



Original Research Article

Comparative evaluation of crystalloid coloadng and colloid coloadng for prevention of spinal anaesthesia induced hypotension in patients undergoing elective caesarian section

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ABSTRACT

Introduction: The most prevalent consequence after a caesarean surgery is post-spinal hypotension. To avoid this, crystalloid or colloid cohydration might be utilized. We aimed to see how crystalloid and colloid coloadng affected hemodynamics and neonatal outcome in patients undergoing elective caesarean section, following spinal anaesthesia.

Materials and Methods: A total of 100 pregnant women were enrolled in this study, which were split into two groups of 50 each. Group A was given 10ml/kg Ringer Lactate (RL) And Group B patients received 10ml/kg 6% hetastarch coloadng. Patients were monitored for Mean SBP, DBP, MAP, HR, SPO2, mean APGAR score of newborn at 1 and 5 minutes post delivery, the prevalence of nausea and vomiting as well as Vasopressor requirement.

Results: The incidence of hypotension was higher in the crystalloid group, as was the need for Vasopressor, compared to the colloid group. The crystalloid group had a higher rate of nausea and vomiting. In the colloid group, hemodynamics such as SBP, DBP, MAP, and HR were more stable. However, as demonstrated by the APGAR score of 1 in both groups, there was no difference in neonatal outcome.

Conclusion: Colloid coloadng is more effective method of preventing post spinal hypotension in patients undergoing caesarean section however combined use of Vasopressor and fluids seems to be more effective way of managing post spinal hypotension.

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1. Introduction

Hypotension is commonest complication following spinal anaesthesia with incidence of up to 75% in general population and up to 80% in parturient having a caesarean section (CS).¹⁻³ Sympathetic blockage is to blame causing venous dilation, decrease return and decrease cardiac output and if sustained can result in placental hypoperfusion and fetal hypoxia and acidosis⁴ fluid coloadng appears to be physiological way of preventing this and which can be done

either with crystalloids or colloids.^{5,6}

Although clinically colloids appear to be more efficient for preventing postspinal hypotension but it also comes with disadvantages like high cost, effects on coagulation and more sensitivity reactions.⁷ Although crystalloids appear to be cheaper alternative, but it may need to administer in large quantity, may cause edema and electrolyte disturbances.⁸ Considering importance of hemodynamic stability and its effect on mother and fetus, we aimed to compare effect of coloadng with crystalloid and colloids on maternal hemodynamics who are undergoing elective CS

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2. Materials and Methods

This was prospective randomized double blind trial conducted after approval from Institutional Ethics Committee and taking valid informed consent from patients. 100 patients were equally randomized into two groups using a predetermined computer generated random number allocation plan as Group A (Crystalloid group) receiving 10ml/kg Ringer Lactate (RL) And Group B (Colloid group) with 50 patients receiving 10ml/kg 6% hetastarch coloadng.

All pregnant women of age group 18 to 35 years of age willing to participate in study of ASA grade I and II with singleton pregnancy were included in study.

Once the patients were enrolled for the study, a thorough history and physical examination was done and patient was investigated according to institutional protocol. Non-invasive blood pressure (BP), electrocardiography (ECG), and a pulse oximeter were attached to the patient when they arrived in the operating room, as were baseline values of heart rate (HR), systolic blood pressure (SBP), and pulse oximeter were taken. SBP and baseline HR were taken as the mean of 3 readings within 10% of each other with the BP recorded from the dependent arm. MBP (mean arterial blood pressure), SBP (systolic blood pressure), DBP (diastolic blood pressure), HR were then recorded throughout the surgery in 5 minutes interval. An 18G iv cannula was taken on nondominant arm of patient. After that patients were placed in sitting position and a 25 gauge spinal needle was placed in the L3-4 vertebral interspace after antiseptic dressing and draping, and hyperbaric bupivacaine 0.5 percent, 2.2 ml was given intrathecally. Thereafter patients were placed supine with left lateral uterine displacement.

Group A received 10ml/kg Ringer Lactate (RL) and Group B receive 10ml/kg 6% hetastarch. Each infusion commenced at the time of the spinal injection, and the procedure was completed in less than 10 minutes. Motor block and the upper sensory level of anesthesia to light touch was assessed. Surgery was allowed to commence if a sensory block to touch at the T6 dermatome is achieved. At delivery all patients received 20 IU of injection Oxytocin. Time of delivery of baby was recorded.

Hypotensive episodes, defined as 20% decrease in Mean arterial pressure (MAP) or MAP 60mmHg or systolic blood pressure decline less than a pressure of 80 mmHg was recorded. Inj. Ephedrine was used to treat hypotension at one minute interval till blood pressure returns to normal value. Time of hypotension and number of doses was recorded. If hypotension is not controlled by 3 bolus doses of Inj. Ephedrine, additional bolus of 100 ml IV fluid was given and the additional amount of fluid and noted. Bradycardia, defined as pulse rate < 60 per minute was noted and Inj. Atropine 0.6mg administered. Neonatal outcome was assessed by recording baby's APGAR score recorded at birth, 1 minute, and 5 minutes. Urine output, total fluid

requirement and blood loss was recorded at the end of surgery. Patients were observed in recovery room for 2 hours postoperatively and Pulse rate, NIBP, SpO2 were recorded. Patient was observed for nausea, vomiting, rigors, shivering, and allergic reaction. Patients requiring blood transfusion, obstetric hysterectomy, conversion to general anesthesia were excluded from study.

Data was presented in tables and statistical analysis was performed using SPSS Software version 15.0. For categorical variables such as age, parity, ASA grade, and weight, the Chi square test was performed. For HR, blood pressure, APGAR score, and other variables, a Student's t-test was employed to compare within-group values to baseline values. Student's t-test was used to evaluate intergroup differences in the data gathered at each measured time point, and a paired t-test was used to determine intragroup differences from baseline within each group. P 0.05 was taken into account .P >0.05 was considered insignificant, <0.05 as significant and highly significant if <0.001.

3. Results

Total 100 patients were enrolled study with 50 patients in each group.

Demographic characters were comparable in both groups including age, parity, BMI, ASA status and duration of surgery.

Hypotension was more common in group A than in group B, and the need for vasopressor was similarly higher in group A, as evidenced by the data from Tables 2 and 3. The heart rates of both groups were comparable intraoperatively throughout the research. There was no discernible difference between the groups (Figure 1). SBP, DBP, and MAP were all lower intraoperatively in comparison to Group B, statistically significant differences exist in Group A (Figures 2, 3 and 4).

The groups' APGAR scores at 1 minute (8.021.55 vs. 8.121.21) and 5 minutes (8.221.33 vs. 8.661.15) were comparable (p >0.05).

Table 1: Demographic parameters in both groups

| Parameters | Group A | Group B | P value |
|--------------------------------|--------------|--------------|---------|
| Age | | 25.16 ± 3.96 | >0.05 |
| Parity | | 24.58 ± 3.96 | |
| Primigravida | 33 | 30 | >0.05 |
| Multigravida | 17 | 20 | |
| BMI (kg/m ²) | 26.35 ± 4.85 | 25.84 ± 4.20 | >0.05 |
| ASA I | 34 | 32 | >0.05 |
| ASA II | 16 | 18 | |
| Duration of surgery in minutes | 52.22±3.58 | 51.42 ±4.33 | >0.05 |

Table 2: Comparison of incidence of hypotension between groups

| Hypotension | Group A n (%) | Group B n (%) | P value |
|-------------|---------------|---------------|---------|
| Yes | 28(56%) | 13(26%) | <0.05 |
| No | 22(44%) | 37(74%) | <0.05 |
| Total | 50(100%) | 50(100%) | <0.05 |

Table 3: Comparison of vasopressor doses needed among study groups

| Vasopressor doses needed | Group A | Group B | P value |
|--------------------------|---------|---------|---------|
| Yes | 30(60%) | 19(38%) | < 0.05 |
| No | 20(40%) | 31(62%) | <0.05 |

Table 4: Comparison of APGAR scores of neonates

| APGAR score | Group A Mean±SD | Group B Mean±SD | P Value |
|--------------|-----------------|-----------------|---------|
| At 1 minute | 8.02±1.55 | 8.12±1.21 | >0.05 |
| At 5 minutes | 8.22±1.33 | 8.66±1.15 | >0.05 |

Table 5: Comparison of incidence of nausea and vomiting between groups

| Incidence of nausea and vomiting | Group AN (%) | Group BN (%) | P value |
|----------------------------------|--------------|--------------|---------|
| Yes | 13(26%) | 2(4%) | < |
| No | 37(74%) | 48(96%) | 0.05% |
| Total | 50(100%) | 50(100%) | |

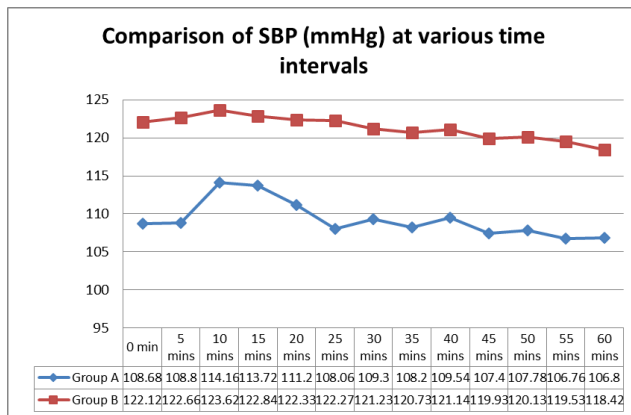


Fig. 2: Comparison of systolic blood pressure [SBP (mmHg)] at various time intervals

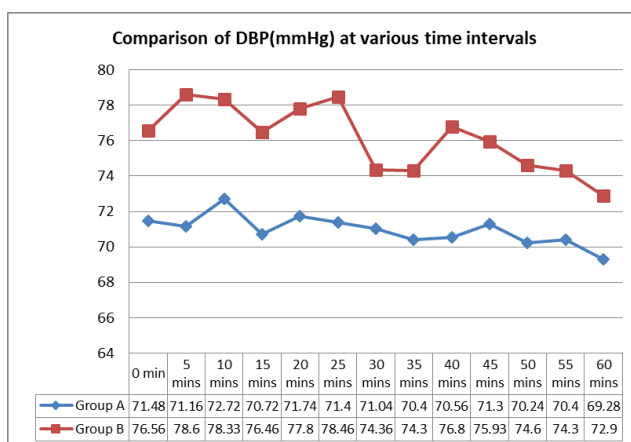


Fig. 3: Comparison of diastolic blood pressure [SBP (mmHg)] at various time intervals

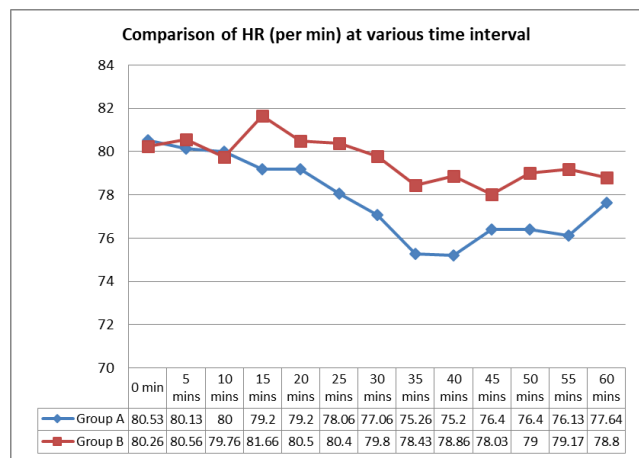


Fig. 1: Comparison of Heart Rate (per min) at various time intervals

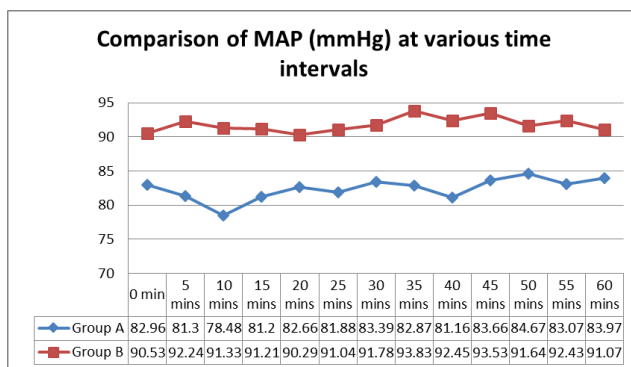


Fig. 4: Comparison of mean arterial pressure MAP (mmHg) at various time interval

4. Discussion

Spinal anesthesia is commonly employed technique for cesarean section due to its simplicity, faster onset, reliability and low cost.⁹ Sympathectomy caused by spinal anesthesia can cause hypotension in significant number of cases even after giving left uterine displacement resulting in maternal morbidity in the form of nausea and vomiting, altered consciousness, cardiovascular collapse.^{3,10}

Also maternal hypotension can compromise placental perfusion leading to adverse effects on fetus which may be in the form of acidosis in term infants¹¹ but may cause more deleterious effects in premature fetuses.¹²

So being an anesthesiologist our aim is to either prevent it or to treat it fast and effectively so as to avoid all deleterious effects.¹³

So we conducted study of crystalloid and colloid coloadng so as to prevent maternal hypotension and subsequent deleterious effects.

In our study we found that colloid had reduced incidence of hypotension than those receiving crystalloid (Figures 2, 3 and 4 and Table 2). This finding was consistent with findings of Macdonald et al¹⁴ where they also had fewer episodes of hypotension in colloid group than in crystalloid group necessitating lower doses of vasopressor in colloid group. The colloid group's hemodynamics were more stable than the crystalloid group's and this may be attributed to fact Crystalloids remain in intravascular space for a shorter time and distribute rapidly into the extracellular fluid compared to colloids.

However, regardless of the type of iv fluid used, the incidence of hypotension in both groups was high (56 percent and 26 percent, respectively) and significant, necessitating vasopressor treatment; thus, regardless of the type of iv fluid used, combined use of vasopressor and iv fluids is recommended in the management of spinal induced hypotension.^{13,15,16}

Although there was significant difference in incidence of hypotension as well as requirement of vasopressor in both groups i.e. crystalloid group had more significant hypotension, neonatal outcome was comparable in both groups as studied shown by APGAR scores at 1 and 5 minutes.(Table 4) indicating that transient hypotension treated using vasopressor do not usually affect fetal outcome.^{17,18} However using vasopressor for correction of hypotension in the background of inadequate knowledge of its effect on fetoplacental perfusion should be restricted and prevention of hypotension should be preferred approach rather than its correction.

We had greater incidence of nausea and vomiting in crystalloid group than in colloid group and findings were consistent with findings of Mercier¹⁹ Fatema²⁰ and Shahriyari.²¹

Although colloids are considered safe and does not transfer cross fetoplacental barrier²² it has potential to cause

allergic reactions and is expensive too. And this could be a reason why many institutions as well as anesthesiologist still prefer to use crystalloid over colloids despite knowing its advantages.²³

5. Conclusion

Colloid coloadng was found to be a more effective strategy of reducing post-spinal hypotension in patients after caesarean section in our study. Regardless of the fluid therapy chosen, some degree of hypotension is likely to develop, which must be treated with Vasopressor therapy.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare no conflict of interest.

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