

Comparative Study between Crystalloid Preloading and Coloadng for Prevention of Hypotension in Elective Cesarean Section Under Spinal Anesthesia in a Secondary Care Hospital

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ABSTRACT

The anesthesia of choice for majority of elective cesarean deliveries is spinal anesthesia, as it is easier to administer, quicker in action, lesser cost, less risk of anesthetic toxicity, minimum transfer of drug to the fetus and provides early ambulation. Maternal hypotension is the major complication associated with subarachnoid block, which can affect both mother as well as fetus. Earlier studies had shown good results of crystalloid preloading for the prevention of maternal hypotension after spinal anaesthesia. Now a days coloadng is preferred over preloading as it increases intravascular volume during vasodilatory phase of sympathetic blockade and thus, causes less fluid redistribution and excretion. Hence, we undertook this study to compare the effect of preloading and coloadng on prevention of hypotension after spinal anesthesia. Total number of participants in our study was 50. P (preloading) group as well as C (coloadng) group consisted of 25 patients each. The systolic blood pressure dropped in both groups after spinal anesthesia but drop was more in P group ($p < 0.001$). Mephentermine requirement was also more in P group as compared to C group. Coloadng of crystalloid fluid is a better method than preloading of crystalloids for prevention of maternal hypotension after Subarachnoid block.

Keywords: coloadng, preloading, hypotension, mephentermine, spinal anesthesia, cesarean.

INTRODUCTION

The anesthesia of choice for majority of elective cesarean deliveries is spinal anesthesia, as it is easier to administer, quicker in action, lesser cost, dense neural block, less risk of anesthetic toxicity, minimum transfer of drug to the fetus and provides early ambulation.¹ Maternal hypotension is the major complication associated with subarachnoid block (SAB), which can affect both mother as well as fetus. Incidence of hypotension seen in patients undergoing cesarean section under spinal anesthesia vary from 60 % – 70 %.² Hypotension can lead to nausea, vomiting, aspiration, dizziness, syncope and arrhythmias in mother. Maternal hypotension further compromises uteroplacental blood flow which can cause fetal hypoxia and acidosis.^{3,4,5} Hypotension occurring after SAB can be prevented by ensuring proper positioning, employing leg wrapping methods, inflatable splints/boots, anti thromboembolic stockings, low dose spinal, intravenous fluid administration and vasopressors.^{6,7,8}

Earlier studies had shown good results of crystalloid preloading for the prevention of maternal hypotension after spinal anaesthesia.⁹ But more recent studies shows that, pre-loading of fluids prior to the administration of spinal anaesthesia for caesarean section is relatively ineffective in the prevention of hypotension.^(10,11,12) After preloading, the fluid gets rapidly redistributed from the intravascular compartment, activating atrial natriuretic peptide (ANP) secretion, causing peripheral vasodilatation, which further increases the renal excretion of the preloaded fluid.¹³ Now a days coloadng is preferred over preloading as it increases intravascular volume during vasodilatory phase of sympathetic blockade and thus, causes less fluid redistribution and excretion.¹⁴ Our hypothesis was that coloadng of crystalloid results in less maternal hypotension, as compared to the preloading of crystalloid, in the setting of an elective cesarean delivery under spinal anesthesia.

MATERIAL AND METHODS

This study was a double-blind randomized study. After taking written informed consent of patients, this study was carried out in gravid patients, between 19 to 40 years of age, coming for elective lower segment caesarean section (LSCS) under spinal anesthesia at civil hospital Nurpur, over a duration of one year. This study was performed in 50 participants, weighing between 50-100 kg, belonging to American Society of Anesthesiologists physical status (ASA) 1 or 2 with singleton uncomplicated pregnancy. The exclusion criteria included patient's refusal to SAB, weight > 100 kg, height of <150 cm or >180 cm, having bleeding disorders, local infection at the site, allergy to local anesthetics and preeclampsia. The participants were divided into two groups: 25 participants in Group P (Preloading) and 25 participants in Group C (Coloadng). Computer generated random number table was used for allocation of group to the participants. Random group assigned was enclosed in a sealed opaque

envelope. The patient and the anesthesiologist who collected the peri-operative data were blinded to the technique used. Preanesthetic evaluation was performed in every patient. Patients were kept nil per orally (NPO) for 8 hours before surgery. Premedication in the forum of tablet Metoclopramide (10 mg) and tablet Ranitidine (150 mg), were given at 10 P.M. and 6 A.M. in the morning. Intravenous line (IV) was secured with 18 Gauge cannula in preoperative room. In the operation theatre, standard monitors were attached (five lead ECG, Non-invasive blood pressure, pulse oximeter) and baseline recordings were noted in supine position. Ringer lactate (RL) was rapidly infused (15 ml/kg) in group P 20 minutes prior to SAB. Similarly, RL was given to the group C, which was initiated just after intrathecal administration of local anesthetic. For spinal anaesthesia, left lateral decubitus position was given. Part was cleaned and draped under all antiseptic precautions. L3 – L4 interspace was identified and 26-gauge Quinke's spinal needle was inserted at this interspace. After appearance of free flow of clear cerebrospinal fluid, 10 mg of hyperbaric bupivacaine over a duration of 20 seconds was injected. After SAB, the patients were immediately put in the supine position with a 15 degrees of left tilt. The level of sensory blockade was assessed using a pin prick to 25 G needle every 5 min till the level stabilized. Whereas the motor blockade was assessed with modified Bromage scale. After achieving a block height of T4, the surgery was allowed to start. Blood pressure (BP) was recorded at the interval of 1 minute till the first 10 min, every 3 min till the next 15 min and every 5 min thereafter till the completion of the surgery.

Hypotension was defined as a decrease of systolic blood pressure by 20% or more from the baseline value and was treated with incremental doses of IV mephentermine starting from 3 mg. 15 units of oxytocin in infusion was given to the mother after the delivery of the baby. Urine output and blood loss of the patient were

noted at the end of surgery. The APGAR scores of the baby were evaluated at 1 min and 5 min after the delivery.

Data was tabulated using Microsoft excel (2010) software and was analyzed using Epi Info software version 7.2.2. Means of two groups were compared using independent Student's t-test. ANOVA test or Mann-Whitney Test depending on the distribution of the population in two groups. P-value of <0.05 was considered to be statistically significant.

RESULTS

Total number of participants in our study was 50. P group as well as C group consisted of 25 patients each. The demographic profile of all the patients in group P and group C were comparable.(Table1) The differences in baseline systolic blood pressure (SBP),mean arterial pressure (MAP) and baseline Heart rate (HR) were not statistically significant.

Table 1: Demographic profile of patients

Variable	Group P (Mean ±SD)	Group C (Mean±SD)	P value
Age (Years)	25.92 ±4.20	25.84 ±4.10	0.947
Weight (kg)	68.72 ±7.16	68.72 ±8.94	0.84
Height (cm)	162.52 ±6.92	163.88 ±6.37	0.472
Duration of surgery (min)	73.28 ±10.27	76.36 ±11.01	0.311
Basal SBP (mm Hg)	118.40 ±6.08	118.08 ± 4.85	0.838
Basal DBP (mm Hg)	71.36 ±8.71	70.24 ± 7.08	0.620

The minimum mean SBP value recorded in group P was 94.80, which was recorded after 5 minutes of SAB. The minimum value of mean SBP in group C was 104.24, which was also recorded 5 minutes after SAB. The difference in the fall of SBP between two groups is statistically significant, which can be clearly seen in table 2.

Table 2: Systolic blood pressure parameters in the group of participants

SBP	GROUP P	GROUP C	P VALUE
At 1 min	105 ±5.36	110.89± 5.51	< 0.001
3 min	99.60± 4.89	106.40± 4.24	<0.001
5 min	94.80 ±6.29	104.24 ±4.33	<0.001
10 min	99.44 ±5.21	107.12± 4.83	< 0.001
15 min	106.48± 5.98	110.64 ±4.89	0.009
20 min	110.96 ±5.57	113.92± 4.74	0.049
25 min	113.12 ±5.72	114.96 ±5.60	0.252
30 min	115.68 ±5.88	115.04± 4.09	0.656

However, the mean HR at different intervals were comparable in two groups and the difference was not statistically significant. (Table 3)

Table 3: Heart rate parameters in the group of participants

HR	GROUP P	GROUP C	P VALUE
1 min	88.72± 12.57	89.72 ±10.43	0.760
3 min	87.80 ±14.73	85.48 ±12.44	0.550
5 min	86.96 ±10.96	84.48± 11.31	0.434
10 min	84.04 ±8.45	86.72± 10.57	0.327
15 min	86.08± 9.12	88.73 ±9.54	0.312
30 min	88 ±8.06	82.96 ±7.05	0.861

Table 4: Parameters of mephentermine (Meph) requirements

Variable	Group P	Group C	P value
Meph requirement(mg)	6.48 ±3.64	3.24 ±2.73	< 0.001

The mean number of doses of mephentermine required for stabilization of blood pressure were more in group P as compared to group C and the difference were statistically significant.(table 4). All neonates had an APGAR score of > 7 at 1 minute and 9 at 5 minutes.

DISCUSSION

Hypotension is a common and troublesome complication after spinal anesthesia. A common practice for prevention of maternal hypotension is preloading of crystalloids before SAB. However, the timing of the infusion of the crystalloid is very critical, as it has shorter intravascular stay. Intravascular volume is raised by 10 % whenever rapid infusion of crystalloid is given to the patient. But the volume is decreased, as soon as infusion is stopped.¹⁵ So, it is a wiser decision to give coloadng of fluids rather than preloading.

From the results of our study, it is clear that, there is statistically significant difference in the incidence of hypotension between preloading and coloadng group. The incidence of hypotension is less in

coload group as compare to preloading group. After administration of heavy bupivacaine in the subarachnoid space, it takes about 10 minutes for the complete blockade of sympathetic nerves and this is the time period, when there are maximum chances of occurrence of hypotension.⁴ So coload is more helpful in prevention of maternal hypotension, as in coload there is more fluid in the intravascular space, less redistribution of fluid and less excretion of crystalloids.¹⁶

In 2004 Dyer et al., studied role of 20ml/kg of crystalloid solution as preload and coload in 25 patients in each group. They concluded that rapid crystalloid administration after induction of SAB is more effective in prevention of maternal hypotension.¹⁴ These findings corroborate with our study.

Similarly, Rao et al., conducted an study to compare the effect of preloading against coload with RL (15 ml/kg) in elective LSCS done under spinal anesthesia. Incidence of hypotension was 60% for preloading group and 40% for coload group.¹⁷ In our study, we found hypotension in 71 % of patients in preload group and 43 % of patients in coload group.

Findings in our study correlated with Jacob et al., study, which was a randomized control study with 100 parturient undergoing caesarean section under SAB. They found higher incidence of hypotension, nausea and vomiting in preloading group.¹⁸ Similar findings were also observed by Oh AY et al. and Artawan et al.^{19,20}

Our study also shows that, total number of doses and cumulative dose of mephentermine used in coload group were statistically lower than preloading group for treatment of hypotension. Similar results were shown in studies done by Rao et al, Jacob et al and Artawan et al.^{17,18,20}

But some studies also shown that coload has no additional benefit over preloading in prevention of hypotension.²¹ In our study, we also found that hypotension cannot be individually prevented by

coload alone. We should always have other methods rapidly available like vasopressors for treatment of hypotension.

CONCLUSION

Coload of crystalloid fluid is a better method than preloading of crystalloids for prevention of maternal hypotension after SAB given for LSCS. So, we should not waste extra time for preloading of fluid before surgery, which can delay the surgery, for prevention of hypotension after spinal anesthesia.

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