Original Research Article

A comparative study of different adjuvants to augment the effect of epidural bupivacaine for lower abdominal surgeries

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Abstract

Background: The technique of epidural anesthesia and analgesia have become widespread following their introduction and acceptance by the patients in surgical and obstetric practice. Adjuvants to bupivacaine have been used to enhance good quality perioperative and postoperative anesthesia and analgesia. The aim of the study is to evaluate the effect of extradural administration of bupivacaine, bupivacaine with fentanyl (2microgram/kg), ketamine (1mg/kg) and dexmeditomedine (1.5microgram/kg). **Aim:** The aim of the study is to evaluate the effect of extradural administration of bupivacaine, bupivacaine with fentanyl(2 microgram/kg), ketamine(1mg/kg) and dexmeditomedine (1.5microgram/kg). **Methods:** The prospective, comparative, single blind study includes 100 patients of ASA grade 1 and 2 for lower abdominal surgeries. Each group was given loading dose of 20ml of 0.5% bupivacaine with various adjuvants-fentanyl(2microgram/kg), or ketamine(1mg/kg) or dexmeditomedine(1.5microgram/kg) **Result:** Time of onset was earlier in group with(bupivacaine+fentanyl) and (bupivacaine+dexmeditomedine). It was delayed in group of plain bupivacaine. The total power regained was delayed in bupivacaine+dexmeditomedine-260.8±18.77,bupivacaine+fentanyl-241.70±24.98,bupivacaine+ketamine-234.232±9.66 when compared to plain bupivacaine of 183.07±14.53(P <0.05).Demand of analgesia is earlier in plain bupivacaine and (bupivacaine+ketamine) when compared to (bupivacaine+fentanyl) and (bupivacaine+dexmeditomedine) requiring an early top up of epidural .Similarly two segment regimen is also significantly early in group (plain bupivacaine) and (bupivacaine+ketamine) (P<0.001). It is also observed that patients are hemodynamically stable with bupivacaine+fentanyl>bupivacaine+dexmeditomedine>plain bupivacaine>bupivacaine +ketamine. **Conclusion:** Fentanyl and dexmeditomedine were effective and superior as compared to plain bupivacaine(bupivacaine+ketamine) as an adjuvant to enhance effect of bupivacaine for epidurals.

Key Words: Bupivacaine, fentanyl, ketamine, dexmeditomedine, epidurals.

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INTRODUCTION

Epidural anesthesia is most commonly used regional anesthesia technique. It is preferable for long duration surgeries ,for the need of post operative pain relief and in labour analgesia. Its slow onset of action, least hemodynamic changes and segmental block causes least amount of hemodynamic instability when compared to sub arachnoid block. Technique- After securing an intravenous line and applying monitors, epidural anesthesia is instituted in patients in sitting position, midline approach. A 18 gauge touhy needle is introduced in slightly cephalad direction, just below upper spinous process. On entering, a low resistance syringe is connected to identify the epidural space by loss of resistance technique. Catheter should be introduced into epidural space to 15 – 20 cms the needle withdrawn over catheter. After knowing the depth of epidural space from skin, the catheter should be fixed at 3 cms in the epidural space. After ensuring that there is no back flow of CSF, or blood down the catheter, a hub and a bacteriostatic

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filter is attached. An aspiration test is performed and test dose is given. The catheter is fixed along patients back with adhesive strapping and loading dose of 20ml of 0.5% bupivacaine is instilled with or without adjuvants.

MATERIAL AND METHODS

Design of Study

After approval from institutional ethical committee and written informed consent, the study was conducted in the patients aged 18-60 years within ASA grade I or II being admitted for lower abdominal surgeries under anaesthesia at PEH/DCMS. Patient's refusal, contraindications to central neuraxial block, allergy to drug, chronic pain syndrome and patients of heart block and hypertension. Epidural anesthesia with loss of resistance technique and catheter was placed at L4-5 interspace in sitting position. Patients randomised by using computer generated random number table to receive one of the following groups of 20ml of 0.5% bupivacaine , 20ml of 0.5% bupivacaine+ fentanyl (2microgram/kg), 20ml of 0.5% bupivacaine+ ketamine (1mg/kg) and 20ml of 0.5% bupivacaine+dexmeditomedine (1.5microgram/kg). All patients were premedicated with ranitidine 150 mg, and alprazolam 0.25mg orally at night before surgery. All of them were properly made aware regarding epidural anaesthesia and were preloaded with 10-15 ml/kg of Ringer Lactate. After the patients had been given epidural anaesthesia, heart rate and noninvasive arterial blood pressure were monitored in three groups preoperatively, intraoperatively and during shifting. Hypotension has been defined as systolic blood pressure <90 mmHg or >30% decrease in baseline values. Tachycardia has been defined as heart rate >100/min and bradycardia has been defined as heart rate <60/min. Sensory block was assessed bilaterally by ice cube in midclavicular line. The time to reach the maximum level of sensory block and time for regression of two segments in the maximum block height was noted. Motor blockade was assessed by using bromage scale (0: no motor block; 1: inability to raise extended legs; 2: inability to flex knees; 3: inability to flex ankle joints). The time for first analgesic requirement postoperatively or the time when the patient perceives pain for the first time following epidural anaesthesia was noted. VAS (visual analogue scale) was also monitored hourly for 24 hours. Total number of rescue analgesic given was also noted for 24 hours. Rescue analgesia was given by epidural top up . Sedation was assessed hourly for 24 hours on a four point scale (Grade 0, awake and alert; 1, mildly sedated, easily aroused; 2, moderately sedated, aroused by shaking; 3, deeply sedated, difficult to be aroused by physical stimulation). Single blinding was done i.e. patients included in the study were not aware of the drug combination they received for epidural anaesthesia and results obtained were subjected to statistical analysis.

Statistical Analysis

Continuous data were summarized as Mean ± SD while discrete (categorical) data in %. The outcome measures (pulse rate, systolic BP, diastolic BP, sedation score and VAS score) of four groups over the periods (time) were compared by repeated measures two factor (Groups x Periods) analysis of variance (ANOVA). Groups were also compared by one way ANOVA followed by Tukey's post hoc test. The categorical variables were compared by chi-square ($\chi 2$) test. A two-sided ($\alpha=2$) $p<0.05$ was considered statistically significant.

RESULTS

Table 1: Basic characteristics (Mean ± SD) of four groups

Characteristics	bupivacaine (n=25)	Bup+fentanyl (n=25)	Bup+ketamine (n=25)	Bup+dexem (n=25)
Age (yrs)	40.00 ± 15.15	41.05 ± 10.22	36.10 ± 15.71	30.35 ± 15.43
Gender				
Males	18 (65.0%)	18(70.0%)	19 (75.0%)	17(70.0%)
Females	8 (35.0%)	7(30.0%)	6(25.0%)	8(30.0%)
ASA				
I	14	13	15	12
II	11	12	10	13

Table 2: Sensory blockade of four groups

Sensory blockade	Bupivacaine (n=25)	Bup+fentanyl (n=25)	Bup+ketamin (n=25)	Bup+dexem (n=25)	p value
Level:					
T4	1	3	0	4	
T6	4	14	10	12	
T7	2	2	2	1	<0.001**
T8	2	1	10	4	
T10	11	5	3	2	
Time for Maximum Block Height (Mean ± SD)	20.10 ± 2.41	15.83 ± 0.78	18.60 ± 1.16	16.40 ± 1.50	<0.001**

** Significance at p < 0.001.

Table 3: Motor blockade (Mean ± SD) of four groups

	bupivacaine (n=25)	Bup+fentanyl (n=25)	Bup+ketamine (n=25)	Bup+dexem (n=25)	p-value
Motor Block (min) B1 B2 B3	12.87 ± 0.90	12.07 ± 0.69	11.73 ± 0.74	12.16 ± 0.80	0.001**
	15.13 ± 1.41	13.73 ± 1.17	14.20 ± 0.99	13.83 ± 1.78	0.001**
	17.70 ± 2.60	15.60 ± 1.61	17.60 ± 1.10	15.56 ± 1.14	<0.001**
Total Power Regain (min) B0	183.07±14.53	241.70±24.98	234.23±29.66	260.8±18.77	<0.05*
Demand of Analgesia (min)	144.90 ± 18.94	225.73± 31.21	216.57 ± 26.44	233.74 ± 34.45	<0.001**
Time of Two Segment Regression	110.83 ± 12.82	131.03 ± 16.51	110.83 ± 15.46	137.53 ± 22.46	<0.001**

*Significance at p<0.05, ** Significance at p < 0.001.

Table 4: Postoperative pain managements

Requirements	bupivacaine (n=25)	Bup+fentanyl (n=25)	Bup+ketamine (n=25)	Bup+dexem (n=25)	p value
Request for first analgesia	196.30 ± 45.88	391.00 ± 70.81	212.00 ± 45.24	317.35 ± 56.49	<0.001**
No. of rescue analgesia	3.32 ± 0.47	2.00 ± 0.65	3.20 ± 0.57	2.83 ± 0.52	<0.001**

** Significance at p < 0.001.

BLUE: Bupivacaine+Ketamine, RED: Bupivacaine +Fentanyl, GREEN: Bupivacaine+ Dexemedetomidine
PURPLE: Plain Bupivacaine

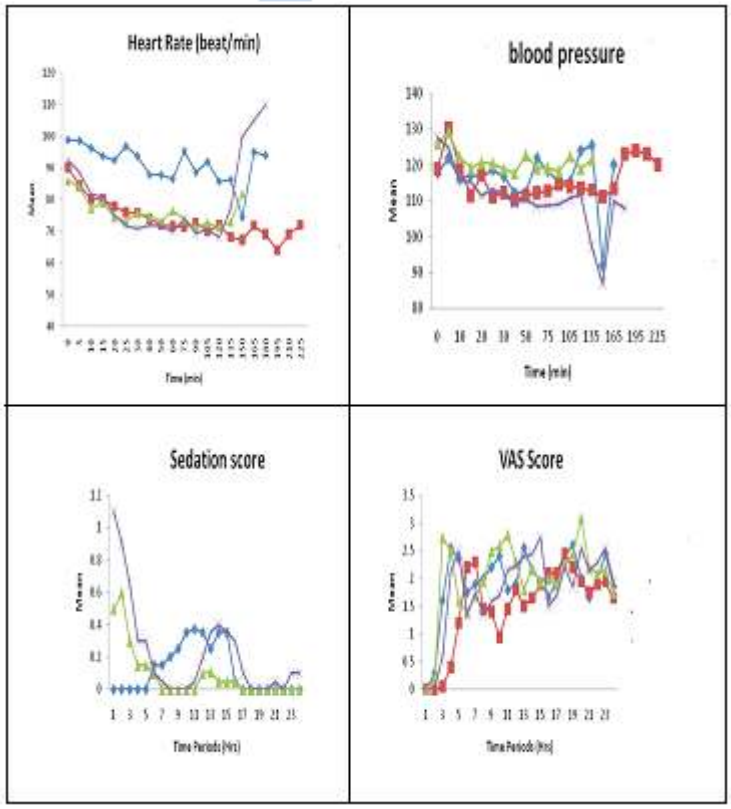

Figure 1

DISCUSSION

Bupivacaine acts by blocking sodium channels .Epidural opoids will diffuse across dura matter and arachnoid matter into the sub arachnoid space to bind with opiod receptors in the dorsal horn of the spinal cord. Dexmeditomidine acts by binding pre-synaptic c fibres transmitters and by hyperpolarization of post synaptic dorsal horn neuron .Our result indicate adding of fentanyl or dexmeditomedine produces prolong duration of sensory and motor block with preserved heamodynamic stability. In our study fentanyl and dexmeditomidine provided faster motor block in comparison to plain bupivacaine and ketamine. The present study also shows heart rate was similar

CONCLUSION

Fentanyl and dexmeditomedine were effective and superior as compared to plain bupivacaine+ (bupivacaine+ketamine) as an adjuvant to enhance effect of bupivacaine for epidurals.

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