

COMBINED SPINAL EPIDURAL ANAESTHESIA VERSUS EPIDURAL ANAESTHESIA: A COMPARATIVE STUDY

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ABSTRACT

Background: Regional anaesthesia are widely utilized in surgical gynaecology practice. The Combined Spinal Epidural Anaesthesia (CSEA) technique and Continuous epidural anaesthesia both have been extensively used in elective gynaecological surgeries. This prospective cross-sectional comparative study was designed to compare the quality of anaesthesia between CSEA and Epidural anaesthesia.

Methods: Sixty-four patients between age group 15- 65 years of ASA grade I, II were randomly divided into 2 groups. Group A patients received CSEA using "double needle double interspace technique" and were given 2.5 ml of 0.5% hyperbaric bupivacaine for spinal block. Group B patients received epidural block with catheter using 10 ml of 0.5% plain bupivacaine. In all patients, subsequent dosage of 2 ml per unblocked segment 0.5% plain bupivacaine was administered through the epidural catheter to achieve a block up to T4-5. Mean was calculated using t-test, median with Mann Whitney U test and Chi-square test where appropriate and the Statistical Analysis was done using SPSS program, version 11.0.

Results: The surgical anaesthesia and motor blockade occurred significantly early in CSEA group. Duration of analgesia was significantly shorter in CSEA (84.1±40.6 min) as compared to epidural group (138.6±32.9 min). The total amount of bupivacaine required to attain the same target level was two times in epidural group ($p<0.05$). Haemodynamic changes were comparable in both the groups. No neurological side effects were observed.

Conclusions: Sequential CSEA is superior alternative to epidural block, which combines the advantages of spinal and epidural while minimizing their drawbacks in elective gynaecological surgeries.

INTRODUCTION

Neuraxial Blockade Techniques like Spinal Anaesthesia, Epidural Anaesthesia and Combined Spinal and Epidural Anaesthesia (CSEA) has been commonly used for gynecological surgeries. Epidural block with the catheter technique gives a better control of the level of anaesthesia by gradual segmental neuraxial blockade and can be used for providing post-operative pain relief by opioids, local anaesthetic or both agents. Epidural Anaesthesia have some disadvantages like slow onset of action, sparing of dermatomal segments, incomplete motor block, poor sacral spread, more doses of local anaesthetics and hazard of cardiovascular and neurotoxicity.¹ The Combined Spinal Epidural Anaesthesia (CSEA) technique aims to provide the benefits of spinal block with extension of the duration of anaesthesia with epidural catheter.^{2,3} The technique of sequential CSEA involves injection of low dose of subarachnoid local anaesthetic and then extension of block by injecting drug through the epidural catheter. It involves the use of a minimal dose of local anaesthetic agent for a shorter duration but allows flexibility of epidural reinforcement if necessary.^{4,5}

The aim of this study was to compare the anaesthetic effect

of CSEA and epidural anesthesia alone. These techniques were compared regarding the onset, duration of action, total dose of Bupivacaine required, quality of surgical anesthesia and hemodynamic changes like Heart Rate, Blood Pressure and oxygen saturation.

METHODS

After ethics committee approval from Institute of Medicine (IOM), a prospective cross-sectional comparative study was conducted in the Department of Anaesthesiology, Tribhuvan University Teaching Hospital, Institute of Medicine from December 2008 to February 2009. All 20 – 80 yrs old patients with ASA physical status I and II undergoing elective gynecological surgery under regional anesthesia were included in our study. Patients with failure to achieve T4 block with CSEA or Epidural Anaesthesia, patients having neurological or coagulation disorder, hypotension, emotional instability, local infection at site of needle insertion or systemic infection, known hypersensitivity to local anesthetics were excluded from our study. Consenting patients was randomized into group A and group B.

Group A as Combined Spinal Epidural group received 18G epi-

dural catheter inserted at L1/L2 interspace through midline approach with a 16G Tuohy needle fixed 4 to 5 cm into the epidural space. Epidural space was identified with loss of resistance to air technique. Test dose of 3ml of 2% Lignocaine with 1: 200,000 Adrenaline was given. Blood Pressure, pulse and any untoward effects were noted. Epidural catheter was secured with silk 2-0 suture to skin. Then spinal anaesthesia was given at L3/L4 interspace level midline approach using a 25G Quincke needle.

After free flow of CSF 2.5 ml of 0.5% hyperbaric bupivacaine was given and patient was positioned supine immediately. Group B as Epidural group received epidural anesthesia only, the technique as described for Group A. Then Inj. 0.5% plain bupivacaine 10 ml was administered via epidural catheter.

Both groups contained 32 patients each. In both groups, baseline Blood Pressure (BP) and Pulse were taken just before the procedure. BP, Pulse were monitored every 2 minutes till 15 minutes and there after every 5 minutes till completion of surgery. Loss of sensation was tested by pin prick method a 5 minutes interval till 15 minutes. Level of block was extended to T4-T5 by injecting fractionated dose 2 ml per unblocked segment of 0.5% plain bupivacaine into epidural catheter. Surgery was started when the sensory block came to T4 level. Quality of surgical anaesthesia was graded as Excellent, Good, Fair and Poor.

Table 1: Quality of Surgical Anesthesia⁹

Excellent	No supplementary drug require
Good	Only anxiolysis or sedation required
Fair	Analgesia required
Poor	General anaesthesia required

The Statistical Analysis was done using SPSS program, version 11.0. Mean was calculated using t-test, median with Mann Whitney U test and Chi-square test where appropriate. Data was reported as mean value +/- Standard Deviation (SD). A p-value of <0.05 was considered statistically significant.

RESULTS

A comparative study was conducted on total of 64 patients of ASA I and II in the age group of 20-80 years posted for gynecological surgery within a period of 4 months (n=64).

With regard to age, weight and changes in hemodynamic parameters observed between the two groups, it was statistically not significant. However, the time to achieve T4 dermatome sensory block was significantly shorter in CSEA group when compared to epidural group. Two segment regression time from T4 dermatome level was lesser in CSEA group than in Epidural group which was statistically significant (p < 0.05) (Table 2).

Table 2: Mean Age, weight, time to reach T4, regression time and total dose of Bupivacaine data between CSEA and epidural group

Parameters	Group A (Mean ±SD)	Group B (Mean ±SD)	Level of significance
Age(yrs)	43.4 ± 9.6	47.5 ± 11.4	NS(p>0.05)
Mean Weight(kg)	54.6 ± 10.4	58.6 ± 7.6	NS(p>0.05)
Time to achieve T4 sensory block(min)	22.2 ± 2.7	30.8 ± 6.0	S (p < 0.05)
Two segment regression time from T4 dermatome level(min)	84.1 ± 40.6	138.6 ± 32.9	S (p < 0.05)
Total dose of Bupivacaine needed to reach T4(mg)	63.9 ± 26.7	100.3 ± 21.0	S (p < 0.05)

NS: Not Significant; S: Significant

The Mean Heart Rate (HR), Mean Systolic Blood Pressure (SBP), Mean Diastolic Blood Pressure (DBP) measured at 0,15,30 and 60 min were not statistically significant in both the CSEA and Epidural Anesthesia alone group.

Table 3: Mean Heart Rate (HR), Mean Systolic Blood Pressure (SBP), Mean Diastolic Blood Pressure (DBP) measured at 0,15,30 and 60 min between CSEA and epidural group

Group	HR at 0	HR at 15	HR at 30	HR at 60	p-value
A	80	80.5	79.4	73.9	> 0.05
B	74.7	74.9	76.1	72.5	> 0.05
Group	SBP at 0	SBP at 15	SBP at 30	SBP at 60	p-value
A	122.78	115.6	114.9	105.4	> 0.05
B	123.96	112	109.7	108	> 0.05
Group	DBP at 0	DBP at 15	DBP at 30	DBP at 60	p-value
A	80.31	72.8	72	67.9	> 0.05
B	72.4	70.5	68	66	> 0.05

Quality of surgical anaesthesia was excellent in 26 patients in CSEA group and 12 patients in Epidural group, good in 4 patients in CSEA group and 8 patients in Epidural group and fair in 2 patients in CSEA group and 12 patients in Epidural group and all were statistically significant (p < 0.05).

Table 4: Quality of Anesthesia data between CSEA and epidural group

Quality of Anesthesia	Group A	Group B	p-value
Excellent	26	12	<0.05
Good	4	8	<0.05
Fair	2	12	<0.05
Poor	0	0	

No patient in study had poor quality of surgical anaesthesia. Mephentermine had to be used in 8 patients in CSEA group and in 6 in Epidural group which was not statistically significant ($p > 0.05$). Shivering was present in 11 patients in CSE group and 8 patients in Epidural group which was not statistically significant ($p > 0.05$).

DISCUSSION

In the present study, the surgical anaesthesia and muscle relaxation following CSEA were superior to those seen after epidural anesthesia alone. The onset time for sensory analgesia in CSEA group was significantly shorter than in epidural group. Various studies comparing CSEA with epidural anaesthesia observed similar results in terms of analgesia and muscle relaxation.^{3,5,7,10} The early onset and superiority of sensory and motor blockade of CSE may be explained due to spinal component in CSE anaesthesia. The need for supplementary analgesics and sedatives were significantly higher in epidural group. The higher incidence of supplementation and failure rate in patients receiving epidural block has been reported by many workers.^{6,8,11}

Duration of analgesia as measured by two-segment regression was found to be longer in epidural group (138.6 ± 32.9) as compared to CSE group (84 ± 40.6 min) ($p < 0.05$). Our results are comparable to that of Gupta P et al, they found duration of analgesia in CSE (81.75 ± 11.09 min) as compared to epidural group (120.75 ± 7.56 min).⁹

The dose of bupivacaine required to produce T4-5 block was about two times larger with epidural block (100.3 ± 21.0 mg) as compared to CSEA block (63.9 ± 26.7 mg). Rawal et al also observed similar findings with CSE group.⁶

The onset of T4 sensory block in CSEA group was faster than the Epidural group which are comparable to finding of a study done by Gupta et al.⁹ Haemodynamically, the incidence of hypotension and bradycardia was almost similar in both the groups. In CSEA, although spinal block was given initially, significant haemodynamic changes were not observed because of less extensive spinal block (T8-9) due to sequential CSE technique combined with slower onset of epidural block. This allows more time for compensatory mechanism to be effective.^{6,9}

Quality of surgical anesthesia was excellent in 26 patients (81.25%) in CSE group and 12 patients (37.5%) in Epidural group, good in 4 patients (12.5%) in CSE group and 8 patients (25%) in Epidural group and fair in 2 patients (6.25%) in CSE group and 12 patients (37.5%) in Epidural group. In the study done by Gupta et al, quality of surgical anesthesia was excellent in 85% in CSE group and 40% in Epidural group, good in 10% in CSE group and 45% in Epidural group and fair in 5% in CSE group and 15% in Epidural group, which are similar.⁹

The mechanism of action of epidural top ups in CSE block is not clear. But based on our study, various hypothesis laid

down are:

1. Continued spread of drug originally injected into the subarachnoid space.
2. Leakage of epidural drug via the hole in dura into subarachnoid space.
3. Cephalad displacement of CSF and subarachnoid drug due to dural compression by epidural fluid (volume effect), epidural pressure changes (becoming atmospheric) altering the spread of spinal drug.
4. Epidural blockade unmasking the effect of sub clinical spinal blockade above the clinical level of blockade.
5. Compression of subarachnoid space by the presence of epidural catheter and by the volume of local anaesthetic, resulting in a "squeezing" of CSF and more extensive spread of local anaesthetic.

The CSEA technique where we perform subarachnoid blockade and epidural catheter placement during the same procedure, ideally combines the best of spinal and epidural blockade, avoiding their disadvantages. The CSEA technique saves time in establishing surgical anesthesia when compared to epidural anesthesia alone. The intrathecal injection with minimal doses of local anaesthetics results in fast onset block which can be prolonged with low dose epidural maintenance administration. CSEA is hence a very effective way to reduce the total drug dosage required for anesthesia. Combined spinal epidural anesthesia (CSEA) is characterized by a shorter latent period, a lower dose of local anaesthetics and a higher reliability which uses combination of techniques to accomplish the ideal kind of anesthesia for patients of all age groups.¹²

The study was conducted in only one center with small sample size, hence the result cannot be generalized. The study was done in gynecological surgeries only hence the inference cannot be extrapolated to other surgeries.

CONCLUSION

CSEA is found to be better and superior alternative to epidural block. Advantages offered by CSEA are faster onset of action, superior quality of analgesia, better muscle relaxation and less dose of local anaesthetic required to reach the same level (Sequential CSEA). The incidence and severity of hypotension and bradycardia is similar with both the blocks. The duration of analgesia by two segment regression method needs to be further analysed. Although CSEA is expensive compared to Epidural Anaesthesia, incidences of side effects were similar in both the groups. Thus, CSEA offers the best of both spinal and epidural technique and has a promising future in regional anaesthesia.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

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