

Comparison of Intrathecal Hyperbaric Bupivacaine with Pethidine Versus Intrathecal Hyperbaric Bupivacaine Alone During Caesarian Section To Prevent Spinal Induced Hypotension

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Abstract

INTRODUCTION

Spinal induced hypotension is a common problem during the caesarian section. To decrease the hemodynamic instability, a local anesthetic can be combined with opioids.

AIM : To compare the incidence of spinal hypotension during caesarian section with hyperbaric bupivacaine alone and with pethidine.

METHODS : After written informed consent and ethics committee approval, 50 parturients belonging to ASA status I or II were randomly allocated to two groups. Non complicated pregnancy and without contraindication for regional anesthesia were included, and parturients with systemic diseases or fetal anomalies were excluded from the study. All the parturients were monitored by ASA standard monitors. After preloading with Ringer lactate, patients were kept in the left lateral position, and spinal anesthesia was given with 25G Quincke needle with 0.5% hyperbaric bupivacaine 2ml was administered in group I and 0.5% hyperbaric bupivacaine with 25mg of pethidine in group II. Hemodynamic parameters, Bromage score, sensory block, postoperative analgesia, and other side effects like nausea, vomiting, shivering were monitored every minute for 15min, then 5min interval for 45min followed by 30min interval for another 6hrs. Data were analyzed using SPSS software.

RESULTS: Demographic details and surgery characteristics were comparable between the groups. The incidence of hypotension in the pethidine group was significantly lower than in the bupivacaine group ($P < 0.001$). Ephedrine requirement was also significantly lesser in the pethidine group. Incidence of nausea, vomiting, and pruritis was also less with the pethidine group (low dose). The duration of analgesia was significantly prolonged in the pethidine group. The time to regression of motor block in the pethidine group was significantly lower than the bupivacaine group.

CONCLUSION: In conclusion, when hyperbaric bupivacaine alone and hyperbaric bupivacaine with pethidine is administered intrathecally, better hemodynamic stability and fewer side effects occurred with the pethidine group.

Keywords: Pethidine, bupivacaine, spinal anesthesia, caesarian section

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I. Introduction

BACKGROUND

Spinal induced hypotension is a common problem during the caesarian section. Hypotension is a common side effect of spinal anesthesia (SA), and it occurs in 16–33% of cases¹. To decrease the hemodynamic instability, a local anesthetic can be combined with various drugs that prolong the duration of analgesia. Many opioids have been used in spinal anesthesia, but pethidine is one of the preferred agents due to its duration of action, good postoperative analgesic effects, and cost effective.²

AIM

The study aims to compare the incidence of spinal hypotension during caesarian section with 0.5% hyperbaric bupivacaine (10mg) 2ml and 0.5% hyperbaric bupivacaine (7.5mg) 1.5ml with (25mg) 0.5ml pethidine.

II. Methods

After ethics committee approval and written informed consent, 50 parturients belonging to ASA status I or II were randomly allocated to two groups. All the parturients were monitored by ASA standard monitors. After preloading with Ringer lactate, patients were kept in the left lateral position, and spinal anesthesia was given with 25G Quincke needle with 0.5% hyperbaric bupivacaine (10mg) 2ml was administered in group I and 0.5% hyperbaric bupivacaine (7.5mg) with 25mg of pethidine in group II. After the procedure patient were immediately positioned with a wedge under their right hip to decrease aortocaval compression. Oxygen facemask was kept at a flow of 4 to 5 l/min till delivery. If the Patients mean blood pressure decreases by more than 15 – 20% from baseline 10mg ephedrine was given; the dose was repeated if needed. Caesarian section started when the sensory block reached at least the T4 dermatome. Onset and duration of sensory blockade, Onset, and duration of motor blockade, Hemodynamic parameters, Bromage score, were monitored every minute for 15min, then 5min interval for 45min followed by 30min interval for another 6hrs, postoperative analgesia and perioperative side effects like nausea, vomiting, shivering, urinary retention and Apgar score at 1min and 5min interval was noted. The degree of motor block was assessed by the modified Bromage score (0- no block; 1- impaired hip flexion; 2- impaired hip and knee movement; and 3 -impaired hip, knee, and ankle movement). The time to complete motor recovery was the duration between spinal anesthesia and the achieving a modified Bromage scale score of 0. The pin-prick test was used to assess sensory block.

In the postoperative period, parturients were assessed for postoperative pain according to a 0 – 10 visual analogue scale (VAS; 0- no pain; 10 - worst pain imaginable). The duration of analgesia was defined as the duration between the spinal injection and the first rescue analgesic. The duration of effective analgesia was defined as the duration between the spinal injection and the time at which a patient complained of pain as ≥ 4 on the VAS. Nausea and vomiting during surgery were treated with 10 mg metoclopramide, i.v. Finally, a pediatrician recorded 1- and 5-min Apgar scores of all of the neonates. Data was entered in MS excel sheet and analysed using SPSS software.

INCLUSION CRITERIA

- Parturients belonging to American Society of Anesthesiologists (ASA) physical status I or
- Non-complicated pregnancy
- Patients taller than 152 cm
- Not having contraindication for regional anesthesia

EXCLUSION. CRITERIA

- Parturients with systemic diseases (e.g., preeclampsia, hepatorenal disease, a bleeding diathesis, etc.)
- A known fetal anomaly
- Placenta previa, abruptio placentae
- Coagulation disorder
- Allergic to any of the study drugs

SAMPLE SIZE CALCULATION

To reduce the incidence of hypotension by 50% from the 70% incidence reported in a previous study where 25 mg hyperbaric meperidine was added to 5 mg isobaric bupivacaine, intrathecally. By performing a power calculation, it was determined that 20 patients were needed in a group to show a significant difference among the groups, given power of 80% ($1 - \beta$) and an α of 0.05. To add for the patients who may discontinue from the study a total of 25 patients were taken for the study.

PRIMARY OUTCOME

- To compare the incidence of spinal hypotension during the caesarian section.

SECONDARY OUTCOME

- Onset and duration of sensory blockade
- Onset and duration of motor blockade
- Duration of postoperative analgesia
- The first use of rescue analgesic
- Incidence of perioperative side-effects like nausea, vomiting, pruritis, and shivering.
- Apgar score at 1min and 5 min

STATISTICAL ANALYSIS

Data entered in MS excel and analyzed by using SPSS software. Qualitative data were represented as frequencies or percentages, and quantitative data were represented as means and standard deviation. The chi-

square test was used to know the statistical significance between qualitative variables. The unpaired t-test was used to know the statistical significance between quantitative variables. P-value <0.05 was considered as statistically significant.

III. Results

A total of 50 patients were studied. Demographic details and surgery characteristics were comparable between the groups (Table 1).

The incidence of hypotension in the pethidine group was significantly lower than in the bupivacaine group as shown by decrease in SBP, DBP and MAP in bupivacaine group (Figure 1, 2, 3) ($P < 0.001$).

Mean pulse rate was comparable between both groups (Figure 4).

Ephedrine requirement was also significantly lesser in the pethidine group. Incidence of nausea, vomiting, and pruritis was also less with the pethidine group because of the low dose used (Table 3). The duration of analgesia was significantly shorter in the bupivacaine group. The time to regression of motor block in the pethidine group was significantly lower than the bupivacaine group (Table 2).

| VARIABLE | GROUP 1 mean ± SD | GROUP 2 mean ± SD | p VALUE |
|----------|----------------------|----------------------|---------|
| AGE | 25.64 ± 2.07 | 24.76 ± 2.24 | 0.85 |
| HEIGHT | 157.88 ± 2.96 | 157.84 ± 3.80 | 0.28 |
| WEIGHT | 66.24 ± 5.96 | 66.24 ± 5.80 | 1.0 |

Table 1: Comparison of demographic data between groups

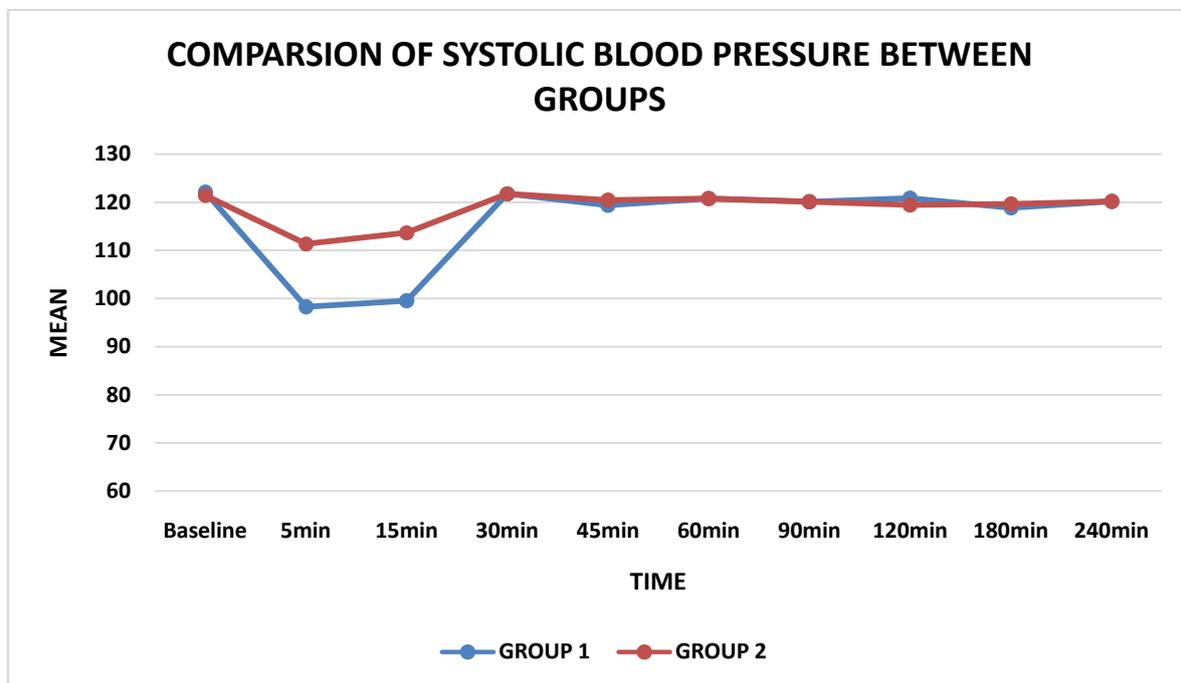


Figure 1: Comparison of mean systolic blood pressure between groups

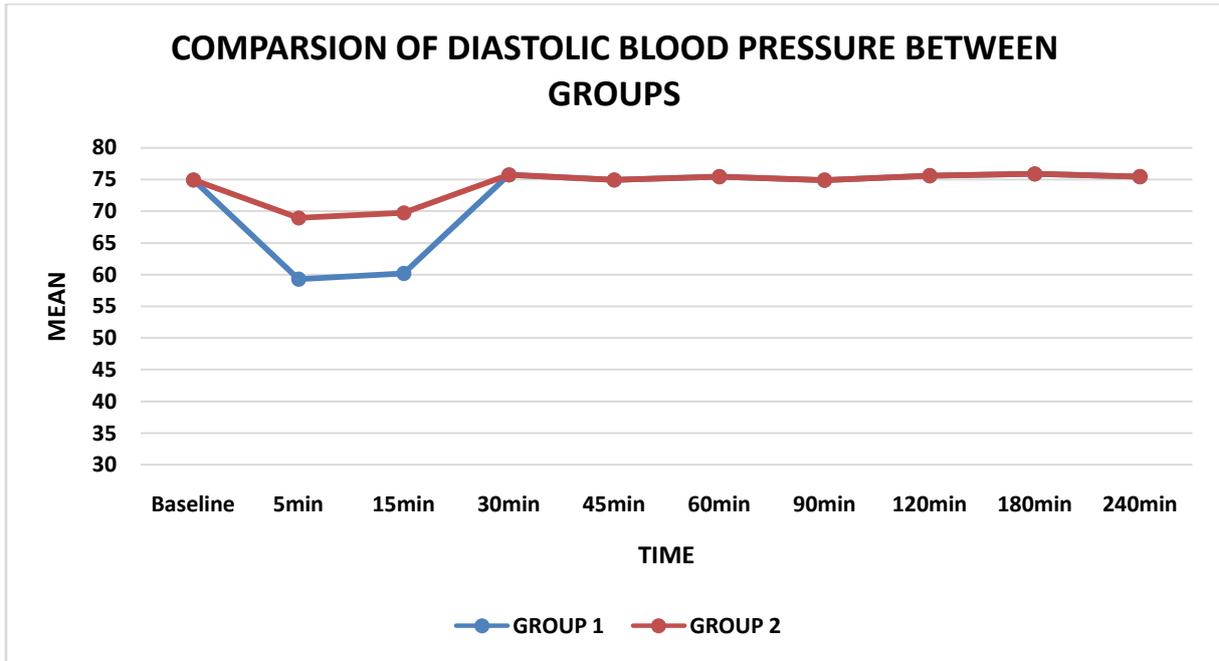


Figure 2: Comparison of mean diastolic blood pressure between groups

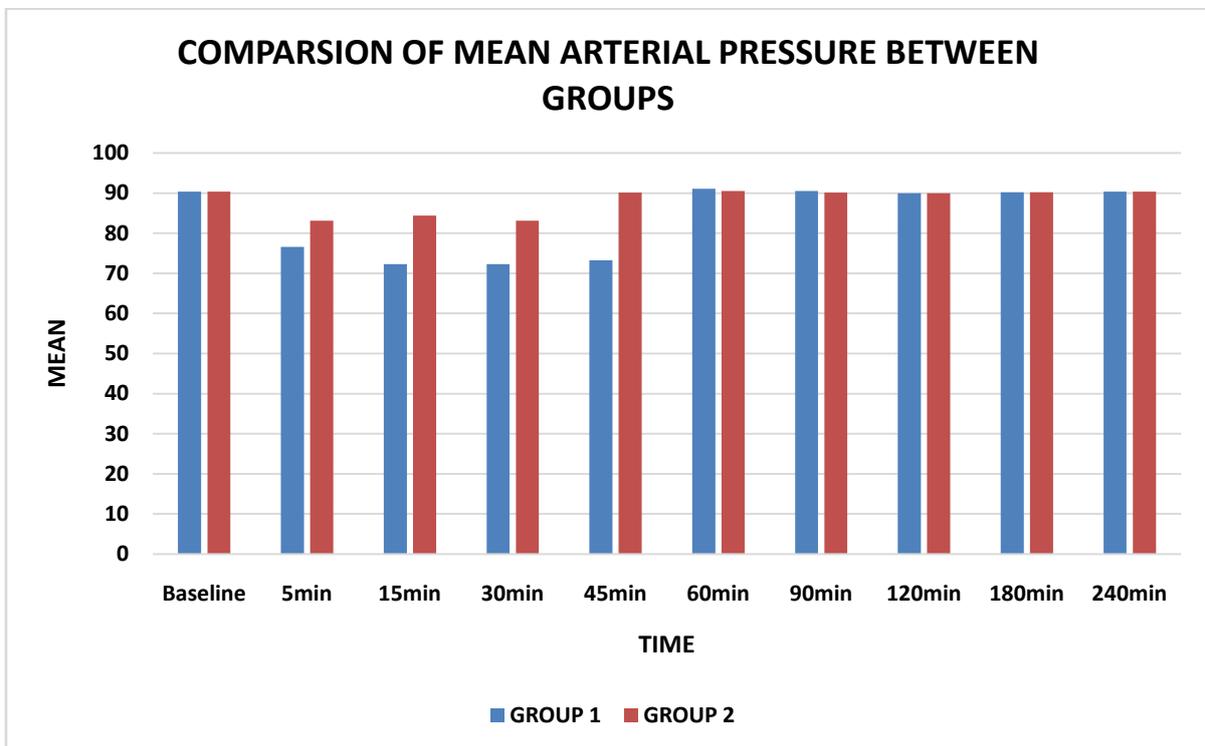


Figure 3: Comparison of mean arterial pressure between groups

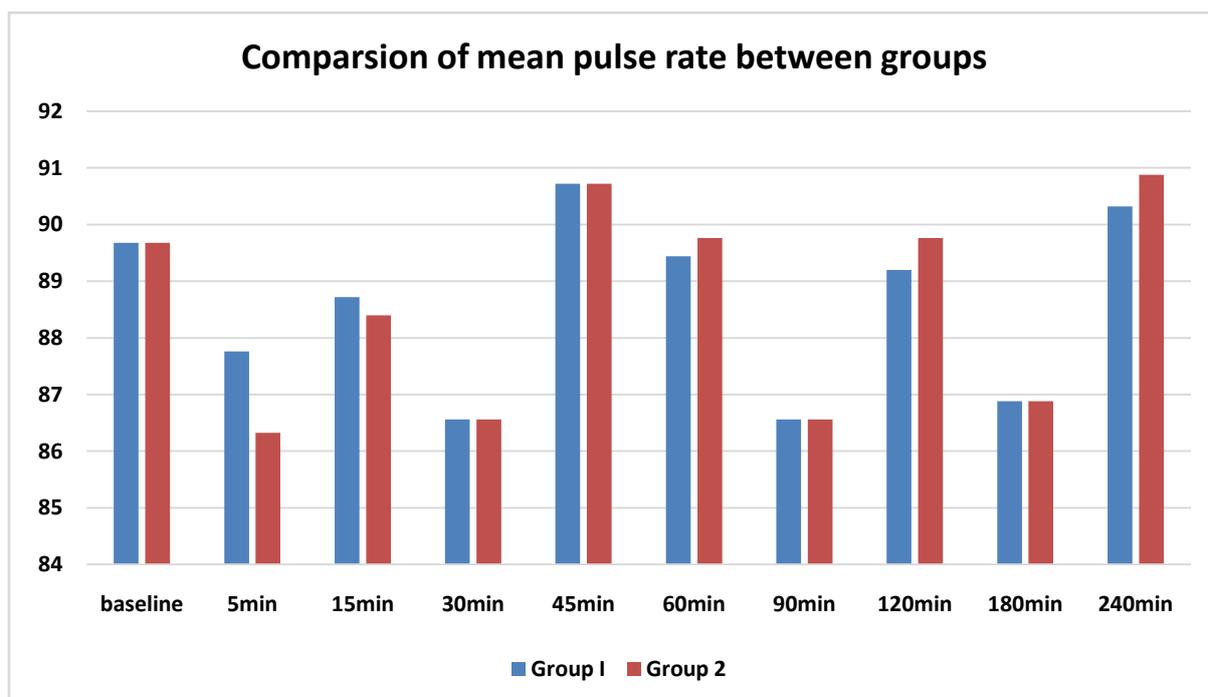


Figure 4 : Comparison of mean pulse rate between the groups

| VARIABLE | GROUP 1 mean ± SD | GROUP 2 mean ± SD | p VALUE |
|---|-------------------|-------------------|---------|
| Time to sensory block (mins) | 6.36 ± 0.42 | 6.96±0.37 | 0.00 |
| Time to motor block bromage 3 (mins) | 6.90±0.25 | 7.94±0.36 | 0.00 |
| Time tomotor regression bromage 0 (hrs) | 2.8±0.25 | 1.24±0.25 | 0.001 * |
| Time to regression to T10 (hrs) | 2.26±0.25 | 2.26±0.25 | 1.0 |
| Duration of analgesia in (hrs) | 3.2±0.25 | 4.72±0.25 | 0.001 * |
| Ephedrine used(mg/kg) | 20.80± 1.18 | 5.06±0.36 | 0.001 * |
| Time to first rescue analgesia(hrs) | 3.20±0.25 | 4.72±0.25 | 0.001 * |

Table 2: Characteristics of the level of sensory and motor block achieved between the groups(*p value significant)

| VARIABLE | GROUP 1 (n=25) | GROUP 2 (n=25) | TOTAL (n=50) | P VALUE |
|------------------|----------------|----------------|--------------|---------|
| HYPOTENSION | 17 | 5 | 22 | 0.001 * |
| NAUSEA/ VOMITING | 17 | 5 | 22 | 0.001 * |
| PRURITIS | 0 | 2 | 2 | 0.14 |
| SHIVERING | 10 | 4 | 14 | 0.05 |

Table 3: Comparison of complications between groups(*p value significant)

IV. Discussion

Pethidine was the first synthetic opioid that was discovered to provide analgesia in humans. Its analgesic properties were discovered by Eisleb and Schaumann in 1939. Pethidine was also shown to have local anesthetic activity comparable with that of cocaine.³

Bupivacaine is an amide local anesthetic used in hyperbaric and isobaric forms. These are administered intrathecally into the spine to provide regional anesthesia for cesarean section.⁴

Hypotension is the most important reason for intraoperative nausea and vomiting. Giving larger doses of intrathecal pethidine has also been associated with nausea or vomiting when pethidine is used as the only agent for spinal anesthesia in patients undergoing cesarean section².

Our study compared the sequential subarachnoid administration of 10 mg hyperbaric bupivacaine alone and 7.5mg hyperbaric bupivacaine with 25 mg of hyperbaric meperidine and was found to be associated with decrease in the incidence of hypotension and other perioperative side-effects. Also the intrathecal administration of plain bupivacaine plus hyperbaric pethidine increased the duration of analgesia compared with hyperbaric bupivacaine alone. The effects on hypotension and the incidence of perioperative side-effects were inversely proportional to the dose of pethidine.

Atalay et al.² conducted a study on Intrathecal Bupivacaine and Meperidine during Caesarean Section to Prevent Spinal Anaesthesia-induced Hypotension and Other Side-effects and concluded that the administration of 5 mg plain bupivacaine and 25 mg of hyperbaric meperidine intrathecally was associated with decrease in the incidence of hypotension and other side-effects and increased the duration of analgesia.

Yu et al.⁵ conducted a study on the addition of meperidine to bupivacaine for spinal anesthesia for Caesarean section and concluded that adding 10 mg of meperidine to intrathecal bupivacaine for Caesarean section resulted in prolonged postoperative analgesia but there is greater intraoperative nausea and vomiting.

In contrast to our study, Conway et al.⁶ conducted a study on A comparison of the hemodynamic effects of intrathecal meperidine, meperidine-bupivacaine mixture, and hyperbaric bupivacaine and concluded that Intrathecal meperidine used alone or mixed with bupivacaine has no intra-operative advantage over heavy bupivacaine 0.5%.

Similar to our study, Cesur et al.⁷ stated that the sequential administration of low doses of plain and hyperbaric bupivacaine during spinal anesthesia reduced the incidence of hypotension, nausea, and vomiting.

Cheun et al.⁸ concluded that meperidine was a good agent to use for spinal anesthesia during cesarean sections because it provided rapid motor recovery and prolonged postoperative analgesia.

Chen et al.⁹ reported that the administration of 10 mg of intrathecal pethidine decreased the incidence of shivering in the study group.

Kaffle et al.¹⁰ conducted a study on Intrathecal meperidine for elective Caesarean section: a comparison with lidocaine and concluded that intrathecal meperidine in a dose of 1 mg. kg-I is superior to 5% heavy lidocaine because of the prolonged postoperative analgesia. The side effects are also readily treatable.

Similar to our study Shami et al.¹¹ conducted a study on the effect of a low dose intrathecal pethidine on the incidence and intensity of shivering during cesarean section under spinal anesthesia and concluded that Low dose intrathecal pethidine is safe and can decrease the incidence and intensity of shivering during cesarean section without any major side effects.

Safavi et al.¹² conducted a study on intrathecal Meperidine versus intrathecal Fentanyl for prevention of shivering in lower limb orthopedic surgeries under spinal anesthesia and concluded that adding 20 µg fentanyl or meperidine 0.2 mg/kg to 0.5% bupivacaine intrathecally significantly decreased the incidence of shivering in lower limb orthopedic surgeries. There was no significant difference between the two drugs.

Jablarneli et al.¹³ conducted a study on The comparison of intraincisional injection tramadol, pethidine, and bupivacaine on postcesarean section pain relief under spinal anesthesia and concluded that the administration of subcutaneous pethidine or tramadol after cesarean section improves analgesia and has a significant morphine-sparing effect compared with bupivacaine and control groups.

V. Conclusion

In conclusion,when hyperbaric bupivacaine alone and hyperbaric bupivacaine with pethidine is administered intrathecally, better hemodynamic stability and fewer side effects occurred with the pethidine group.

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