

A Comparative Study of Combined Spinal–Epidural versus Spinal Anaesthesia in Elective Lower Segment Caesarean Section

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Abstract:

➤ Background:

Spinal anaesthesia is widely used for elective lower segment caesarean section (LSCS); however, it is associated with hypotension and limited duration of analgesia. Combined spinal–epidural (CSE) anaesthesia may overcome these limitations.

➤ Aim:

To compare efficacy, hemodynamic stability, and duration of postoperative analgesia between spinal anaesthesia and CSE in elective LSCS.

➤ Methods:

A prospective randomized study was conducted in 60 ASA I–II patients undergoing elective LSCS. Patients were allocated into Group S (spinal) and Group CSE. Hemodynamic parameters, block characteristics, and analgesia duration were analyzed using appropriate statistical tests.

➤ Results:

Hypotension was significantly higher in Group S (40%) compared to Group CSE (20%) ($p=0.03$). Duration of analgesia was significantly longer in the CSE group (300 ± 40 min vs 120 ± 20 min, $p<0.001$).

➤ Conclusion:

CSE provides better hemodynamic stability and prolonged postoperative analgesia compared to spinal anaesthesia.

Keywords: Spinal Anaesthesia, Combined Spinal–Epidural, LSCS, Hemodynamic Stability, Postoperative Analgesia.

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I. INTRODUCTION

Spinal anaesthesia is the preferred technique for elective LSCS due to its rapid onset, dense sensory blockade, and minimal fetal drug exposure [1,2]. However, it is associated with significant hypotension due to sympathetic blockade and has a limited duration of action [3].

Combined spinal–epidural (CSE) anaesthesia integrates the advantages of both techniques by providing rapid onset along with the flexibility to extend analgesia through an

epidural catheter [4,5]. It also allows better titration of block height and improved postoperative pain control.

This study was conducted to compare spinal anaesthesia and CSE with respect to hemodynamic stability, efficacy, and duration of postoperative analgesia in elective LSCS.

II. MATERIALS & METHODS

Hypotension was defined as systolic blood pressure <90 mmHg or a decrease of more than 20% from baseline.

Episodes of hypotension were treated with intravenous fluids and incremental doses of mephentermine (6 mg) or ephedrine as required.

➤ *Study Design:*

Prospective randomized study

➤ *Study Population:*

60 patients (ASA I–II), aged 18–35 years, scheduled for elective LSCS.

➤ *Randomization:*

Patients were randomly allocated using computer-generated random numbers into two groups using sealed opaque envelopes:

- Group S (Spinal Anaesthesia, n=30)
- Group CSE (Combined Spinal–Epidural, n=30)

➤ *Inclusion Criteria:*

- ASA I & II
- Age 18–35 years
- Elective LSCS

➤ *Exclusion Criteria:*

- Patient refusal
- Coagulopathy
- Infection at puncture site
- Severe systemic disease

➤ *Ethical Consideration:*

Institutional Ethics Committee approval was obtained, and written informed consent was taken from all patients.

➤ *Procedure*

Group S (Spinal Anaesthesia): Subarachnoid block was performed at the L3–L4 interspace using a 25G Quincke needle. After confirmation of free flow of cerebrospinal fluid, 2.2 ml of 0.5% hyperbaric bupivacaine (11 mg) was administered intrathecally.

Group CSE (Combined Spinal–Epidural): Combined spinal–epidural anaesthesia was performed using the needle-through-needle technique at the L3–L4 interspace. An epidural catheter was inserted and secured at 4–5 cm in the epidural space. Following this, 1.8 ml of 0.5% hyperbaric bupivacaine (9 mg) was administered intrathecally.

Epidural top-up doses were given as required using 0.125% bupivacaine with fentanyl 2 µg/ml to maintain

adequate analgesia intraoperatively and postoperatively.

➤ *The Outcomes of the Study were Predefined as Follows:*
Parameters Assessed / Outcome Measures

• *Primary Outcome:*

- ✓ Incidence of hypotension (defined as systolic BP <90 mmHg or >20% fall from baseline)

• *Secondary Outcomes:*

- ✓ Onset of sensory block
- ✓ Maximum block height
- ✓ Hemodynamic parameters (HR, BP)
- ✓ Duration of postoperative analgesia
- ✓ Time to first rescue analgesia
- ✓ Complications (bradycardia, nausea, vomiting, PDPH)

➤ *Sample Size Calculation*

The sample size was calculated based on the expected difference in the incidence of hypotension between the two groups. Previous studies have reported an incidence of hypotension of approximately 40% with spinal anaesthesia and 15–20% with combined spinal–epidural anaesthesia.

Assuming a difference of 20% between groups, with a power of 80% and a significance level (alpha) of 0.05, the minimum required sample size was calculated to be 27 patients per group. To account for possible dropouts, a total of 30 patients were included in each group, resulting in a total sample size of 60 patients.

➤ *Statistical Analysis*

- Data were analyzed using SPSS version 25.
- Normality of data was assessed using the Shapiro–Wilk test.
- Continuous variables were expressed as mean ± SD and compared using the unpaired t-test.
- Categorical variables were analyzed using the Chi-square test or Fisher's exact test.
- A p-value < 0.05 was considered statistically significant.

III. RESULTS

The findings are summarized in Tables 1–4.

➤ *Demographic Data*

Both groups were comparable in age, weight, and ASA status (p>0.05), as shown in Table 1.

Table 1 Demographic Data

Parameter	Group S (Spinal)	Group CSE	p-Value
Age (years)	26.4 ± 3.2	25.8 ± 3.5	>0.05
Weight (kg)	62.5 ± 5.8	63.1 ± 6.2	>0.05
ASA I/II	18 / 12	17 / 13	>0.05

Interpretation: No Significant Difference between Groups (Comparable Baseline)

Table 2 Hemodynamic Parameters

Parameter	Group S (Spinal)	Group CSE	p-Value
Hypotension (%)	40%	20%	0.03*
Bradycardia (%)	10%	7%	>0.05

Interpretation: Statistically Significant

➤ *Hemodynamic Changes*

The incidence of hypotension was significantly higher in the spinal group (40%) compared to the CSE group (20%) ($p=0.03$), as shown in Table 2. Bradycardia was comparable between groups.

➤ *Analgesia Profile*

The duration of analgesia was significantly longer in the CSE group (300 ± 40 min) compared to the spinal group (120 ± 20 min) ($p<0.001$). Time to first rescue analgesia was also prolonged (6 hours vs 2 hours).

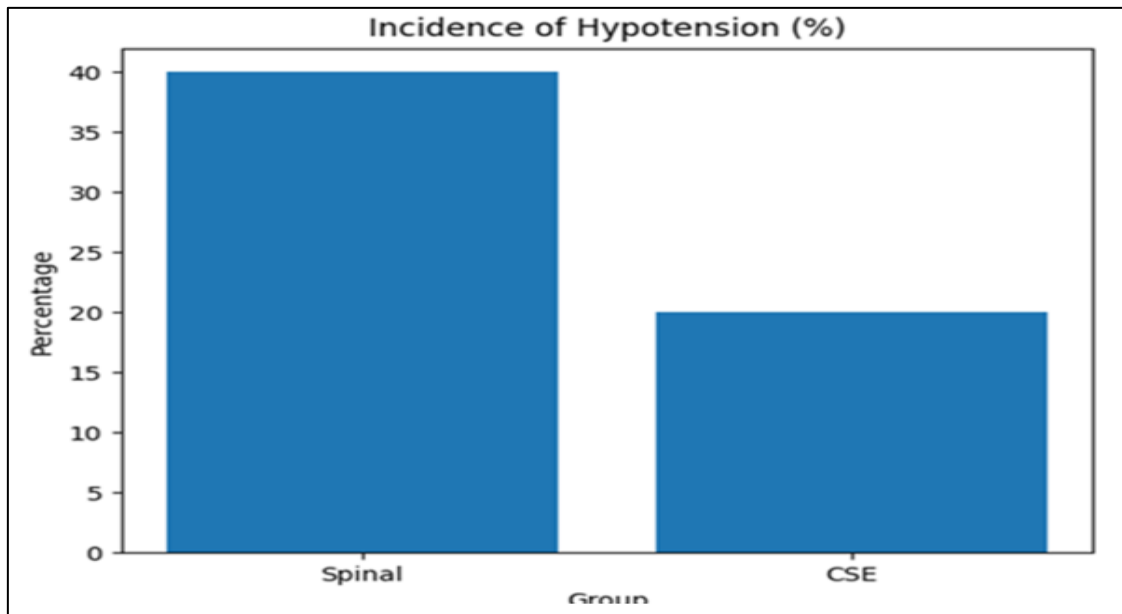


Fig 1 Incidence of Hypotension in Both Groups

Table 3 Analgesia Profile

Parameter	Group S (Spinal)	Group CSE	p-Value
Duration of Analgesia (min)	120 ± 20	300 ± 40	<0.001*
Time to Rescue Analgesia (hours)	2	6	<0.001*

Interpretation: Highly Significant

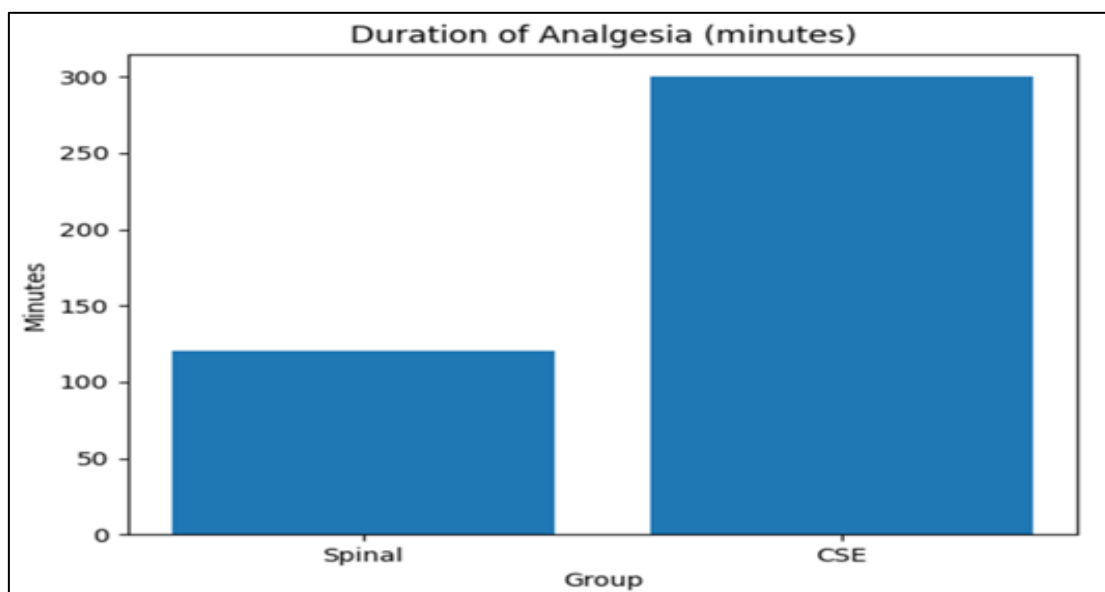


Fig 2 Duration of Postoperative Analgesia

➤ **Complications**

The incidence of nausea, vomiting, and PDPH was

comparable between groups, although hypotension was more frequent in the spinal group.

Table 4 Complications

Complication	Group S (%)	Group CSE (%)	p-value
Hypotension	40	20	0.03*
Bradycardia	10	7	>0.05
Nausea/Vomiting	15	10	>0.05
PDPH	5	3	>0.05

IV. DISCUSSION

The present study demonstrates that CSE provides superior hemodynamic stability and prolonged postoperative analgesia compared to spinal anaesthesia.

The reduced incidence of hypotension in the CSE group can be attributed to a more gradual sympathetic blockade [3]. These findings are consistent with international consensus guidelines on obstetric anaesthesia [3].

The prolonged analgesia observed in the CSE group is due to the presence of an epidural catheter, allowing continued drug administration [5]. Similar findings have been reported in previous systematic reviews [4].

CSE also allows better control over block height and duration, making it particularly advantageous in obstetric anaesthesia.

However, it requires greater technical expertise and resources, which may limit its routine use.

V. CONCLUSION

Combined spinal–epidural anaesthesia offers improved hemodynamic stability and prolonged postoperative analgesia compared to spinal anaesthesia in elective LSCS. It may be considered a preferable technique in appropriately selected patients.

LIMITATIONS

- Small sample size
- Single-center study
- No long-term follow-up
- Neonatal outcomes not assessed
- Blinding not performed

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