural administration of opioids is an effective way of pain control in the post-operative period, but they are not free of side effects, the most serious of which is delayed respiratory depression [4-12]. There is considerable evidence implicating Ketamine in the spinal inhibition of nociceptive transmission when administered epidurally. Choe H *et al* (1997) [13] postulated that central nervous system sensitization would be prevented more effectively by the preoperative use of morphine and ketamine simultaneously, and the effect of preemptive analgesia would be demonstrated. ketamine 60mg and morphine 2mg were injected epidurally through an indwelling catheter that was inserted at the T7- 8 interspace in 60 ASA physical status class 1-2 patients. The drugs were injected before induction of anaesthesia (Group I; n =30) or immediately after removal of surgical specimen (Group 2; n = 30). An additional 2mg of morphine was injected when the patient complained of resting pain. The analgesic effect was assessed by the time from first analgesic injection to second dose and the number of patients who needed supplemental injections. Complications were also noted. The duration of analgesia was longer ( $p < 0.01$ ) in Group I (31.1 +/-16.0h) than in Group 2 (21.1 +/- 12.0h) and the proportion of patients who needed supplemental injections was decreased ( $p < 0.05$ ) in Group I (56.7%) compared with Group 2 (90%). The incidence of adverse effects was not different between the two groups. They concluded that preoperative administration of morphine and ketamine is more effective in reducing postoperative pain than it is when given during the operation.

This study is intended to compare the sensory and the motor block between two groups.

### Aims and Objectives

To compare the sensory and motor block evaluation of lumbar epidural block using 0.5% bupivacaine and 0.5% bupivacaine with ketamine.

### Materials and Methods

This study was conducted in 60 ASA physical status-I-Patients posted for elective surgical procedures, which required sensory blockade below the level of T - 6 dermatome and operated under single shot lumbar epidural block. Patients were randomly assigned into two groups. Groups I and Group II. (30 patients in each group).

Group-I (N=30) (Control Group)	Group-II (N=30) (Study Group)
Lumbar epidural block with 0.5% bupivacaine 1.5ml. spinal segment to be blocked.	Lumbar epidural block with 0.5% bupivacaine 1.5ml. spinal segment to be blocked plus 1% preservative free ketamine 0.5mg.kg body weight.

## Results

**Table 1:** Distribution of patients according to time of onset of sensory block

Time (minutes)	Number of patients			
	Group I	%	Group II	%
0-5	0	0.0	0	0.0
6-10	0	0.0	4	13.3
11-15	7	23.3	23	76.7
16-20	22	73.3	3	10.0
21-25	1	3.3	0	0.0
Total	30	100.0	30	100.0
Mean $\pm$ SD	17.57 $\pm$ 2.14		13.37 $\pm$ 2.03	
P – value 0.0001*				

**Table 2:** Distribution of patients according to time of onset of maximum motor block

Time (minutes)	Number of patients			
	Group I	%	Group II	%
10 - 20	0	0.0	0	0.0
21 - 30	0	0.0	9	30.0
31 - 40	12	40.0	19	63.3
41 - 50	17	56.7	2	6.7
51 - 60	0	0.0	0	0.0
61 - 70	1	3.3	0	0.0
Total	30	100.0	30	100.0
Mean $\pm$ SD	43.73 $\pm$ 6.28		33.87 $\pm$ 5.37	
P-value	0.0001*			

\* Significant, based on Student's t-test for independent samples

## Discussion

Gebhardt B (1994) [7] studied pharmacology and clinical results with peridural and intrathecal administration of ketamine in animals and humans. Animal study suggested that ketamine may cause complete sensory and motor blockade after intrathecal administration which leads to high concentrations in CSF. One-study investigation effects after epidural administration showed motor blockade only after high dose of ketamine. Binding to opiate receptor seems to play only a minor role; where as significant analgesia after even low doses of ketamine is the result of antagonism to NMDA receptors. The study of intrathecal administration of ketamine in humans revealed local anaesthetic effect after 50 mg ketamine. For epidural use, doses upto 30 mg did not give adequate pain relief after surgery in controlled studies, but had some analgesic effect in patients with chronic pain syndromes. When doses 30 mg and over were used postoperative analgesia was generally assessed as good. He concluded that intrathecal ketamine showed local anaesthetic effects in both animals and humans. epidurally administered ketamine doses of 30 mg and more seems to provide adequate analgesia while smaller doses might be effective in chronic pain syndrome. Shighara A *et al.* (1995) [8] studied use of ketamine combined with local anaesthetic in epidural anaesthesia. Post-operative pain relief and sedation with epidural ketamine were studied. Twenty-four patients for elective upper abdominal surgery

were divided into groups. Epidural Catheter was inserted into thoracic epidural space before induction of general anaesthesia. In each groups either 0.25% bupivacaine 5ml only; ketamine 0.1mg.kg + bupivacaine 5ml or ketamine 0.3mg.kg + bupivacaine 5ml or ketamine 0.5mg.kg + bupivacaine 5ml was injected into epidural catheter for complaint of pain in recovery room. In ketamine injected groups, blood pressure and heart rate were unchanged, but respiration rate increased significantly. Patients in ketamine 0.3 or 0.5 mg.kg injected groups, pain relief and sedation score were significantly intensified, but patients in ketamine 0.5mg.kg injected group, incidence of pain in the back during injection and headache was high. They concluded that epidural ketamine is useful for postoperative pain relief and superior dose of epidural ketamine is 0.3mg.kg. Yang C Y *et al* (1996) [9] studied the effect of intrathecal ketamine on intrathecal morphine in treatment of cancer pain. A double blind cross over study was designed in terminal cancer pain patients. A two-phase protocol was used; phase M, Intrathecal morphine alone twice daily; phase M + K, co-administration of ketamine (1.0 mg) with morphine intrathecally twice daily. Dose of morphine was titrated upwards until acceptable pain relief was achieved, defined as effective doses. They found that effective dose of intrathecal morphine in phase M of 0.38 +/- 0.04 mg.day was higher than that in phase M + K (0.17 +/- 0.02 mg/day) (P < 0.05). The average pain scale were 7.95 +/- 0.25 before intrathecal drug administration. Pain scale were decreased to 2.2 +/- 0.17 (p < 0.05) in phase M and 1.95 +/- 0.2 (p < 0.05) in phase M + K after effective dose of morphine has been reached. No serious side effects were observed in this study. They concluded that ketamine enhanced the analgesic effect of morphine, thus reducing the dose of intrathecal morphine. Wong CS *et al.* (1996) [10] evaluated effects of co-administration of ketamine, morphine and bupivacaine in a case of post herpetic neuralgia where other conventional method had failed. Patient had severe pain, allodynia and hyperesthesia over right side T2 to T8 dermatomes. Subanalgesic dose of ketamine (10mg) morphine (1 mg) and 6ml of 0.1% bupivacaine was administered through thoracic epidural route. After treatment, hyperalgesia and allodynia improved dramatically and the receptive field also reduced. After four weeks treatment, satisfactory pain relief was achieved with conventional analgesic treatment. They concluded that combination of relatively low doses of morphine, ketamine and bupivacaine epidurally provided effective pain relief and provides a promising treatment for the neuropathic pain with limited side effects. Russel SCS *et al* (1997) [11] evaluated the effect of clonidine and ketamine in caudal epidural analgesia with 0.25% bupivacaine for various inguinal, lower abdominal and lower limb surgeries in paediatric patients. Clonidine and ketamine have both been shown to prolong the duration of local anaesthetic bupivacaine when used to provide caudal epidural analgesia. Median duration of caudal epidural analgesia with 0.25% bupivacaine is prolonged from 3- 4 hours to 9-16 hours when 1.2 mcg. Kg of clonidine is added to local anaesthetic solution. Similarly, ketamine combined with 0.25% bupivacaine significantly prolonged the median duration of single shot caudal epidural blockade to 12.5 hours. Optimal dose of ketamine for prolonging caudal epidural block in children has been shown to be 0.5 mg.kg. No difference has been found between children receiving caudal epidural clonidine or ketamine and control groups in occurrence of

side effects such as significant haemodynamic changes, respiratory depression, motor block, urinary retention or post operative sedation. Wong CS *et al* (1997) [12] studied forty five ASA 1-2 patients, undergoing unilateral total knee replacement. In the study groups epidural lidocaine was used as a primary anesthetic. Patients received ketamine + morphine epidurally 30 minutes either before (group EB) or after skin incision (group EA). Group G patients received general anaesthesia and ketamine + morphine were given 30 minutes after skin incision via an epidural catheter used for postoperative pain control. Epidural morphine and ketamine in lidocaine was given to all patients at the end of surgery after every 12 hours for three days for analgesia supplemented with PCA morphine. Time until first PCA trigger, morphine consumption, pain score, satisfaction score and morphine related side effects were recorded at 6, 12, 24, 48 and 72 hours after surgery. They observed that epidural ketamine plus morphine with lidocaine before surgical incision produced better pain relief and patient satisfaction than when given after incision. A longer time to PCA and decreased morphine consumption were observed in-group EB than in group G. In-group EA, epidural anaesthesia also produced some preemptive analgesic effect compared with general anaesthesia shown by decreased morphine consumption. They concluded that administration of ketamine plus morphine with epidural lidocaine anaesthesia before surgery provided improved postoperative analgesia compared with general anaesthesia alone or when analgesics were given after skin incision.

### Conclusion

Epidural ketamine in a dose of 0.5mg/kg with bupivacaine 0.5% resulted in earlier onset of sensory blockade. Epidural ketamine in a dose of 0.5mg/kg with bupivacaine 0.5% resulted in earlier onset of maximum motor blockage. Quality of motor blockade does not change significantly by addition of ketamine in a dose of 0.5mg/kg along with epidural bupivacaine 0.5%.

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