

Comparison of Hemodynamic Stability in Patients with Intrathecal 0.75% Hyperbaric Bupivacaine Alone and with Pethidine

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ABSTRACT

Objective: To find out better hemodynamic stability in patients with intrathecal 0.75% hyperbaric bupivacaine alone and with pethidine.

Study Design: Quasi experimental

Place and Duration: This study was conducted in department of Anesthesiology. Combined Military Hospital Multan from 2-3-23 to 2-12-23 total duration of the study was 6 months.

Methodology: Pregnant women numbering 80 with gravidity 2 undergoing elective lower segment cesarean section surgery meeting the inclusion criteria were selected. They were divided in two equal groups A and B, n=40 each. Group A received 10mg of++ 0.75% bupivacaine whereas group B were injected with 7.5mg of 0.75% bupivacaine plus 25mg of pethidine. Comparative decrease in blood pressure in terms of 'mean arterial pressure', incidence of hypotension, bradycardia, nausea and post spinal shivering were noted.

Results: Mean Arterial Pressure (MAP) decreased in both groups at 2.5-minute post intrathecal injection but this decline was more prominent in group A 70±2 versus 80±3 for group B respectively (p 0.001). At 10 minute the decline in MAP was lesser but the difference between the two groups remained significant statistically. Similarly, frequency of bradycardia and post-op shivering remained on the lower side in group B. The major difference was seen in the frequency of hypotension in both the groups.

Conclusion: Addition of pethidine to bupivacaine for intrathecal use keeps the hemodynamic profile of the patients relatively more stable and thus avoids the fetomaternal adverse events.

Keywords: Hemodynamic stability, intrathecal bupivacaine, pethidine

INTRODUCTION

Hemodynamic stability remains the major concern following intrathecal regional anesthesia. Heart rate, systolic and diastolic along with mean arterial blood pressure changes are significant following the intrathecal regional anesthesia in general. [1] Incidence of post spinal anesthesia hypotension ranges from 20 to 40 percent which is quite a considerable number and its severity depends on many

factors like body mass index, multigravidity, volume of preloaded fluid, base line blood pressure, heart rate and choice of anesthetic agent used for the block. [2] In obstetric surgeries like lower segment cesarean section hemodynamic instability usually compromises fetomaternal outcome that may include but not limited to, maternal nausea, vomiting and fetal acidosis and it even lead to cardiovascular collapse if goes untreated, arterial dilation and

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decrease in systemic vascular resistance are the main causes.^[3]

In order to avoid these unwanted effects of intrathecal anesthesia and avoid hemodynamic instability different additives like clonidine, tramadol and opioids like pethidine have been tried in conjunction with local anesthetics, these additives usually strengthen the block and increase postoperative analgesic duration leading to avoidance of prelacteal feeding resulting in a better fetomaternal relation.^[4] Bupivacaine as hyperbaric and isobaric have long been used for intrathecal block with acceptance of hemodynamic instability it causes.^[5] Pethidine is a relatively newer agent in this regard and is being used with better quality and longer duration of analgesia in association to lower time requirement for reversal of motor block.^[6]

When hyperbaric bupivacaine combined with pethidine was used for intrathecal block in comparison to bupivacaine alone it caused lesser hemodynamic instability (5/25 and 17/25, p-0.001 respectively) and similarly lesser post spinal shivering but pethidine may cause pruritus.

Methodology

The study was quasi experimental and prospective, carried out at Combined Military Hospital, Multan, for the duration of six months starting from 2-3-23 and ending at 2-12-23. Inclusion Criteria were female gender, pregnant, gravidity 2, aged between 20 to 30 years and American society of Anesthesiologist (ASA) status <II. Whereas exclusion criteria were not consenting for inclusion in the study, coagulopathy, low platelet count <100, any infection at the site of intrathecal injection, gravidity 3, body weight greater than 100kg, ASA>I, advance stage renal or hepatic disease, preeclampsia, eclampsia or placental abnormalities like abruption, Previa, accreta, increta and percreta. Sample size calculation was done using WHO sample size calculator with reference parameters as frequency of hypotension of 5 out of 25 for one group and 17 out of 25 in other group.^[7] By using convenient consecutive Sampling technique, a total of 80 patients were included in the study. Patients were divided in two equal groups of 40 each, groups named as A and B (n=40 each).

Both the groups were monitored intraoperatively using standard monitoring which includes blood pressure measurements non-invasively at 2.5-minute interval automatically or when required, pulse oximetry for oxygen saturation and three lead electrocardiography. Temperature measurements were taken as and when required. Patients in both the groups were preloaded with fluid (Ringer lactate) 10ml/kg and premedicated with metoclopramide 0.15mg/kg, Dexamethasone 0.1mg/kg. Patients in group A received 10 mg of 0.75% hyperbaric Bupivacaine as intrathecal injection whereas group B received 7.5mg of 0.75% hyperbaric Bupivacaine with 25mg of Pethidine. 27G Quincke needle was used in both groups and intrathecal injection was given at the level L4-L5 intervertebral space. Patients, immediately following the injection, were laid down in supine position with operating table leveled at zero position (no foot/head incline and no tilt on either side). Fluid replacement was done as per guidelines. Blood pressure in terms of mean arterial pressure (MAP) was documented at the start as a base line and then at following intervals following the intrathecal injection 2.5 min and 10 min for the purpose of this study. Hypotension would be defined as 20% decrease in MAP from base line. Incidence of bradycardia (heart rate <50), nausea and post spinal shivering were also noted. All these parameters were documented on a pro forma. At the end of the surgery patients were kept in the recovery room and later shifted to the wards. SPSS 25 was used for data analysis. Differences between the two groups for continuous and normally distributed variables were explained using independent t test whereas numerical variables were explained in terms of mean \pm standard deviation (SD). Frequency and percentage were used to present categorical data. P value < 0.05 will be taken as significant.

Results

Patients numbered 78 completed the study, 2 patients, one from each group, were dropped because intrathecal injection did not result in adequate motor blockage. One out of them was converted to general anesthesia where as for other one intrathecal injection was repeated.

Incidence of hypotension, nausea, bradycardia and post spinal shivering were the measurements noted for both groups. All the patients in this study were ASA II status. Youngest patient included in the study was 20 years of age whereas oldest was 30 years. Patients particulars of both groups are laid down in Table I.

Difference between the two groups in terms of age, weight and ASA status was not significant statistically hence both the groups were comparable (Table 2).

Mean Arterial Pressure (MAP) decreased in both groups at 2.5-minute post intrathecal injection but this decline was more prominent in group A. At 10 minute the decline in MAP was lesser but the difference between the two groups remained significant statistically. Similarly, frequency of bradycardia and post-op shivering remained on the lower side in group B.

The major difference was seen in the frequency of hypotension in both the groups as depicted in figure 1.

Different adjuvant drugs are in practice for intrathecal use in combination with local anesthetics, the primary aims of the usage of these drugs are better hemodynamic stability, lesser period of motor blockage but longer period of post-operative pain relief [8]. Bupivacaine belongs to amide group of local anesthetics and usually used intrathecal in isobaric or hyperbaric emulsions to produce regional anesthesia as required for lower segment cesarean section.[9]

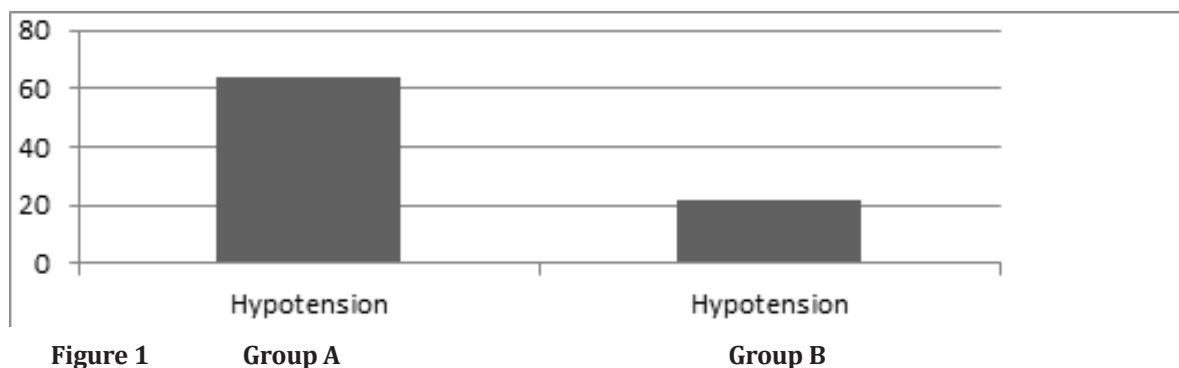
Pethidine is an opioid and is being used intrathecally alone [10] or in conjunct to other local anesthetic drugs for regional anesthesia'. [11] Hemodynamic instability after intrathecal block is a known fact causing maternal and fetal compromise in gravid patients, different drugs to

Table 1: Patients' Profile

Variable	Bupivacaine alone group	Bupivacaine +Pethidine group	P Value
Age	26±2	25±2	0.18
Weight	78±3	80±2	0.15
ASA Status I/II	0/39	0/39	--

Table 2: Comparison of Outcomes

Variable	Bupivacaine alone group	Bupivacaine +Pethidine group	P Value
MAP at 2.5 min	70±2	80±3	0.001
MAP at 10 min	83±2.5	90±2	0.001
Hypotension	25/39	9/39	0.001
Bradycardia	8/39	2/39	0.001
Post-op shivering	5/39	1/39	0.001



prevent or correct are in practice which are not devoid of their unwanted effects.^[12] In this study we tried to compare the hemodynamic effects of bupivacaine 0.75% alone and in conjunct with pethidine, It was found that when pethidine was added hence decreasing the bupivacaine required dose, frequency of hypotension and bradycardia was decreased and fall in MAP was lesser, A similar study by Priyanga et al found that addition of pethidine to bupivacaine lead to reduction in the incidence of hypotension thus reducing the dosage requirement of ephedrine required to counter hemodynamic instability. They also found out that its addition caused lesser duration of motor blockage but prolonged the analgesia time. Contrary to our study incidence of pruritus was also lesser in pethidine group^[6]

Saifullah et al found out that low dosage of intrathecal bupivacaine is associated with decreased frequency of hypotension and same might be the cause of low incidence of hypotension in group B of our study^[13] In a similar double blind randomized clinical trial Anahita et al found that addition of meperidine to bupivacaine resulted in lesser incidence of postoperative shivering and better intraoperative hemodynamic status that too without affecting the level of sensory blockage or infant's Apgar score, in addition to this they also found that meperidine provides better hemodynamic profile in mutual comparison with the fentanyl^[14] In another trial by Malihe et al compared the relative hemodynamic stability of meperidine alone, bupivacaine alone and bupivacaine plus meperidine. Overall, the meperidine group experienced more nausea, vomiting, and itching than the other two groups did. Meperidine plus bupivacaine remained a good substitute for meperidine due to the nearly identical analgesic efficacy of the two drugs, the stabilization of other hemodynamic indicators in the meperidine plus bupivacaine group, and the decrease in the frequency of nausea, vomiting, and itching.^[15]

Shoaleh et al conducted a similar study on three groups, bupivacaine with saline and bupivacaine with S and 10 mg of pethidine, they found out that the maximal sensory blockage, hemodynamic indices, demographic and surgical

profiles and core temperatures were similar in all three study groups. As comparison to the saline group, the bupivacaine plus pethidine groups showed considerably lower frequency and intensities of shivering (P 0.001). Except for pruritus, which occurred more frequently in the pethidine groups compared to the saline group (P-001. there were no other significant differences between groups for the secondary outcomes. With little adverse effects, a small intrathecal dose of pethidine can reduce the frequency and intensity of shaking during casarean delivery^[16].

Mohamed et al conducted a study on comparative hemodynamic profile and odor/sensory blockade of bupivacaine plus fentanyl and bupivacaine plus pethidine in potent doses. They found out that onset of sensory/motor blockade in fentanyl group was more rapid and prolonged and incidence of hypotension, nausea and vomiting was more pronounced in pethidine group^[17].

Mojaver et al conducted a randomized controlled study with division of patients in four groups, they used bupivacaine alone 1 Omg, pethidine 1mg/kg, bupivacaine 10mg plus magnesium sulfate 100mg and pethidine 1mg/kg plus magnesium sulfate 100mg respectively. Contrary to our results and results of other studies mentioned above in the discussion they found no significant differences in the hemodynamic profiles of the patients. They also concluded that magnesium sulfate decreased the duration of motor blockage in bupivacaine group but it increased this duration in the pethidine group^[18]

Conclusion

Addition of pethidine to bupivacaine for intrathecal use keeps the hemodynamic profile of the patients relatively more stable and thus avoids the fetomaternal adverse events.

Ethical Clearance

Permission from Hospital ethical committee was sought via letter no.101/2023 and data collection was started after that. Informed written consent was taken from all the participants and their attendants were counseled too.

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