*Original Research Article*

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# Modified Combined Spinal and Epidural Analgesia with Buprenorphine and Bupivacaine

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**Abstract**

*Context:* Combined spinal and epidural analgesia is performed by double space or single space technique. It can also be performed through single intervertebral space with a CSE needle or a Spinal needle which is the modified technique we planned. *Aims:* To compare the effect of different doses of epidural Buprenorphine with spinal Bupivacaine in terms of Onset and duration of Sensory & Motor Block; Duration of post operative analgesia with Visual analog scale. *Settings and Design:* It is a prospective randomised control study. *Methods and Material:* A total of 30 patients who met the enrolment criteria were approached & written informed consent was obtained.Group A were given Buprenorphine in the dose of 4 micrograms per kg with 10 ml Normal saline for epidural and 15 mg of Bupivacaine for spinal and Group B given Buprenorphine in the dose of 6 micrograms per kg with 10 ml Normal saline for epidural and 15 mg of Bupivacaine for spinal. *Statistical analysis used:* Comparisons between numerical variables were made using Student's t test or the Mann-Whitney U test, accordingly. To test for potential differences in onset neural block assessments of the two concentrations, a repeated measures analysis of variance (ANOVA) was applied. *Results:* There was significant increase of mean in Onset of Sensory Block (min) in groupA compared to group B. There was significant increase of mean in Time to two Segment Regression of Sensory Level (min) in groupB compared to groupA. Mean Duration of analgesia is significantly increased in group B compared to group A. *Conclusions:* CSE can be practised safely with Buprenorphine as additive to subarachnoid block with single needle technique offering good postoperative analgesia.

**Keywords:** Buprenorphine; Bupivacaine; Epidural; Spinal

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## Introduction

Combined spinal and epidural analgesia (CSE) can be performed by double space (DST) or single space/segment technique (SST). It can also be performed through single intervertebral space with a CSE needle or a Spinal needle which can be cost effective, single injection site with an advantage of postoperative analgesia. Using opioids for epidural is practiced and local anaesthetic like Bupivacaine/ Ropivacaine for intrathecal injections. We planned this study with a spinal needle for identifying both epidural and subarachnoid block.

*Objectives*

To compare the effect of different doses of epidural Buprenorphine with spinal Bupivacaine

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in terms of Onset and duration of Sensory & Motor Block; Duration of post operative analgesia; Hemodynamic changes.

## Materials and Methods

Inclusion criteria were, after institutional Ethical Clearance, a total of 30 patients (15 in each group) who met the enrolment criteria were approached & written informed consent was obtained. American Society of Anesthesiologist (ASA) I & II, aged 20-60 yrs, posted for elective surgery (OBG, Surgery, Urology, orthopedic) were included. Exclusion criteria were Patient refusal, morbidly obese patients, contraindication to subarachnoid block or epidural block, patient on opioids.

Randomization done by computerized random table and double blinding method was followed. Preoperatively detailed medical, surgical history, allergies was noted. Preoperative detailed general & systemic examination was done and vitals recorded and necessary investigations were done. Demographic data like age, weight (kg), height (cm) was obtained for each case.

The patients were familiarized with the 10 cm visual analogue scale (VAS) for pain during the pre-anesthetic visit. Patients kept fasting for 6-8 hrs prior to anesthesia. Baseline monitoring of E.C.G, noninvasive blood pressure, oxygen saturation, and respiratory rate recorded, all the patients preloaded with Ringer's Lactate10 ml/kg and Group A were given Buprenorphine in the dose of 4 micrograms per kg with 10 ml Normal saline for epidural and 15 mg of Bupivacaine for spinal and Group B given Buprenorphine in the dose of 6 micrograms per kg with 10 ml Normal saline for epidural and 15 mg of Bupivacaine for spinal.

The epidural done in sitting position with 23 G Quincke spinal needle with Loss of resistance to air technique and it was followed by spinal. Modified insertion technique advocated by Ali and Samson was adopted for ease of identification of the epidural space. According to this technique, the dorsum of the operator's left hand rests on the patient's back, while the left thumb advances the spinal needle. Continuous restrain by the left three fingers thus helps in slow continuous advance movement of the spinal needle until the loss of resistance is clearly appreciated once the tip is in the epidural space [1].

The onset of Sensory, Motor block; highest level of sensory, motor block; hemodynamic changes- HR, BP; SPo2; Time to 2 segment regression; VAS scores during the postoperative period noted. If VAS >4, Rescue analgesia Inj. Tramadol 50 mg was given. Side effects- hypotension, hypoventilation, itching noted and treated appropriately.

## Results

Fig. 1: Comparison of the heart rate (mean (SD) changes between groups at 0-120 min. Changes in heart rate (HR) (mean (SD)). Group A= Buprenorphine mcg and Group B = Buprenorphine 6 mcg (F=64.89, p=0.596)

Fig. 2: Comparison of the mean arterial pressure (mean (SD) changes between groups at 0-120 min. Changes in mean arterial pressure (mean (SD)). Group A = Buprenorphine 4 mcg Group B = Buprenorphine 6 mcg (F=8.496, p<0.001).

The observations made entered in to MS Excel and Demography details presented as Mean & SD; Statistical analysis was performed in SPSS 22.0 for Windows (US, Desk top Version). Comparisons between numerical variables were made using

**Table 1:** Comparison of age, block characteristics, in Group-A & Group-B patients

| Variables | Group –A (Buprenorphine 4 mcg (mean±SD) (n=15) | Group-B (Buprenorphine 6mcg) (mean+SD) (n=15) | T Value | p |
|---|---|---|---|---|
| Age (years) | 44.33±11.09 | 44.87±10.46 | -0.135 | 0.893 |
| Onset of sensory block (min) | 2.73±0.79 | 2.07±0.704 | 2.425 | 0.02 |
| Time to two segment regression of sensory level (min) | 104.33±11.782 | 121.00±10.88 | -4.024 | 0.001 |
| Total duration of analgesia (min) | 334.33±31.21 | 423±27.37 | -8.271 | 0.001 |
| Time for complete motor recovery (min) | 323.67±34.35 | 314±30.89 | 0.810 | 0.424 |
| VAS score when patient complains of pain | 4.93±0.70 | 4.67±0.90 | 0.904 | 0.374 |
| Number of rescue analgesia doses given during 24 hours | 0.93±0.70 | 0.47±0.516 | 2.071 | 0.048 |

Student's *t* test or the Mann-Whitney U test, accordingly. To test for potential differences in onset neural block assessments of the two concentrations (Buprenorphine-4 mcg & 6 mcg), a repeated measures analysis of variance (ANOVA) was applied. Basal values for mean arterial pressure, and Heart Rate were entered as covariates in the relevant models (ANCOVA). Group assignment was entered as the between-subject factor. The Greenhouse-Geisser correction for the denominator degrees of freedom was used if the assumption of sphericity did not hold. We chose to only consider results from the Duration × group interaction, to assess for possible differences in the time course of the sensory block.

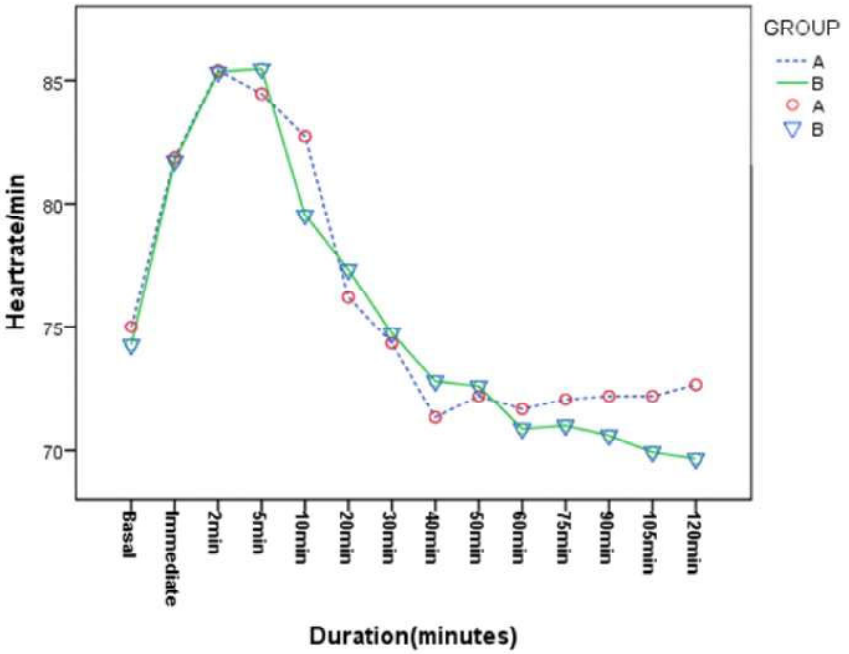


**Fig. 1:** shows ANOVA for repeated measures, there was no significance between-group differences in terms of heartrate (F=64.89, p=0.596)

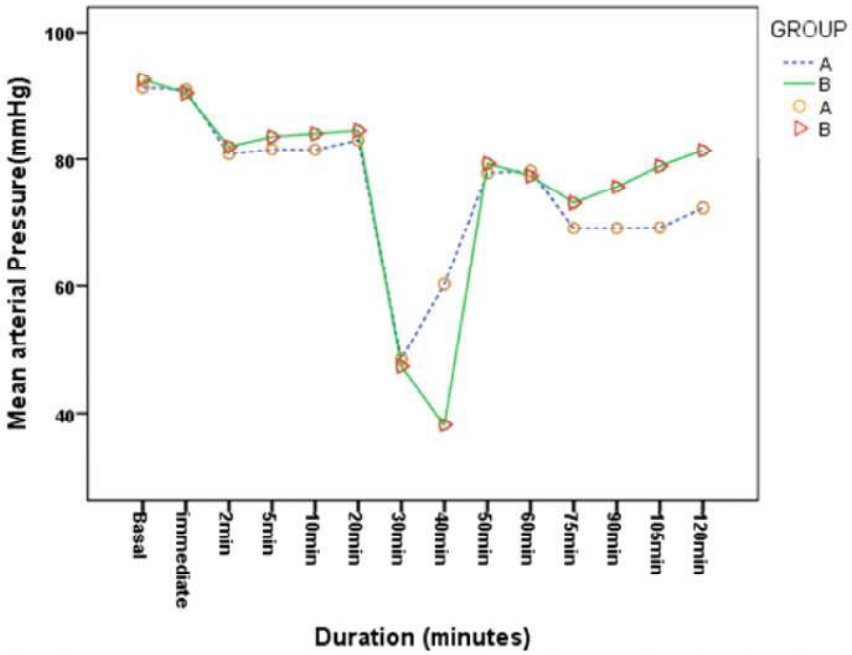


**Fig. 2:** shows ANOVA for repeated measures, there was significance between-group differences in terms of Mean arterial pressure (F=8.496, p<0.001)

A $p<0.005$ was considered statistically significant.

Neural block assessments are presented in Table 1. between Group-A & Group-B. The age was matched between the groups. There was significant increase of mean in onset of sensory block (min) ($p<0.02$) in group A compared to group B.

There was significant increase of mean in time to two segment regression of sensory level (min) ($p<0.001$) in group B compared to group A.

Mean Duration of analgesia is significantly increased in group B compared to group A ($p<0.001$).

The VAS scores and number of rescue analgesia doses were comparable in between the two groups.

**Discussion**

Different approaches for Combined spinal and epidural analgesia are practiced, like same space or 2 different spaces; Needle thorough needle or side port; use of 2 needles or single needle. We choose to use 23 Gauge spinal needles as it was difficult to identify epidural space with 25 gauge needles. We also used 2 different spaces.

One more method followed is called the modified combined spinal epidural technique or the sequential combined spinal-epidural technique, in which a spinal dose intended to be inadequate for surgery is used in an attempt to reduce hypotension and the block is then deliberately extended cephalad with the epidural drug. This is becoming popular in modern obstetric practice, because of stable haemodynamic status, also used in elderly high risk patients for orthopaedic surgery [1]. The combined spinal epidural (CSE) anaesthesia technique was first described by Soresi in 1937 [2].

Use of epidural needles may cause inadvertent dural puncture, migration of catheter in to subarachnoid space [3]. Special kit for CSE can be very costly and may not be affordable to all. To overcome this issue we have tried using a spinal needle for our study [4]. This technique of modified CSEA using a spinal needle can be cost effective and less complication prone alternative to the conventional CSEA [5].

Samaddar et al. used 25 G Quincke spinal needle for Modified CSEA in 60 adult patients subjected for lower abdominal or lower extremity surgery. Technique advocated by Ali and Samson was used while identifying epidural space. Epidural morphine 50 microgram kg-1 body weight was used. This Modified CSEA was successfully performed in 85% cases; this offered almost 24 h post of pain relief in 88.23% cases without any incidence of respiratory depression, pruritus and post dural puncture headache. They found it to be cost effective and less complication prone alternative technique and need of epidural catheter might be obviated [5].

Joshi et al. evaluated combined spinal-epidural anesthesia with a needle-through-needle technique using two different needle sets, 16-gauge Tuohy needle and a 26-gauge spinal needle that extended 13 mm beyond the tip of the Tuohy needle and other kit consisted of a 16-gauge Tuohy needle with an aperture in its curve (back hole) for the insertion of a 26-gauge spinal needle that protruded 10 mm beyond the tip of the epidural needle. They found Combined spinal-epidural technique provided satisfactory surgical and postoperative analgesia for total knee arthroplasty [6].

Rudra et al. compared of two analgesic regimens following lower abdominal surgery,extradural pentazocine 30 mg or extradural buprenorphine 0.3 mg to provide postoperative analgesia and found demand for rescue analgesia was significantly greater after extradural buprenorphine (18.96 hours) than after extradural pentazocine (8.39 hours). No serious side-effects were reported [7].

Casati et al. compared double-segment and the needle-through-needle techniques for combined spinal and epidural anesthesia (CSE), 120 patients were selected. They concluded needle-through-needle technique for CSE required less time, had no greater failure rate and resulted in greater patient satisfaction than the double-segment technique. They also observed use of a spinal needle with an adjustable locking mechanism and protruding up to 15 mm beyond the Tuohy needle improved successful spinal block in the needle-through-needle technique. No difference in the incidence of hypotension, postdural puncture headache, and back pain was observed between the two groups [8].

Kumar et al. also used 25 G Quincke spinal needle for modified CSE technique in 200 adult patients subjected for lower abdominal or lower extremity surgery. They also followed Needle insertion technique advocated by Ali and Samson. They used epidural buprenorphine 4 - 8 microgram kg-1 body weight successfully performed in 90% cases. Offered almost 20 - 24 h post of pain relief in 58.5% cases without any incidence of respiratory depression, pruritus and post dural puncture headache [4].

In our study, we planned to use epidural

buprenorphine and spinal Bupivacaine, so that postoperative analgesia is obtained without the side effects of adding additives to spinal anaesthesia. In our study we found that mean duration of onset of sensory block was earlier in group A (2.73±0.79 min) compared to group B (2.07±0.704 min). The mean time to two segment regression (A: 104.33±11.782 and B: 121.00±10.88 min) and duration of analgesia (A: 334.33±31.21 and B: 423±27.37 min) was also significant and more in group B. Group B had a significant drop in MAP at 40 minutes in 3 patients treated with Inj Mephentermine 6 m, g IV. In our study the VAS scores in between groups was not significant (4.93±0.70 & 4.67±0.90) and number of rescue analgesia doses were also less and not statistically significant.

Limitations of our study are, sample size is small and it is difficult for Novices to attempt Epidural with Spinal needle. We have used 23 gauges spinal as it is difficult to identify epidural with 25 gauge needles. Strengths of our study is using single needle for two techniques is cost effective and also provides postoperative analgesia with minimal side effects.

## Conclusion

CSE can be practised safely with Buprenorphine as additive to subarachnoid block with single needle technique offering good postoperative analgesia.

## Key Messages

Epidural analgesia combined with spinal anaesthesia will give an additive advantage in quality of anaesthesia and postoperative analgesia. Using spinal needle for epidural space identification needs anaesthesiologist with experience and has an advantage of cost effectiveness and post operative analgesia with a combined epidural and spinal technique.

*Conflict of Interest:* Nil

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