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Efficacy of Combined Spinal Epidural Block with Needle through Needle Single Interspace Technique and Epidural Anesthesia for Elective Infra Umbilical Orthopedic and Gynecological Surgery

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Abstract

Background: Over three decades revival interest developed in effective use of regional anesthesia techniques for surgery and pain management. *Objective:* To evaluate the efficacy of combined spinal epidural block and epidural block. *Materials and Methods:* Prospective study was conducted on American Society of Anesthesiologists grade I and II patients (20 to 60 years old) posted for infraumbilical gynecological and orthopedic surgeries. Sixty patients were randomized divided into two groups of 30 each such as group A (combined spinal epidural) and group B (epidural). Various parameters were studied to evaluate efficacy of combined spinal epidural anesthesia and epidural anesthesia regarding sensory blockade (by pinprick method), motor blockade (modified Bromage scale method) and total amount of bupivacaine required. Data was analyzed using unpaired t test and chi square test with the help of MS Excel and SPSS software. *Results:* Onset of anesthesia (sensory blockade) in group A (combined spinal epidural) was reduced significantly ($p<0.05$) as compared to group B (Epidural). Extent of motor blockade, group A showed all patients had grade 3 blockade which was 100%, whereas grade 3 blockade was found in only 3 patients of group B which was 10% only. The total amount of bupivacaine required was less in group A when compared with group B. *Conclusion:* Combined spinal epidural anesthesia showed effective and promising future over epidural anesthesia by offering rapid onset of action, superior quality of analgesia, better muscle relaxation and less dose of local anesthetic required.

Keywords: Bupivacaine; Combined Spinal Epidural Block; Epidural Block; Needle Through Needle Technique; Neuraxial Blocks.

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Introduction

Neuraxial blocks (spinal, epidural, caudal) result in sympathetic block, sensory analgesia, and motor block depending on dose, concentration and volume of local anesthesia (LA) after insertion of a needle in the plane of the central neuraxis [1]. Spinal and epidural blocks are famous regional techniques with long history of effectiveness in surgical procedures and pain management [2]. Despite their advantages, there are significant physiologic and pharmacologic differences. Difficulty in regulating the level of analgesia and hypotension are major disadvantages of spinal block. Whereas, epidural block with the catheter technique gives a better control to the level of analgesia and can be used for providing post operative pain relief by local anesthetic agents. It still has its drawbacks such as long onset of action, patchy anesthesia, more doses of anesthetics and hazard of cardiovascular and neurotoxicity [3,4]

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The combined spinal and epidural (CSE) technique for orthopedic procedures was first used by Coates and Mumtaz independently needle through needle technique in 1982 using long spinal needle through the epidural needle to provide the benefits of spinal block with the flexibility of an indwelling epidural catheter to extend the duration of analgesia into the post operative period [5,6]. CSE technique provides advantages of an epidural block especially an epidural catheter which provides ability to prolong the analgesia or anesthesia. The CSE technique includes an initial sub-arachnoid injection followed by epidural catheter placement and administration of epidural medications. This provides immediate relief of pain by rapid onset of spinal drugs and subsequent administration of analgesia or anesthesia via epidural route. Therefore, CSE is a sort of balanced anesthesia, which uses combination of techniques instead of drugs to accomplish the ideal kind of anesthesia for almost all patients of any age. Later, many modifications and different methods came with some advantages over the other. CSE block can be used for a variety of surgeries [7] and also for relief of labor [8] and postoperative pain [9].

Objectives

1. To evaluate the efficacy of combined spinal epidural block and epidural block in patients undergoing elective infraumbilical orthopedic and gynecological surgeries.
2. To compare sensory blockade, motor blockade and total amount of bupivacaine required in patients undergoing elective infraumbilical orthopedic and gynecological surgeries.

Materials and Methods

This prospective study was completed in two years after the approval from the Institutional Ethics Committee. Informed consent was obtained from each patient. Sixty patients under ASA (American Society of Anesthesiologists) I and II status were randomized in two groups of 30 each, after thorough clinical and routine laboratory examinations.

Inclusion Criteria

Patients with age group 20 to 60 years, under ASA I and II and posted for various elective surgical procedures of lower abdomen where regional anesthesia was indicated included for study.

Exclusion Criteria

Patient's refusal, anticoagulant therapy, bleeding diathesis, infection on the back, spinal deformities, history of peripheral neuropathy, neurological disorders, allergic to local anesthetics, blockade is more than T_8 level were excluded from the study.

Sample Size

Sample size of 30 was calculated by taking failure of spinal component as 16% with alpha error of 0.05 and power of 90.

Randomization Method

Initially randomization sequence was decided upon as combined spinal epidural block for even numbers and epidural block for base numbers. The randomization sequence was generated by random number table.

Methods

Intravenous 16G cannula was introduced and the patients were preloaded with 15mL/kg of Ringer lactate solution. In the operation theatre, standard monitors attached and all patients were positioned in sitting or lateral position with the help of an assistant. Under all aseptic conditions the back was prepared with 5% povidine iodine solution, spirit and area was draped. The L_{3-4} interspace was identified after local infiltration with 2% xylocaine.

Group A: Combined Spinal and Epidural (CSE) Anesthesia

After infiltration, epidural space was located in midline by using needle through needle single interspace technique, with 18G Weiss's needle via L_{3-4} interspace. A long 27G Whitacre's spinal needle was introduced through epidural needle until the spinal tap felt to penetrate the duramater and cerebrospinal fluid back flow; 3mL of 0.5% hyperbaric bupivacaine was injected intrathecally to achieve T_8 level blockade in fractionated doses followed by removal of the spinal needle. Thereafter, 20G epidural catheter was introduced into the epidural space via the Weiss's needle followed by removal of epidural needle. Once the motor blockade was established by paralysis and the maximum level of sensory analgesia confirmed and the patient was put in required position and surgery was started.

Group B: Epidural anesthesia

After infiltration, spinal needle was introduced through the midline route and after successful dural puncture stylette was re-inserted into the spinal needle. The epidural space was then located at the same interspace using 18G Tuohy's needle by the paramedian route and epidural catheter was inserted up 4 to 5 cm in epidural space. In all the patients 0.5% hyperbaric bupivacaine was given through the epidural catheter to achieve T_8 level blockade in fractionated doses. This would amount to about 12 to 16 mL and was deposited through the epidural catheter. Once T_8 level of analgesia and adequate blockade was established, the patient was suitably placed and surgery was commenced.

Outcome parameters

1. Assessment of sensory block (Start of anesthesia and bupivacaine dose required): It was assessed by pinprick and time noted for the block to reach different dermatomal level. Level of analgesia to pin prick were monitored every 5min for the first 20min followed by every 10min thereafter. The time from start of anesthesia (i.e. after injection of local anesthesia into space) to time for a T_8 block was recorded.
2. Assessment of motor block (Muscle relaxation grading) assessed by modified Bromage scale:

   Grade 0: Able to raise the straight leg

   Grade 1: Able to flex knee only

   Grade 2: Able to flex ankle only

   Grade 3: Unable to move lower limbs at all
3. *Rating of analgesia:*

   Excellent: When no sedatives/analgesic was required

   Good: When only sedatives was required

   Fair: when both sedative and analgesic were required

   Poor: when GA with oral endotracheal tube was required

Statistical Analysis

All clinical data were presented as mean± standard deviations. Statistical analysis was carried out using the unpaired two tailed students t test and chi square test wherever appropriate. A p value of <0.05% was considered statistically significant.

Results

Demographic data

Sixty patients (30 in each group) with ASA (American Society of Anesthesiologists) physical status I and II were studied. Patients were in between 20 to 60 years.

Group A (CSE) and group B (Epidural) both were comparable in terms of age, weight, height and nature of surgery as shown in Table 1. The p value for all parameters was statistically not significant (p>0.05).

Start of anesthesia (onset) and Bupivacaine dose required

Sensory blockade was assessed by pinprick method. Table 2 showed mean onset time in group A (CSE) was statistically significant (p<0.05) reduced as compared to group B (Epidural). The total amount of bupivacaine required was also less in group A, when compared with group B. The p value was highly significant (p<0.001).

Muscle relaxation grading

Extent of motor blockade using modified Bromage scale was assessed. In group A, all patients had grade 3 blockades as compared to 3 in group B, as shown in Table 3. The p value was highly significant (p<0.001).

Table 1: Demographic data of patients

Parameters	Group A (CSE)	Group B (Epidural)	Statistical analysis
No of patients	30	30	p = 1.000 [NS]
Age (years)	47.37 ± 9.75	48.66 ± 8.75	p = 0.589 [NS]
Weight (kg)	55.00 ± 5.43	55.53 ± 5.09	p = 0.697 [NS]
Height (cm)	158.76 ± 4.62	156.93 ± 4.22	p = 0.115 [NS]
Surgery (Orthopedic/Gynecology)	16/14	14/16	p = 0.606 [NS]

CSE: combined spinal and epidural anesthesia. NS: Non significant. The values quoted as the Mean±Standard deviation. Unpaired t-test was used to compare the results between two groups. The *p* value of <0.05 was considered statistically significant difference.

Table 2: Onset and bupivacaine dose required across both study groups

Parameters	Group A (CSE)	Group B (Epidural)	Statistical analysis
Onset of analgesia (min)	4 ± 1	18 ± 5	p = 0.010 [S]
Total dose of bupivacaine (0.5%) required (mL)	55.00 ± 5.43	55.53 ± 5.09	p < 0.001 [S]

CSE: combined spinal and epidural anesthesia, S: Significant. The values quoted as the Mean±Standard deviation. Unpaired t-test was used to compare the results between two groups. The *p* value of <0.05 was considered statistically significant difference.

Rating of analgesia

The quality of surgical analgesia was excellent in group A as compared to group B, as shown in Table 4. The p value was highly significant (p<0.001).

Discussion

Over the last three decades there has been considerable revival of interest in the use of regional anesthesia techniques for surgery and pain management [10]. Several modifications of neuraxial blockade techniques have been described to improve efficacy of various neuraxial blockade. New anesthesia techniques have been introduced in recent years [11]. The CSE technique has attained widespread popularity for patients undergoing major lower abdominal surgery and who require prolonged and effective post operative analgesia [5,6]. The CSE involves intentional subarachnoid blockade and epidural catheter placement during the same procedure.

In the present study, the surgical analgesia and muscle relaxation following CSE block were superior to those seen after epidural block. The onset time for sensory analgesia in CSE group was significantly shorter than in epidural group (4±1min vs 18±5min). All these may be explained due to spinal component in CSE anesthesia. Various studies comparing CSE verses epidural anesthesia observed similar results in terms of analgesia onset [12,13,14].

The dose of bupivacaine required to produce T_{4-5} block was about three times larger with epidural block as compared to CSE block. Similar findings were observed by Rawal et al. [15]] with CSE group. In our study, four patients of the CSE group did not require drug through the epidural catheter since the block extended to a level of T_{4-5} after the spinal dose. The total dose of bupivacaine required is significantly less in CSE group than epidural group which is due to spinal component.

The degree of motor blockade is excellent, 100% of CSE group and only 10% of epidural anesthesia group patients. The lack of complete muscle

Table 3: Muscle relaxation grading across both study groups

Grade (Modified Bromage scale)	Group A (CSE)	Group B (Epidural)	Statistical analysis
0	0 (0%)	0 (0%)	p = 1.000 [NS]
1	0 (0%)	2 (7%)	p < 0.001 [S]
2	0 (0%)	25 (83%)	p < 0.001 [S]
3	30 (100%)	3 (10%)	p < 0.001 [S]

CSE: combined spinal and epidural anesthesia, S: Significant, NS: Non significant. The percentage values were quoted in brackets. Chi square-test was used to compare the results between two groups. The *p* value of <0.05 was considered statistically significant difference.

Table 4: Rating of analgesia across both study groups

Quality Rating	Group A (CSE)	Group B (Epidural)	Statistical analysis
Excellent	12 (40%)	3 (10%)	p < 0.001 [S]
Good	16 (53%)	13 (43%)	p < 0.001 [S]
Fair	2 (7%)	12 (40%)	p < 0.001 [S]
Poor	0 (0%)	2 (7%)	p < 0.001 [S]

CSE: combined spinal and epidural anesthesia, S: Significant. The values quoted as the Mean±Standard deviation. Chi square-test was used to compare the results between two groups. The *p* value of <0.05 was considered statistically significant difference.

relaxation with epidural bupivacaine is consistent with the findings of Cousins and Nydal et al. [16].

The need for supplementary sedatives and analgesics were significantly higher in epidural group patients. The higher incidence of supplementation and failure rate in patients receiving epidural block has been reported by many authors.

Conclusion

Present study showed advantages offered by CSE are rapid onset of action, superior quality of analgesia, better muscle relaxation and less dose of local anesthetic required to reach the same level over epidural anesthesia. Thus, CSE block is more effective and superior alternative to epidural block.

Conflicting Interest: None Decleared

Key Message

Combined spinal epidural block emphasizes the effective technique by offering rapid onset of action, superior quality of analgesia, better muscle relaxation and less dose of local anesthetic required

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