Original Research Article

Epidural block with Bupivacaine with or without Ketamine: A comparative assessment of clinical efficacy

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Abstract

Background: An epidural nerve block is an anaesthetic procedure performed by injecting anaesthetic medication into the epidural space useful for carrying on complicated and long-running surgeries, useful for diagnostic procedures, acute pain therapy or to treat chronic pain syndromes. **Objective:** To compare the clinical efficacy of Bupivacaine with or without Ketamine for epidural block. **Methods:**A total of 80 patients fulfilling as per the American Society of Anesthesiologists I and II of either sex aged between 30-60 yrs were considered for the study. Patients were treated with Bupivacaine alone or in combination with Ketamine prior to surgery and clinical efficacy was evaluated by assessing the time of onset of sensory block, time of onset of maximum motor block and duration of analgesia. Motor block was evaluated by Bromage scale. **Results:**In Bupivacaine alone group mean onset of anaesthesia was significantly less than in the patients receiving combination of Bupivacaine and Ketamine ($P<0.05$). Onset of maximum motor block was also smaller and for longer duration in combination group. In addition, duration of analgesia was also increased by 1 hr in combination group. **Conclusion:**It is concluded that addition of Ketamine 0.5 mg/kg to caudal Bupivacaine 0.25% in a dose of 0.5 ml/kg significantly prolonged the postoperative analgesia compared with administration of caudal Bupivacaine 0.25% in a dose of 0.5 ml/kg alone.

Keywords: Epidural, block, Bupivacaine, Ketamine

Introduction

An epidural nerve block is a procedure to block pain by injecting anaesthetic medication into the epidural space. It is performed as anaesthesia during surgeries or for pain relief (analgesia) for short periods or to treat chronic pain syndromes. An epidural nerve block may be performed as the sole method of anesthesia, in combination with spinal anaesthesia (anaesthetic injected into the subarachnoid space) or in combination with general anaesthesia.

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Among the many options available for the control of postoperative pain, analgesia delivered through an indwelling epidural catheter is a safe and effective method for the management of acute postoperative pain. It can provide analgesia superior to systemic opioids[1]. Apart from providing adequate pain relief, epidural local anesthetics promote reconvalescence by blunting autonomic and somatic reflexes to pain. It is for useful for inducing anaesthesia in orthopaedic surgery, vascular surgery, amputation of lower limbs, caesarean delivery of pregnancy and surgery in the lower abdominal area.Epidural block can be achieved by administering a local anaesthetic and/or a narcotic agent. A drug named Bupivacaine is the most used local anaesthetic for anaesthesia and post-operative analgesia. 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 parenteral opioids are often required to relieve the pain[2]. 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[3]. Ketamine is the novel companion in the spinal nociceptive transmission inhibition for epidural administration. It can be useful to prevent central nervous system sensitization more effectively by the preoperative use of morphine and Ketamine simultaneously, and the effect of pre-emptive analgesia would be demonstrated[4].In the present study we aimed to study and compare the clinical efficacy of epidural Bupivacaine 0.25% with Bupivacaine + 0.25 % Ketamine for inducing epidural block and post-operative pain management.

Materials and Methods

A legal approval was received form the Institutional Ethics Committee and written informed consent from all the participating subjects.

Inclusion and Exclusion Criteria-Total 80 American Society of Anesthesiologists physical status I or II of either sex patients of age 30–60 years, body weight 40–70 kg and height >150 cm were enrolled in this randomized, double blind study. Any kind of contraindication to epidural anaesthesia, allergy to local anaesthetics, and subjects with communication difficulties (who may cause difficulty in reliable assessment) were set to exclude from the study.

Preparation for Anaesthesia and randomization

All patients were kept on fasting for 6 h. preanesthetic medication was administered that included oral ranitidine 150 mg, ondansetron 4 mg and diazepam 5 mg and Ringer lactate solution (750 ml). They were then allocated randomly to receive epidural anaesthesia using either 0.5% Bupivacaine (Group I) or 0.5% Bupivacaine + Ketamine (Group II). The study drug for anaesthesia and post-operative analgesia was prepared by a separate anaesthesiologist. The anaesthesiologist doing the study, the surgeon, the patient, and the staff were blinded to the drug used.

Control Group (Group-I, N=40): Caudal epidural block with 0.25% Bupivacaine, 0.5 ml/kg

Study Group (Group-II, N=40): Caudal epidural block with 0.25% Bupivacaine, 0.5ml/kg plus 1% Ketamine 0.5 mg/kg body weight.

Assessment of pain-Clinical efficacy was investigated by evaluating the time of onset of sensory block, time of onset of maximum motor block and duration of analgesia. Motor block was evaluated by Bromage scale[8]

- 0 - Full flexion of knees and feet possible, able to lift extended legs
- 1 - Unable to lift extended legs, but able to flex knees and feet
- 2 - Unable to flex knees but flexion of feet possible
- 3 - Unable to move legs and feet at all.

Statistical analysis-Data were collected of each patient from both the groups and fed in a Microsoft Excel Worksheet. Mean value and standard deviation were computed for age, weight, duration of surgery, and duration of analgesia. The mean values of the two groups were compared using student's t-test. $P < 0.05$ was considered statistically significant.

Results

The two groups were comparable for age (43±5.23 vs 45±6.17 years) and weight (55±5.23 vs 54±4.57 years). Mean age and weight of the two groups are not statistically significant.

Time of onset of sensory block-Time of onset of sensory block was noted in both the group from the time of epidural drug administration. Patients were classified based on the time taken for the sensory block. In Bupivacaine plus Ketamine group most of the patient achieved sensory block in 11-15 min, while that in the Bupivacaine alone group patient showed sensory block in 16-20 min. Mean onset of anaesthesia was significantly less in the patients receiving combination of Bupivacaine and Ketamine ($P<0.05$).

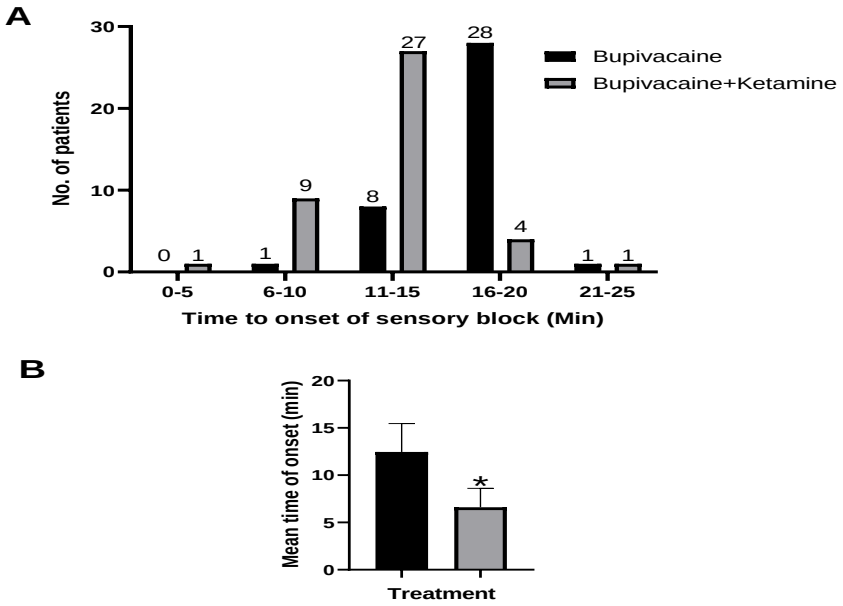

Fig 1: A, number of patients showing sensory block following Bupivacaine or Bupivacaine plus Ketamine administration. Each patient takes different time to achieve sensory block. B, Mean time for the onset of sensory block in two groups. *P<0.05 vs Bupivacaine alone group.

Time of onset of maximum motor block-Time of onset of maximum motor block was another assessment criterion (Table 1). Alone Bupivacaine administration showed maximum motor block at 33 min from the injection. On the other hand, in the patient receiving combination of Bupivacaine with Ketamine this time was reduced to 25 min. Motor block remained up to 2 hrs in only one patient of the combination group and 4 hrs in Bupivacaine alone group.

Table 1: Number of patients showing time of onset of maximum motor block

Time post-operative	Groups	Bromage scale			
		No. of patients			
		0	**1**	**2**	**3**
1 hr post-operative	Bupivacaine	23	8	5	2
	Bupivacaine + Ketamine	25	9	6	2
2 hr post-operative	Bupivacaine	25	8	4	1
	Bupivacaine + Ketamine	32	7	2	1
4 hr post-operative	Bupivacaine	35	2	1	0
	Bupivacaine + Ketamine	38	3	1	0
8 hr post-operative	Bupivacaine	38	0	0	0
	Bupivacaine + Ketamine	42	0	0	0
16 hr post-operative	Bupivacaine	38	0	0	0
	Bupivacaine + Ketamine	42	0	0	0
24 hr post-operative	Bupivacaine	38	0	0	0
	Bupivacaine + Ketamine	42	0	0	0

Duration of analgesia-The duration of analgesia was longer ($p < 0.05$) in patients who received combination of Bupivacaine and Ketamine (210 ± 17 min) than the Bupivacaine alone (150 ± 12 min).

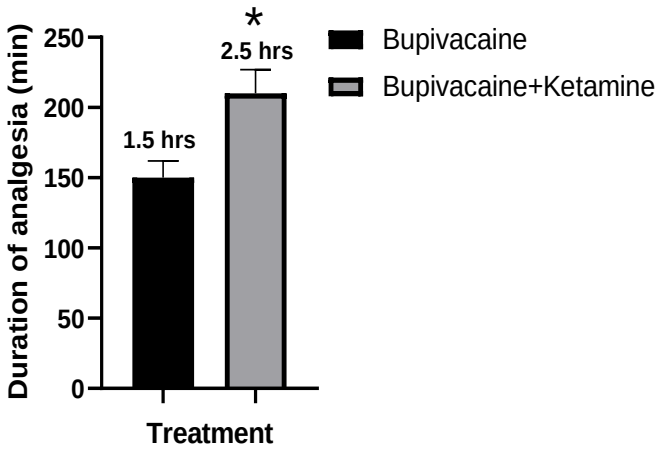

Fig 2: Represents duration of analegiafollowing epidural block in the patients. *P<0.05 vs Bupivacaine alone group.

Discussion

Caudal epidural is commonly performed and one of the most popular regional blocks in surgical anaesthesia. The limitation of the single-agent caudal blockade is its limited and short duration. Due to these limitations, its utility as postoperative analgesic is compromised. Even long-acting local anaesthetic drug such as Bupivacaine provides only 4–6 h of analgesia. Therefore, there is a continuous search for an ideal adjuvant to prolong the duration of analgesia. In the present study, we used caudal Bupivacaine 0.25% 0.5 ml/kg in one group of patients and caudal Bupivacaine 0.25% 0.5 ml/kg plus Ketamine (preservative free) 0.5 mg/kg in another. Similar combination was also studied in previous studies[5-7]. The present study determined that epidural block induced by 0.25% Bupivacaine + 1% Ketamine provides adequate spinal anaesthesia for surgery and pain management. The mean time to onset of motor block with combination is shorter than that achieved with Bupivacaine 0.25% alone and more if the maximum level of sensory block is considered. Wider differences were found in secondary outcome variables regarding recovery from spinal anaesthesia; patients undergoing epidural block with combination longer time to end of anaesthesia and post-operative pain. These observations are coherent with earlier reports suggesting that Bupivacaine plus Ketamine in combination may be a better alternative for the epidural block and post-operative pain management. In our study, duration of analgesia after caudal block was documented using the objective pain score. We observed that the mean duration of action with Bupivacaine alone was shorter range varied between 1 and 4 h (Mean 1.5 hrs). In Bupivacaine with Ketamine group duration of action was in the range of 2–4 h, and its mean duration of action was 2.5 hrs with statistical significance of $\mathbf{P} < 0.05$. The results indicate that caudal Bupivacaine and Ketamine combined prolonged postoperative analgesia by 1 hr and significantly reduced the need for subsequent postoperative analgesia by more than 50% compared with caudal Bupivacaine alone. Similar results are noted in the children previously[8]. The degree of motor blockade was also comparable in both the groups. No motor blockade was seen after 6 h of observation in both the groups. In terms of side effects, we observed no differences in the safety profile of the patients from both groups No differences were noted in the motor block, postoperative sedation, or urinary retention. Nausea and vomiting was not a major problem in any of the groups.

Conclusion

We concluded that preoperative administration of Ketamine is more effective in reducing postoperative pain than it is when given during the operation. Combination significantly prolongs the duration of postoperative analgesia and reduced the need for postoperative analgesic supplementation when compared to 0.5ml/kg of 0.25% Bupivacaine. It also

reduced the need for perioperative analgesic supplementation alone, without any side effects.

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