Efficacy of Equal Volume of Ringer Lactate Versus 3.5% Polymer of Degraded Gelatine Solution (Haemaccel) as Preloading Fluid for Prevention of Hypotension after Spinal Anaesthesia for Lower Segment Cesarean Section

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Abstract

Introduction: Systemic hypotension is frequently and immediately seen after spinal anaesthesia. Historically Ringer lactate is used to substitute the acute relative volume loss after spinal anesthesia, although it remains in intravenous circulation for a short period. The preloading with 5% albumin and gelatine have become popular and effective as they remain intravascular for a longer duration providing sustained normotension. The aim of this study was to assess the efficacy of equal volume of Ringer lactate and Haemaccel as a preloading fluid for the prevention of hypotension after spinal anaesthesia in patients undergoing Lower Segment Cesarean Section.

Methods: This was a prospective comparative study in which Patients were randomly allocated in to Group A and group. Group A patients were preloaded with Ringer lactate 10ml/kg body weight and Group B were preloaded with Haemaccel 10 ml/kg body weight within a period of 5-10 minutes before spinal anaesthesia. After giving the block, blood pressure (systolic, diastolic and mean) were recorded every 2.5 minutes for initial 20 minutes and every 5 minutes during the rest of the period of surgery. Onset of hypotension along with other parameters were recorded and analysed using SPSS ver. 13.

Results: All together 100 patients were enrolled in the study, 50 in Group A (Ringer lactate) and 50 in Group B (Haemaccel). The episodses of hypotension was higher in patients who received Ringer lactate as preloading fluid than who received haemaccel as preloading fluid (42% versus 24%).

Conclusion: Preloading with Haemaccel gives better hemodynamic stability and lesser incidence of hypotension than that of Ringer lactate.

Key words: Hemaccele, Hypotension, Preloading.

Introduction

Spinal anaesthesia has a low degree of physiological trespass with a profound degree of sensory denervation and muscles relaxation[1]. Systemic hypotension is seen frequently and immediately after spinal anaesthesia which occur in 33 %.[2] The cause of hypotension is generalized arterial and arteriolar dilatation causing a decreased peripheral vascular resistance and decreased cardiac output due to decreased venous return[3,4].

Wollman and Marx[5] empasized the use of intravascular volume expansion for prophylaxis rather that therapeutic measure in response to hypotension. Although Clark et al[6] reported good results in 1976, the remarkable success (100% prevention of hypotension) was never reproduced. Historically Ringer lactate is used to substitute the acute relative volume loss after spinal anesthesia as it is cheap, easily available and non

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allergic although it remains in intravenous circulation for a short period[1]. The preloading with 5% albumin and gelatine have become popular and effective as they remain intravascular for a longer duration providing sustained normotension, eventhoug it is associated with higher incidence of allergic reaction. Studies have shown that severe anaphylactic reaction has been rare with preparation of gelatine such as Haemaccel, and now very popular method[7,8].

Despite various advantages of Heamaccel, preloading with the Lactated ringers is still the commonest practice, and to our knowledge no similar research has been published in our country. This study intended to assess the efficacy of equal volume of Ringer lactate and Haemaccel as a preloading fluid for the prevention of hypotension after spinal anaesthesia in patients undergoing Lower Segment Cesarean Section (LSCS).

Methods

This was a prospective comparative study, which was conducted at BP koirala institute of health sciences from 2002 to 2004. Patients undergoing emergency LSCS under spinal anaesthesia with physical status I and II and aged between 18-40 yrs were included after obtaining approval from the ethical committee and written informed consent for the procedure. Patients with inadequate effect with drug supplementation following spinal anaesthesia, Patients requiring general anaesthesia after subarachnoid block for any reasons, allergic to degraded gelatine solution (Haemaccel), Unexpected and excessive perioperative bleeding leading hemodynamic instability requiring transfusion and severely dehydrated patients with or without per vaginal bleeding were excluded from the study. Patients were randomly allocated to any of the groups (Group A- Preloading with Ringer lactate (10ml/kg) +SA+LSCS; Group B- Preloading with Haemaccel (10ml/kg) +SA+LSCS).

In the operation theatre basal heart rate and blood pressure were recorded before starting of the infusion of preloading fluid. and peripheral venous access was secured with 18G intravenous cannula. Group A patients were preloaded with Ringer lactate 10ml/kg body weight and Group B were preloaded with Haemaccel 10 ml/kg body weight within a period of 5-10 minutes before spinal anaesthesia. Spinal Anaesthesia was given through a 25 G spinal needle at the level L2-L3 or L3-L4 in left lateral position with 0.5% hyperbaric bupivacain 2.2 ml through 5cc disposable plastic syringe and patient turned supine immediately keeping a wedge under right pelvic region. After giving the block, blood pressure (systolic, diastolic and mean) were recorded every 2.5 minutes for initial 20 minutes and every 5 minutes during the rest of the period of surgery. The level of block was determined by pin prick method at 5 minutes after the block. The usual maintenance and replacement therapy were given with Ringer lactate solution for both the groups of patients. Essential monitoring like ECG, NIBP, and SPO2 were monitored throughout the perioperative period.

Hypotension was defined as fall in systolic blood pressure more than 20% and was treated with intravenous bolous of Mephenteramine 3 mg. It is repeated if hypotension persisted or reocurred. Nausea was rated on a scale of 0 to 3. (0: No nausea, no vomiting. 1: Light nausea, no vomiting episode. 2: Moderate nausea, two vomiting episodes. 3: Severe nausea, three or more vomiting episodes)[9].

Data was anlysed using SPSS version 13, students t test was used for parametric values and Chi-sqare test was used for nonparametric values. The confidence interval was set as 95% and p-value of less than 0.005 was considered as significant.

Results

All together 100 patients were enrolled in the study, 50 in Group A (Ringer lactate) and 50 in Group B (Haemaccel). The mean age, weight, heart rate, Systolic BP (SBP), Diastolic BP(DBP) and mean MAP in both the group were comparable (see Table 1).

21 patients in group A received SAB at L2-L3 and 29 at L3-L4 where as in group B 19 patients received SAB at L2-L3 and 31 at L3-L4. In group A, 12 patients had a level of block at T8, 23 of T7 and 15 of T6.The level of block in group B were 14 patients T8, 21 patients T7 and 15 patients T6 (see Table 1).

The duration of surgery (39.60+/-4.72 min in group A versus 41.70+/-5.21 min in group B) and urine output (91.90+/-51.59 ml in group A and 94.90+/-34.93 ml in group B) were not significantly different in both the groups (see Table 1).

The episodse of hypotension was higher in patients who received Ringer lactate as preloading fluid than who received haemaccel as preloading fluid (see Figure 2).

The comparision of intraoperative mean systolic and diastolic BP showedthat, the pressure in Ringer lactate group was persistently lower than hemaccele group after 25 minutes of SAB (see Figure 3 and 4).

Table 1: Comparision of two groups in various parameters.

Parameters	Group A	Group B	p- Value
Age (Years)	24.28±4.18	24.66±3.87	>0.05
Weight (Kg)	61.80±6.91	58.76±5.82	>0.05
Mean heart rate (bPm)	85.38±12.16	89.04±11.07	0.119
Mean Systolic BP (mm Hg)	122.72±6.91	121.08±8.77	0.302
Mean diastolic BP (mm Hg)	76.36±8.47	73.26±8.14	0.065
Mean MAP (mm Hg)	91.98±7.94	89.76±8.05	0.168
Duration of Surgery (min)	39.60±4.72	41.70±5.21	>0.05
Urine output (ml)	91.90±51.59	94.90±34.93	>0.05
SAB at L_2-L_3 (No. of cases)	21	19	>0.05
SAB at L_3-L_4 (No. of cases)	29	31	>0.05
Level of block at 5 min. T8 T7 T6	 12 23 15	 14 21 15	 >0.05 >0.05 >0.05

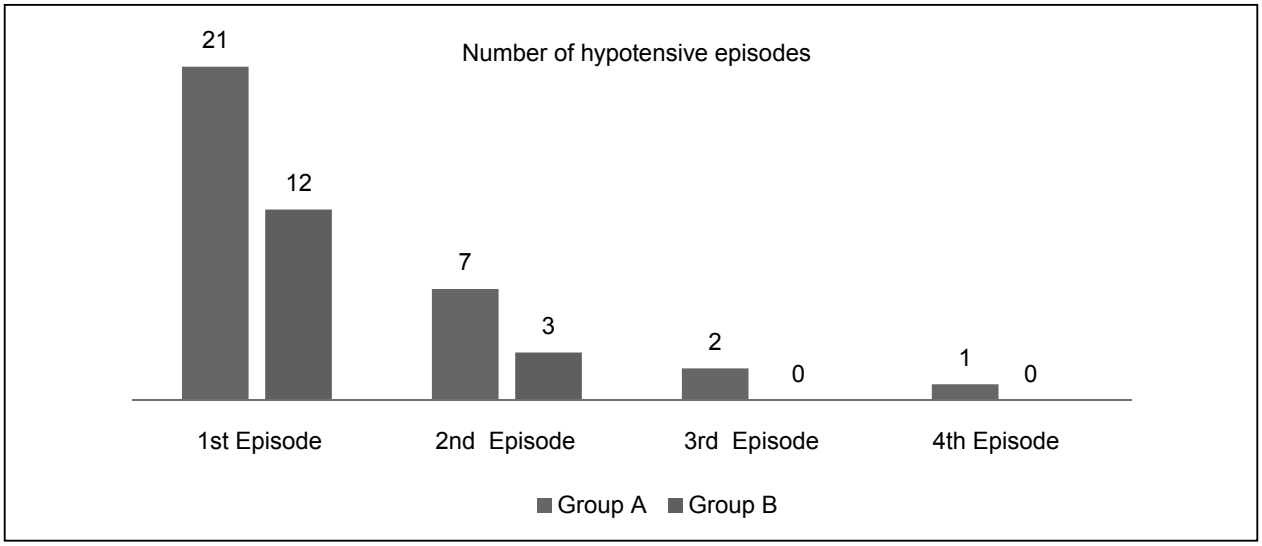

Fig 1: Number of hypotensive episodes in bothe group

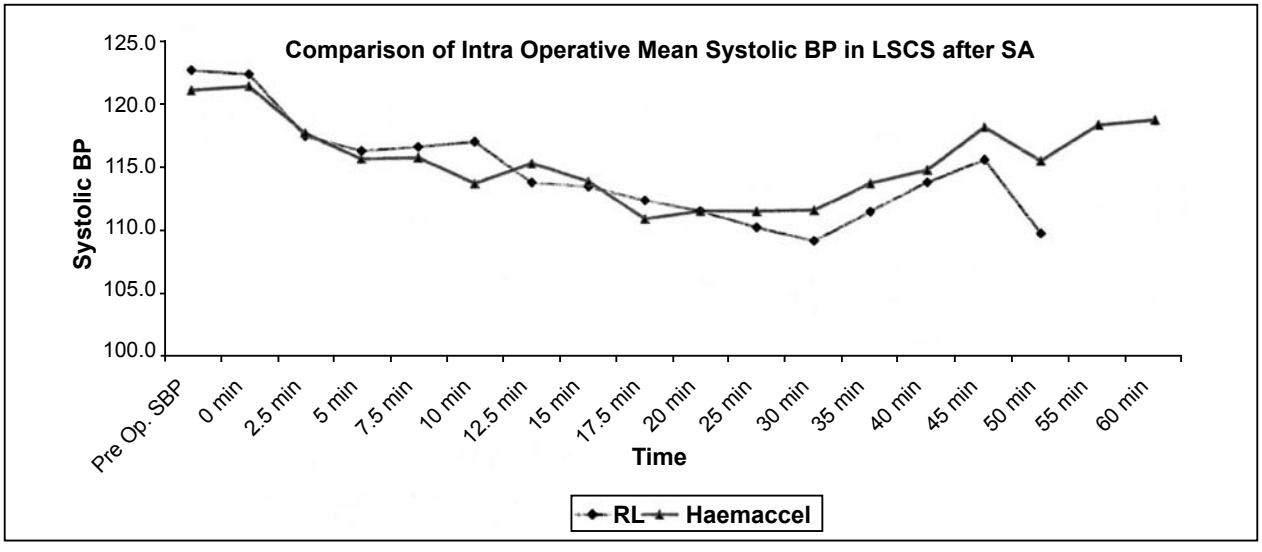

Fig 2: mean Systolic BP in various time

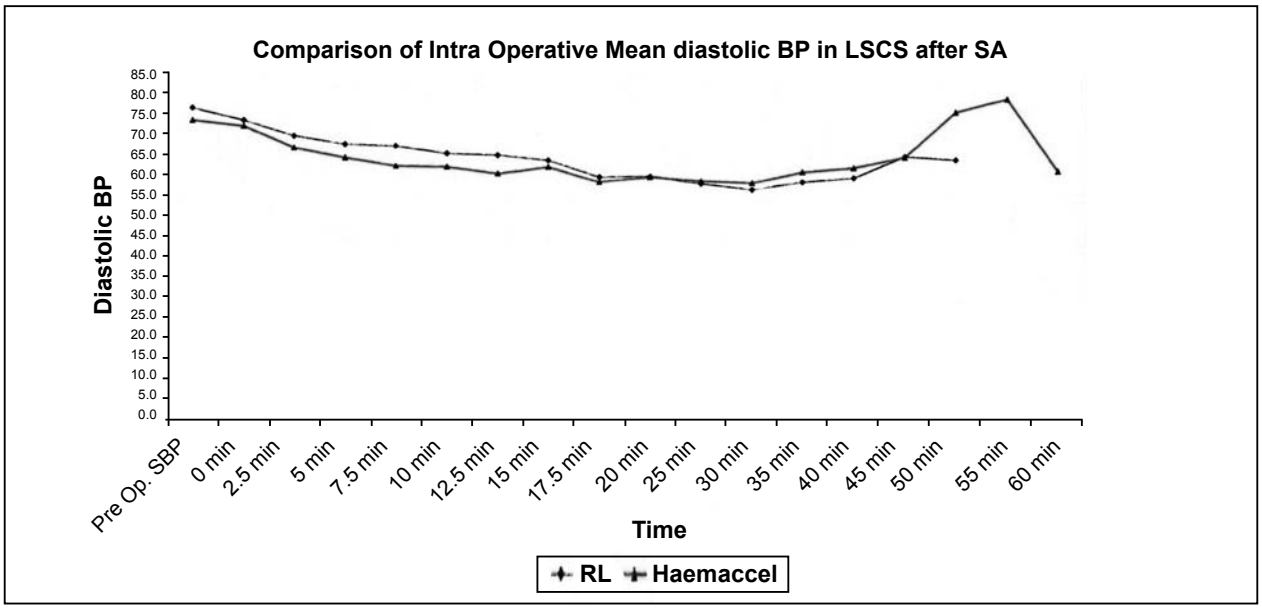

Fig 3: mean diastolic BP in various time

Discussion

The patients of group A in our study received Ringer lactate preloading 10ml/kg within ten minutes before subarachnoid block. The result from this study showed that 42%patients developed first episode of hypotension after 21.91+/-9.38 minutes of SAB. No patients developed nausea and vomiting but 14% patients developed second episode of hypotension and the mean time for the episode was 26.78+/-10.87 minute after SAB. 4% of patients developed third episode of hypotension at a mean time of 30.00+/-14.14 and 2%of patients also developed fourth episode of hypotension.

A study conducted by Venn et al[10] infused one litre of Hartman's solution (compound sodium lactate) fifteen minutes before spinal block for different lower abdominal and lower limb surgery. They found an incidence of hypotension of 66%. We infused the fluid over ten minutes before SAB and our incidence of hypotension was 42%. Relative lesser incidence of hypotension in our study might be due to shorter preloading time. Surgical procedure in our study was same while their patients were fasting for overnight and subarachnoid block for surgeries involving both lower abdomen and lower limb. So blood loss varies accordingly. Moreover their patients randomly received one litre of fluid irrespective of body weight whereas we preloaded with 10ml/kg body weight for patients.

Wollman et al[5], in another study found no incidence of Hypotension after preloading with one litre of 5% dextrose Ringer lactate solution. Similarly, Marx et al[11] also did not find any episode of hypotension after preloading with one litre of 5% dextrose ringer lactate solution before SAB. Clark et al[6] found the incidence of hypotension as 57% in their pregnant patients who receive one litre of crystalloid before SAB. Rout et al[12] infused ringer lactate 20ml/kg body weight over 20 minutes and 10 minute in ten patients undergoing elective caesarean section under spinal anaesthesia. 7 patients in 10 minute group developed hypotension severe enough to required ephedrine compared with 6 patients with 20 minutes group. It was concluded that rapid preloading did not significantly reduce the incidence of hypotension. In comparison to his 10 minutes group(20 ml/kg in 10 minutes) to our group A (10ml/kg in 10 minutes), the higher incidence of hypotension in their study may be due to longer fasting throughout the night for elective caesarean. Sharma et al[13] compared with preloading of one litre of Ringer lactate solution with 500 ml of 6% HES solution in non- parturient patients scheduled for tubal ligation. The incidence of hypotension in their group was 52%which is higher than in our study (42%). This may be attributed to longer fasting to the patients.

In our study 24% of the patients preloaded with Haemaccel, 10ml/kg body weight developed hypotension. The mean time for the development of the hypotension was 15.21+/-12.94 minutes after SAB. No patients developed nausea and vomiting, but 6% of patients developed second episode of hypotension and mean time for this episode was 21.66+/-7.21minute. No

third episode of hypotension was seen and no allergic reaction was seen in any patients.

Mathur et al[7] compared 5% albumin and 5%dextrose ringer lactate solution 15ml/kg over 15-20 minutes for elective caesarean section under spinal anaesthesia. The incidence of hypotension was 30% in 5%dextrose ringer lactate group and no episode in albumin group. High incidence of hypotension in our study (24%) in Haemaccel group as compared to their study may be due to less amount of preloading fluid (10ml/kg) and different physical and chemical properties of colloid. Baraka et al[14] compared 3% polymerisate of degraded succinylated gelatine in electrolyte solution and isotonic saline 7ml/kg body weight for elective TURP surgery. The incidence of hypotension in colloid group was 23.5% (4/17). The incidence of hypotension in our group B was 24% (12/50) which is comparable. Although the incidence of hypotension in patient receiving gelatin in our study and their study were similar, the patients characteristic (prolong fasting period, higher age group of patients and elective TURP) were different from our study.

Conclusion

From this study we can conclude that the incidence of hypotension was heigher in patients who received Ringer lactate infusion as a preloading fluid than who received Haemaccel as preloading fluid. It can be recommended that the preloading is an effective measure to prevent development of hypotension following spinal anaesthesia. Haemaccel gives better hemodynamic stability and lesser incidence of hypotension than that of Ringer lactate.

References

1. Greene NM. Physiology of spinal anaesthesia. Forth edition: Baltimre: Williame and Wilkins, 1981: vii-ix, 134-200.
2. Carpenter RL, Caplan RA, Brown DL, Stephenson RN, Wu R. Incidence and risk factor for side effects of spinal anesthesia. Anesthesiology 1968; 29:374-378.
3. Bruch CJ, Harrison RT. The effect of spinal anaesthesia on the cardiac output. Arch Surg 1930; 21; 330-332.
4. .Smith HW, Rovenstine EA, Golding W, Chasis H, Rangers HA. The effect of spinal anaesthesia on the circulation in normal, un-operated man with reference to arterioles and especially those of the renal circulation. J Cin Invest 1939; 18:319-339.
5. Wollaman SB, Marx GF. Acute hydration for prevention of hypotension of spinal anaesthesia in parturient. Anaesthesiology 1968; 29: 374-378.
6. Clark RB, Thomson DS, Thomson CH. Prevention of hypotension associated with caesarean section. Anaesthesiology 1976; 45: 670-674.
7. Mathru M, Rao TLK, Kartha RK, Shanmugham M, Jacobs HK. Intravenous albumin administration for prevention of spinal hypotension during caesarean section. Anesth Analog 1980:59:655-658.
8. Quon CY. Clinical pharmacokinetics and pharmacodynamics of colloid plasma volume expanders. J Cardiother Anesth 1988; 2: 13-23.
9. Czllesen T, SchouchborgL, Nelsen D, Guldager H and Kehlet. Combined epidural- spinal opioid free anaesthesia and analgesia for hysterectomy.Br. J. Anaesth. 199; 82(6) 81-5.
10. Venn PJH, Simpson DA, Rubin AP, Edstrom HH. Effect of fluid preloading on cardiovascular variables after spinal anaesthesia with glucose free 0.75% Bupivacaine. Br. J. Anesth 1989; 63: 682-687.
11. Marx GF, Cosmi VE, Wollmann SB. Biochemical status and clinical condition of mother and infant of caesarean section. Anesth Analg 1969; 48: 986-994.
12. Rout CC, Akoojee SS, Rocke Da, Gauws E. Rapid administration of crystalloid preload doesnot decrease the incidence of hypotension after spinal anesthesia for elective caesarean section. Br. J. Anesth 1992; 68: 394-7.
13. Sharma SK, Gajraj NM, Saidawi JE. Prevention of hypotension during spinal anaesthesia. A comparison of intravascular administration of hetastrach versus Ringer lactate solution. Anesth Analog 1997; 84:111-114.
14. Baraka AT, Taha SK, Ghabach MB, Sibaii AA/ N, Nader Am. Intravascular administration of polymerized gelatine versus isotonic saline for prevention of spinal induced hypotension. Anesth Analog 1994; 78: 301-303.