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Comparison of preloading versus coloading with crystalloid for elective caesarean section done under low dose spinal anaesthesia – A double blind randomised trial

Authors
Dr Ankita Chandel[1], Dr Nisha Sharma[2], Dr Manjit Singh Kanwar[3]
[1]Assistant Professor Department of Anaesthesia, Dr RKGMC Hamirpur
[2]Senior Resident, Department of Anaesthesia Dr RKGMC Hamirpur
[3]Assistant Professor Department of Anaesthesia Dr RKGMC Hamirpur
Corresponding Author
Dr Nisha Sharma

Abstract
Background: *Spinal anaesthesia is now an established technique for lower segment caesarean section (LSCS) but is associated with maternal hypotension. We intended to compare the use of preloading vscoloading with crystalloid for prevention of same.*
Methods: *Fifty parturients with American Society of Anesthesiologists' physical status 1 or 2 undergoing elective LSCS were recruited. Twenty five patients in group P (n =25) and group C (n =25) received 15 mL/kg of ringer lactate 20 minute before spinal anaesthesia and just after spinal anaesthesia respectively in both groups. Blood pressure and heart rate were recorded at 1 min interval starting 1 min after intrathecal injection till the first 10 min, every 5 min till the next 20 min and every 10 min thereafter till the end of the surgery. Data was tabulated using Microsoft excel (2010) and analyzed using the SPSS (version 8) software. Student's t-test was used for quantitative data and the Chi square test for qualitative data.*
Results: *The minimum mean systolic blood pressure (SBP) values recorded in the two groups were 90 ± 12.5 mm Hg in group P and 100 ± 9.5 mm Hg in group C (P = 0.043) at 7th and 6th minute respectively. The mean number of doses of mephentermine were more in group P (1.56±0.234) compared to group C (0.75±0.452). (P< 0.0001).*
Conclusion: *Coloading provides a better alternative than preloading for prevention of maternal hypotension secondary to spinal anaesthesia given for caesarean section.*

Introduction

Spinal anaesthesia is now the technique of choice for cesarean section because not only it avoids risk associated with general anaesthesia, but it also provides effective pain control, early ambulation and fast return back to daily activities for new mothers and thus improves their quality of life.[1]

The only disadvantage associated with spinal anaesthesia involves the maternal hypotension and subsequent decreased uterine perfusion resulting in fetal hypoxia and acidosis.[2,3]

The incidence of post spinal hypotension in parturients can be as high as 82%.[4] Thus, prevention of hypotension is utmost essential for

the well-being of both the mother and the fetus. Among various strategies to prevent hypotension, volume preloading with crystalloid solutions received rapid acceptance since it was first introduced by Griess et al.[5] Earlier studies demonstrated immense success of crystalloid preloading in prevention of maternal hypotension after spinal anaesthesia.[6] However, recent studies further revealed that even large volumes of crystalloid have minimum effect on the incidence of hypotension.[7] Pauta et al. suggested that preload is rapidly redistributed and thus is ineffective in maintaining the fluid balance.[8]

Recent years have witnessed, increasing interest among anaesthesiologists for coloading rather than preloading because of the rapid redistribution of crystalloid. Coload might be physiologically more appropriate because the maximal effect can be achieved during the time of the block.[9]This might increase intravascular volume expansion during vasodilatation from the sympathetic blockade and limit fluid redistribution and excretion.

We thereby tried to find out the effect of preloading versus coloading in maintaining maternal hemodynamics. We hypothesised that administration of crystalloids at the time of induction of spinal anaesthesia (coload) is associated with less hypotension than the administration of an equivalent volume of crystalloid preload. The secondary outcomes studied were the total vasopressor requirement for maintaining the maternal blood pressure, maternal nausea and vomiting andfetal APGAR scores.

Methodology

The study was carried out in 50 parturient patients(20-40 years age group) belonging to American Society of Anesthesiologists physical status 1 or 2 with singleton uncomplicated pregnancy scheduled for elective lower segment caesarean section (LSCS) over a period of 1 year. The exclusion criteria included patient's refusal to block, having bleeding disorders, local infection at the site where needle for block was to be inserted and pregnancy with comorbidities. The parturients were allocated to two groups Group P (Preloading) and Group C (Coloading) with 25 patients in each group by computer-generated random number table. Random group assigned was enclosed in a sealed opaque envelope to ensure concealment of allocation sequence. The observer who collected the peri-operative data as well as the patients was blinded to the technique used.

During preanaesthetic visit, the patients were explained about the study purpose and informed written consent was obtained. All the patients were kept nil orally for 8 h before surgery. Patients were premedicated with Metoclopramide (10 mg, IV) and Ranitidine (50 mg, IV), 2 h prior to the procedure. On arrival to the operative room, standard monitors (Non-invasive blood pressure, pulse oximeter, five lead ECG) were attached and baseline parameters recorded.

The preload group received rapid infusion of 15 ml/kg of Ringer lactate solution(sodium 131 mmol/L, chloride 111 mmol/L, lactate 29 mmol/L, potassium 5 mmol/L, calcium 2 mmol/L, osmolarity 279 mOsm/L) 20 minutes before spinal anaesthesia. The same amount of Ringer lactate was infused in the coload group, but was initiated just after intrathecal administration of local anesthetic solution for spinal anaesthesia.

Before starting spinal anaesthesia, systolic blood pressure and heart rate were measured in the supine position and was regarded as baseline. Spinal anaesthesia was conducted in the right lateral decubitus position. After skin infiltration with lidocaine, a 26-gauge quicke's spinal needle was inserted at the L 3–4 interspace. After appearance of clear cerebrospinal fluid, 10 mg of 0.5% hyperbaric bupivacaine was injected.

After the spinal injection, the patients were put in the supine position with a 15 degrees wedge under the right hip. The sensory level was assessed using pin prick to 25 G needle every 5 min till the level stabilized. After achieving a block height of T 4, the surgery was allowed to commence.Blood

pressure and heart ratewere recorded at 1 min interval starting 1 min after intrathecal injection. till the first 10 min, every 5 min till the next 20 min and every 10 min thereafter till the end 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 IV mephentermine in increments of 3 mg. After the delivery of the baby, the mother was given 15 units of oxytocin in infusion. The APGAR scores of the baby were evaluated by pediatrician at 1 min and 5 min after the delivery and were noted. The total intravenous fluid administered and blood loss during the procedure was noted.

Data was tabulated using Microsoft excel (2010) and analyzed using the SPSS (version 8) software. Student's t-test was used for quantitative data and the Chi square test for qualitative data. P-value of <0.05 was considered to be statistically significant.

Results

All the patients were comparable in demographic profile including age, weight, duration of surgery, average total fluid administered and maximum block height achieved. [Table 1].The baseline mean values of maternal HR, SBP, and DBP for the two groups were comparable statistically [Table 1].

The minimum mean SBP values recorded in the two groups were 90 ± 12.5 mm Hg in group P and 100 ± 9.5 mm Hg in group C (P = 0.043) at 7th and 6th minute respectively. (Figure 1) Mean heart rate was comparable in both groups. (Figure 2) The mean number of doses of mephentermine were more in group P (1.56±0.234) compared to group C (0.75±0.452). (P< 0.0001). All the neonates had an APACHE score of> 7 at 1 min and 5 min intervals.

Table 1: Demographic profile of patients

	Group P (n=25)	Group C (n=25)	P value
Age (years)	24.5 ±5.9	25.7 ±4.8	0.789
Weight (kg)	74.8 ±6.8	77.6 ±4.5	0.634
Duration of surgery(minutes)	88.7 ±8.4	89.0 ±9.2	0.657
Baseline systolic blood pressure (mm Hg)	118.7 ±9.5	119.9 ±7.9	0.132
Baseline diastolic blood pressure(mm Hg)	82.7 ±5.8	79.6 ±6.9	0.089
Baseline heart rate (per min)	102.7 ±5.5	100.5 ±5.6	0.845
Total fluid given (ml)	1420 ±220	1380 ±250	0.567

Figure 1: Mean systolic BP at different time intervals

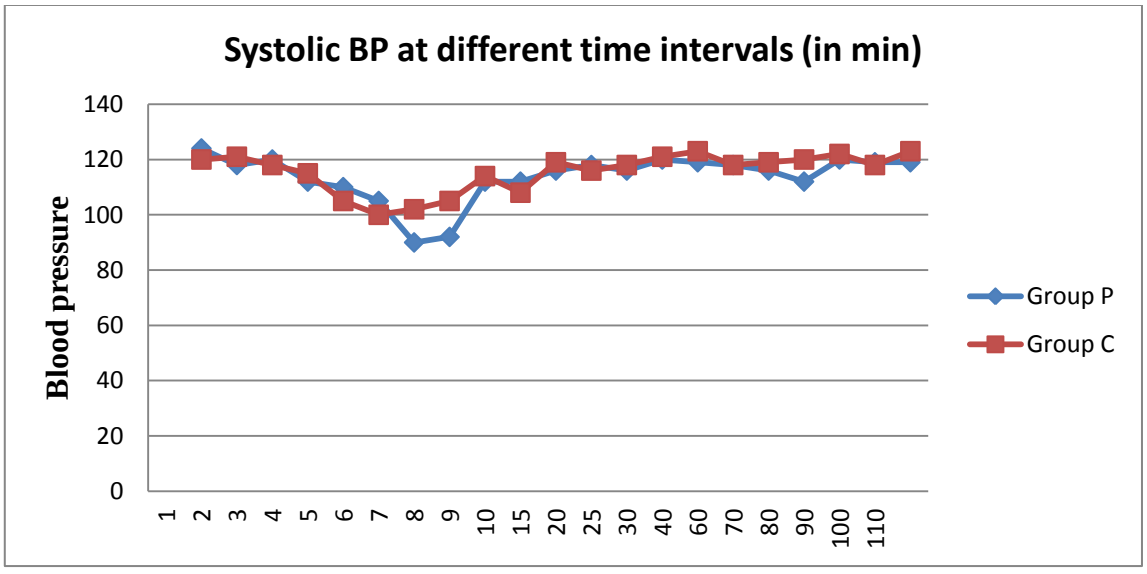
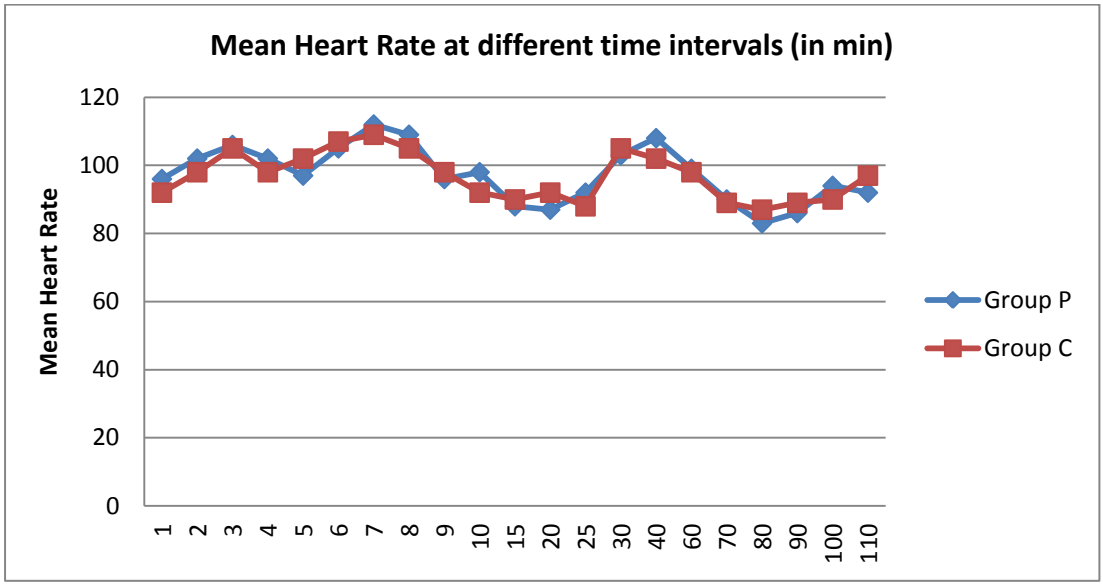


Figure 2: Mean Heart rate at different time intervals



Discussion

In our study we compared the efficacy of coloadingvs preloading in elective caesarean sections performed under spinal anaesthesia and foundthat incidence of hypotension was less in coloading group than preloading group. The total number of mephentermine boluses required were also statistically less in coload group than preload group.

The possible explanation is that crystalloids rapidly redistributes to the extravascular space. Because fluid is rapidly lost from the intravascular compartment, it may be rational to initiate a rapid infusion immediately after induction of spinal anaesthesia. Studies have shown that a rapid infusion of crystalloid increases the intravascular volume by about 10%. This decreases rapidly when the infusion is discontinued.[10] Preloading further also induces atrial stretching, releasing atrial natriuretic peptide, which is a potent vasodilator.[9] Because fluid is rapidly lost from the intravascular compartment, it seems rational to initiate a rapid infusion immediately after induction of spinal anaesthesia.

Despite of these possible explanations, most literary review suggests no additional benefit of coload over preload. A recent meta-analysis also concludes that the timing of fluid loading does not have an impact on the incidence of hypotension.[11] However, these analysis have combined crystalloids and colloids and only limited data are available for crystalloids. Crystalloids and colloids should be evaluated separately in this respect.

Additionally, most practitioners prefer crystalloids over colloids because of higher cost and allergic reactions associated with colloids. Thus we need more studies to evaluate the role of crystalloids separately.

Limitations in our study include small sample size. Also, even in our study, we could not prevent hypotension even in the coload group. Thereby add on measures like use of vasopressors should always kept ready before administrating spinal anaesthesia.

Conclusion

From our study we could conclude, that coloading provides a better alternative than preloading for prevention of maternal hypotension secondary to spinal anaesthesia given for caesarean section.

References

1. Ng K, Parsons J, Cyna AM, Middleton P. Spinal versus epidural anaesthesia for caesarean section. Cochrane Database Syst Rev. 2004;2:CD003765.
2. Somboonviboon W, Kyokong O, Charuluxananan S, Narasethakamol A.

Incidence and risk factors of hypotension and bradycardia after spinal anaesthesia for caesarean section. J Med Assoc Thai. 2008;91:181-187.

3. Mueller MD, Bruhwiler H, Schupfer GK, Luscher KP. Higher rate of fetalnacidemia after regional anesthesia for elective cesarean delivery. Obstet Gynecol. 1997;90:131-4.
4. Shnider SM, Lorimier AA, Asling JH, Morishima HO. Vasopressors in obstetrics I I: Fetal hazards of methoxamine administration during obstetric spinal anesthesia. Am J ObstetGynecol 1970;106:680-6.
5. Greiss FC Jr, Crandell DL. Therapy for hypotension induced by spinal anesthesia during pregnancy. JAMA 1965;191:793-6.
6. Marx GF, Cosmi EV, Wollman SB. Biochemical status and clinical condition of mother and infant at cesarean section. AnesthAnalg 1969;48:986-94.
7. KeeNgan WD, Khaw KS, Lee BB, Ng FF, Wong MM. Randomized controlled study of colloid preload before spinal anesthesia for cesarean section. Br J Anaesth 2001;87:772-4.
8. Pouta AM, Karinen J, Vuolteenaho OJ, Laatikainen TJ. Effect of intravenous fluid preload on vasoactive peptide secretion during caesarean section under spinal anesthesia. Anesthesia 1996;51:128-32.
9. Park GE, Hauch MA, Curlin F, Datta S, Bader AM. The effects of varying volumes of crystalloid administration before cesarean delivery on maternal hemodynamics and colloid osmotic pressure. AnesthAnalg 1996;83:292-303
10. Hahn RG, Svensen C. Plasma dilution and the rate of infusion of Ringer's solution. Br J Anaesth 1997; 79: 64–7.
11. Higgins JP, Thompson SG. Quantifying heterogeneity in a meta-analysis. Stat Med 2002; 21: 1539–58.