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Combined Spinal Epidural Anaesthesia Using Epidural Volume Extension (Eve) Leads To Faster Motor Recovery after Elective Cesarean Section

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Abstract *–Combined spinal epidural is used in cesarean sections for faster onset and reduced incidence and severity of hypotension. In Epidural volume extension(EVE) technique, small dose of intrathecal local anaesthetic agent and opioid is used to produce a limited block that can be extended by epidural administration of saline. We conducted this study to see feasibility of EVE technique to achieve faster recovery which is desirable for parturient in view of the need to nurse the baby immediately in the post operative period.*

Material and method*- A prospective double blind randomized controlled trial was conducted in a tertiary care hospital over a period of two years. ASA status I or II, singlet pregnancy for LSCS were chosen to receive either single shot spinal anaesthesia or combined spinal epidural using EVE method.*

In spinal group(I), 1.8ml of 0.5% bupivacaine (heavy) and 10 mcg of fentanyl was used for spinal anaesthesia and in group II ,epidural catheter inserted followed by spinal anaesthesia with 1 ml 0.05% bupivacaine heavy 6 ml of normal saline was injected through the epidural catheter. The differences in spread of analgesia, postoperative motor power and regression of analgesia to T10 level between two groups were analyzed by two tailed unpaired t-test, Mann –Whitney U test.

Results*- It was observed that onset of motor blockade was faster in group I ($p<0.05$). Motor blockade in majority of the patients in the CSE was motor power grade 2 or 1 as compared to grade 3 in spinal group. Post operative motor power regain faster in CSE group as compared to spinal group ($p<0.05$). Regression of analgesia to T-10 level was shorter in CSE group as compared to spinal group ($p< 0.05$). Side effects as nausea vomiting or shivering were equally in both groups.*

Conclusion: *CSE block is better than epidural or spinal in terms of level of motor blockade, time taken for motor recovery and with comparable incidence of side effects with spinal anaesthesia in cesarean section.*

Keywords: *Cesarean section, spinal, CSE, EVE technique.*

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I. Introduction

Epidural and spinal anaesthesia are major regional techniques which have potential advantage over general anaesthesia as they are relatively safe in patients with full stomach and are economical. The use of epidural or spinal anesthesia during surgery has been linked to a reduced risk of perioperative complications such as deep-venous thrombosis, less deterioration of cerebral and pulmonary functions in patients who are at a higher risk for complications, decreased blood loss, early ambulation, and a higher patient satisfaction[1]. Combined spinal epidural anaesthesia(CSEA) gained popularity as a preferred technique for cesarean sections and orthopedic surgeries mainly hip surgeries due to its rapid onset through the spinal component and extension of anesthesia and postoperative pain relief through epidural component while avoiding the disadvantages of both[2]. Spinal anaesthesia is relatively safe and simple method but it has well recognized drawbacks such as precipitous hypotension, postdural puncture headache etc. With epidural anaesthesia there is reduces incidence and severity of hypotension and no incidence of postdural puncture headache. However slower onset, patchy anaesthesia and higher dose of local anaesthetic drug and as well as risk of cardiovascular and neurotoxicity following accidental injection into intravascular or subarachnoid compartment may occur. Several modifications were made in combined spinal and epidural technique and one of them is EPIDURAL VOLUME EXTENSION (EVE) TECNIQUE. In this technique spinal anaesthesia is induced with a small dose of intrathecal local

anaesthetic agent and opioid to produce a limited block that can be extended by epidural administered saline[3].This technique enables faster motor recovery of the lower limbs and also enables to supplements analgesia intraoperatively and postoperatively. The faster recovery is considered desirable in parturient in view of the need to nurse the baby immediately in the postoperative period.

II. Material and method

After approval of the hospital ethics committee, 40 patients belonging to ASA status I or II, singleton pregnancy for LSCS were chosen to receive either single shot spinal anaesthesia or combined spinal epidural using EVE technique.

Exclusion Criteria-

1. Contraindication to regional anaesthesia like coagulation disorder, skin infection at the regional and non consented patients.
2. Hypertensive disorder.
3. Peripartum hemorrhagic condition.

After routine pre-anaesthetic check up and routine investigations for fitness patients were randomly divided in two groups 20 in each group, inj. metoclopramide 10 mg and inj. ranitidine 50 mg i.v. given one hour before the surgery.

After placement of all standard monitors, each patient was preloaded with 1000 ml of ringer lactate over period of 15-20 minutes. In group I patients received spinal anaesthesia with 1.8 ml of 0.5% bupivacaine heavy and 10 mcg of fentanyl was given over 10 seconds and in group II, 20 G epidural catheter placed 4cm. in epidural space with. Spinal was given with 1 ml 0.5% bupivacaine heavy and 10 mcg fentanyl was injected over 10 seconds without barbotage. After 5 minutes of spinal anaesthesia6 ml. 0.9% saline was given in epidural space through epidural catheter over 30 seconds. The completion of the saline injection marked the completion of regional anaesthesia for this EVE technique. The difference in age, height, weight, supplemental doses of local anaesthetics and total doses of ephedrine used intraoperatively in two groups were analyzed by two tailed unpaired t test. The differences in spread of analgesia between two groups were analyzed by Mann-Whitney U-test.

III. Results and observation

Written informed consent was obtained from forty patients fulfilling the inclusion criteria scheduled to undergo LSCS. The difference in mean age of patients of Group I and Group II were 26±2.8, 26.4±2.3 respectively and were not found to be significant statistically. Patients of both groups were found to be statistically comparable for weight and height ($p>0.05$).

Table-1 – Demographic data

Groups(n=20)	Group I	Group II
Age	26±2.8	26.4± 2.3
Weight	66.3±2.3	68.1±3.1
Height (cm)	158.4±3	158.1±5.1

Table 2- Onset of Analgesia

Onset of analgesia(in minutes)	Group I	Group II	P value
T5 level	5.05±1.43	5.85±1.68	0.54

Onset of analgesia was recorded from the time of injecting the drug to the time to reaching the T5 level in both the groups is not significant ($p>0.05$).

Table 3 - Onset of motor blockade (Mean±SD)

Time	Group I	Group II	P value
(Minutes)	5.38±2.3	8.3±3.1	0.01

Onset of motor block was measured from the time of drug injection till the maximum grade of motor blockade attained (according to modified Bromage scale).

Table 4-Apgar score

Apgar score	Group I	Group II
1 minute	8.4	8.8
5 minute	8.9	8.8

Apgar score was recorded at 1 and 5 minutes. The mean values between both the groups were comparable.

Table 5- Post operative motor power

Right limb

Time (min.)	Group I	Group II	p value
0	2.6±0.503	0.65±0.74	0.000
15	2.4±0.503	0.45±0.605	0.000
30	2.05±2.2	0.05±2.29	0.000
45	2.00±0.00	0.00±.00	0.000
60	1.55±0.510	0.00±.00	0.000
75	1.00±0.00	0.00±.00	0.000
90	0.65±0.48	0.00±.00	0.000

Left limb

Time (min.)	Group I	Group II	p value
0	2.75± 0.44	0.70± 0.733	0.000
15	2.75± 0.44	0.50± 0.607	0.000
30	2.05± 0.510	0.10± 0.308	0.000
45	2.15± 0.366	0.00±.00	0.000
60	2.0± 0.21	0.00±.00	0.000
75	1.55± 0.51	0.00±.00	0.000
90	0.75± 0.44	0.00±.00	0.000

Patients were assessed in recovery room for motor power at every 15 minutes according to modified Bromage motor score. The return of the motor power was significantly faster in the CSE group as compared to spinal group ($p<0.05$).

Table 5- Regression of analgesia to T10 level

Duration of analgesia	Group I	Group II	p- value
Minutes	181.8±25	159.2±30	0.00

The time to regress the analgesia to T10 in CSE group was shorter 159.2± 30 as compared to spinal group 181.8±25 minutes ($p< 0.05$).

IV. Discussion

In our study we used 1.8 ml of 0.5% heavy bupivacaine and 10mcg fentanyl in spinal group whereas 1ml of 0.5% bupivacaine 10mcg fentanyl in CSE group which was supplemented 6 ml of 0.9% normal saline in epidural space on turning the patients supine. The enhancement of a spinal block by epidural top up of saline including VOLUME EFFECT in which theca is compressed by epidural saline, resulting in the squeezing of cerebrospinal fluid and more extensive spread of subarachnoid anaesthetic[4].

Blugart C. H. et al[5] examined the mechanism of extension of extradural injection of 10 ml of 0.5% bupivacaine or normal saline on the progression of spinal anaesthesia in 28 patients undergoing LSCS. Lew Eileen et al[6] also showed similar results in their study. Both the groups had similar sensory block height with peak sensory level of T2 (C7-T4). In another study, Takiguchi *et al*. demonstrated clinical and myelographic extension of sensory block with 5 and 10 ml saline 0.9% w/v injected epidurally following intrathecal block in CSEA[7] but Loubert *et al*. and Beale *et al*. have reported that EVE failed to increase the level of sensory block[8,9].

Alahuha S et al [10] also observed that the time of onset of analgesia to be less in the spinal group (11.2±1.0min) as compared to epidural group (16.3± 1.5min). Stienstra R et al [11] studied the mechanism of an epidural top up in CSE patients for lower limb surgery and found in three groups that increased sensory level after epidural top up of 10 ml 0.5% bupivacaine (group I), 10 ml saline (group II) and no top up in group III. The quality of analgesia was excellent in 70% patients and good in 30% patients as compared to 60% and 40 % having excellent and good analgesia respectively in the CSE groups which was statically insignificant similar to study conducted by Lew Eileen et al. Rawal et al [12] similarly found that CSE had better quality as compared to epidural. Onset of motor blockade was earlier in spinal group as compared to CSE group which is statically significant.

In this study mean Apgar score at 1 and 5 minute in spinal and CSE group were comparable. In our study, CSE technique using EVE produced a more rapid motor block regression time and the faster motor recovery may have impact on reducing or bypassing post anaesthesia care unit as reported by Choi D H et al[13]. Kaur *et al* demonstrated a benefit in using EVE with 10 ml normal saline, as a part of a CSE technique by providing a more rapid motor recovery of the lower limbs after elective cesarean section[14].This may be

explained on the basis of the use of lower amount of the anaesthetic agent but achieving the desired result on the basis of "VOLUME EFFECT".

Regression of analgesia to T10 level in spinal group and CSE was 181.8±25 minutes and 159.2± 30 minutes which is statically significant. Stienstra R reported the difference in the regression of analgesia to T10 level. Similar study with low-dose intrathecal hyperbaric bupivacaine with EVE is associated with adequate sensory and motor blockade while maintaining hemodynamic stability due to decreased requirement of intrathecal drug[15].

V. Conclusion

On the basis of our study we concluded that CSE with EVE technique produced adequate surgical analgesia with lower level of motor blockade as compared to the spinal group. The time taken for motor recovery was significantly shorter as compared to spinal group. The dose required of bupivacaine heavy in CSE group was 55% of the dose used in spinal block. CSE block has advantages of both epidural and spinal block. CSE block with EVE may be considered a novel alternative to spinal anaesthesia for cesarean delivery.

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