

Comparative Study between Preloading Over Coloding and Vasopressor Requirement for Spinal Anesthesia Induced Hypotension

Dr Jenny Aby Mammen Dr Madhu Velayudhan

Department of Anesthesia, Sree Gokulam Medical College and Research Foundation, Thiruvananthapuram, Kerala, India

Address for correspondence: Dr. Jenny Aby Mammen

Department of Anesthesia, Sree Gokulam Medical College and Research Foundation, Thiruvananthapuram, Kerala, India.

Abstract:

Background: Subarachnoid block is considered a safe regional anaesthesia technique. Hypotension remains most common intraoperative anesthetic complication following spinal anesthesia. One of the foremost methods to prevent the above complication includes prophylactic administration of i/v fluids before implementation of subarachnoid block which is called as preloading. Another method is the administration of i/v fluid bolus immediately after subarachnoid block which is known as coloding. The current study attempt to compare the efficacy of crystalloids as preloading infusion to prevent hypotension, requirement of vasopressors and the requirement of total fluid given during surgery to maintain stable hemodynamics

Keywords: Coloding, Preloading, Mephentermine

Date of Submission: 04-04-2022

Date of Acceptance: 19-04-2022

I. Introduction

Subarachnoid block is considered a safe regional anesthesia technique. Spinal anaesthesia was introduced in to clinical practice by German surgeon Karl August Bier in 1898¹. It is a good anaesthesia technique for surgeries like caesarean section, lower abdominal surgeries, lower limb orthopedic surgeries and urological procedures. As far as hypotension is concerned, after the introduction of different vasopressors and intravenous fluids, spinal anaesthesia has become relatively safe.

Hypotension remains most common intraoperative anesthetic complication following spinal anesthesia. It is defined as a decrease in the mean arterial pressure by more than 15 – 20 % from initial base level. It is considered to be a combined effect of reduced vascular resistance secondary to sympathetic blockade during spinal anesthesia. One of the foremost methods to prevent the above complication includes prophylactic administration of i/v fluids before implementation of subarachnoid block which is called as preloading^{2,3,4}. Another method is the administration of i/v fluid bolus immediately after subarachnoid block which is known as coloding.

Preloading with i/v fluids offsets the vasodilating effects of sympathectomy caused by spinal anaesthesia thereby maintaining the venous return and thus prevents a drop in blood pressure. Co loading may decrease the incidence of hypotension after subarachnoid block when compared to those who did not receive any preloading. However its not needed to preload all patients, needed only those patients who are having volume deficit.

This study was aimed to compare the efficacy of crystalloids as preloading infusion to prevent hypotension, requirement of vasopressors^{5,6} and requirement of total fluid given during surgery to maintain stable hemodynamics

II. Materials and Methods

After approval from the ethical committee and obtaining informed written consent from each patient, 184 patient of age group 18-60 years with ASA 1 or 2 scheduled for surgery under LSAB for inguinal hernia were included in the study. Patients were divided into 2 groups. Baseline parameters (HR, SBP, DBP, SpO₂) were recorded. The first group (group P) received 0.9% NS 20 minutes before spinal anaesthesia at 10ml/kg and 2nd group (group C) received 0.9 % NS immediately after spinal anaesthesia at 10ml/kg. After the initial fluid all patients received NS as maintenance and inj.mephenteramine. Under strict aseptic precautions LSAB

was given to all patients . Sensory level of blockade was checked using ice pack after 5 minutes. Hypotension (>20%from baseline) was managed with mephenteramine 6mg i/v subsequently until BP was increased to acceptable level. SBP,DBP,HR and use of mephenteramine was recorded at 5 minutes interval till 20 minutes and 10 minutes interval till end of surgery

III. Results

There was no significant difference in systolic BP among the two groups before the start of the procedure .After 5 minutes of giving spinal anaesthesia the average SBP in group P {112.6(SD=18.5)} significantly different from that of group C {122.5 (SD=16.4)} at a p value of < .001. The finding of reduced SBP in group P compared with that of group C was persistent on serial SBP recording till 30 minutes of giving anaesthesia.By the end of 40 minutes there was no significant difference in SBP among the two groups,a finding which lasted till the end of measurement(Fig 1) . Five minutes after giving spinal anaesthesia the usage of mephentermine to manage hypotension was more in group P (33.7%) compared with that of group C(16.3%) at a p value of .01. Usage of mephentermine remained strikingly high in group P until the end of 30 minutes. Intravenous mephentermine was not required to maintain BP after 40 minutes in both groups (Fig 2) .

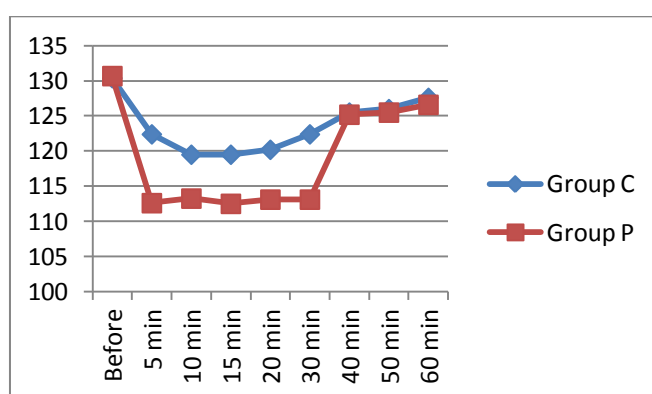


Fig 1

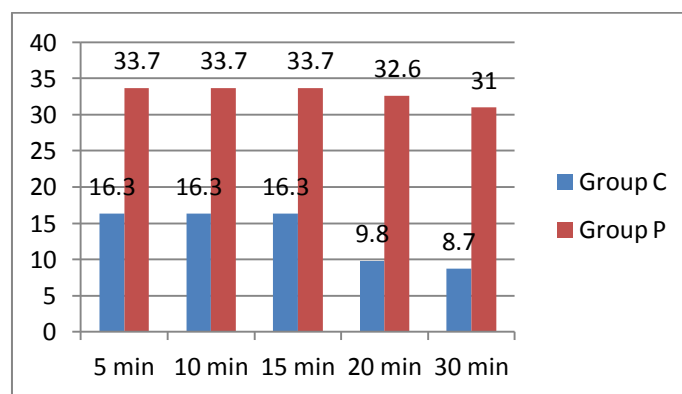


Fig 2

IV. Discussion

In the present study the average Systolic BP(SBP) before the procedure in group P was similar to that of Group C..After 5 minutes of giving spinal anaesthesia the average SBP in group P {112.6(SD=18.5)} was significantly different from that of group C {122.5 (SD=16.4)} at a p value of < .001. The finding of reduced SBP in group P compared with that of group C was persistent on serial SBP recording till 30 minutes of giving anaesthesia.

These findings were similar to a study by Sharma A et al in 2016 where they reported a gradual fall in systolic blood pressure from baseline after the induction of spinal anaesthesia in both the Groups(coloaded and preloaded group). Statistically significant difference in blood pressure was during the period from 10 to 15 minutes, when systolic blood pressure in Group C was significantly higher than in Group P. After 20 minutes, there was no significant difference in systolic blood pressure between the groups

In the current study hypotension was defined as systolic blood pressure less than 20% of the calculated baseline value when mephentermine was given to maintain BP. It was revealed that the incidence of hypotension was lesser in coload group (16.3%) as compared to the preload group (33.7%) and the difference

was statistically significant ($p < 0.001$)

This result was comparable to that found in the studies by Mojica¹⁴ et al and Kamenik et al⁸. They reported that rapid infusion of 20ml/kg lactated Ringer's solution did not reduce the incidence of hypotension compared with a control group, although patients who received rapid fluid after induction had a lower incidence of hypotension (47%).

Cardoso et al⁹. compared 10 ml/kg of RL as coload and preload in parturients and reported the incidence of hypotension as 22.5% and 25% in the coload and preload groups respectively

Findings in the study correlated with Williamson.W et al [2009]¹⁰ study, which was a randomised control study with 87 patients undergoing SAB. were preload group [control], [preload/coload] experimental group. Supplemental vasopressors, iv bolus, fluids were higher in the preload group and statistically significant they hypothesized that administering 10ml/kg crystalloid before and 10ml/kg immediately following injection of the SAB would provide benefit.

Jacob JJ, William A, Verghese, M Afzal L, (2012)¹¹⁻¹³ studied 100 patients scheduled for spinal anaesthesia randomized to two groups one group receiving 15ml/kg RL as preload and other group receiving 15ml/kg RL as co-load. Number of patients developing hypotension in preload group is significantly higher compared to co-load group. Ephedrine requirement is high in preload group and statistically significant¹³.

Banerjee et al. (2010)¹⁴ did a meta-analysis to determine the timing of the fluid infusion before (preload) or during (co-load) induction of spinal anaesthesia for caesarean delivery. They retrieved eight randomized controlled trials comprised of 518 patients that compared a fluid preload with co-load in patients undergoing spinal anaesthesia. They graded the articles and recorded the incidence of hypotension, lowest blood pressure, incidence of nausea and vomiting etc. Incidence of hypotension in co-load group is less [59.3%] compared to preload group 62.4 %

Other studies comparing crystalloid preloading and coload in patients undergoing spinal anaesthesia have reported variable incidence of hypotension. All these studies revealed higher incidence of hypotension in preload group than in coload group which was comparable to that found in the present study. In contrast to these findings

Bouchnak et al¹², reported higher incidence of hypotension in the coload group (96.6%) than in the preload group (86.6%) while comparing 20ml per kg of crystalloid as coload or preload in obstetric population. The wide variations in the incidence of hypotension in these studies may be explained by differences in the definition of hypotension used in the studies, the different volumes of crystalloids used and the differing rates of administration of the crystalloids.

Keeping the above facts in view, the concept of "coload" was introduced for prevention of spinal induced hypotension. The rationale for effectiveness of coload can be explained by timing of hemodynamic events after spinal anaesthesia. Sympathetic nerve blockade is completed within the first 10 minutes after administration of bupivacaine in subarachnoid space. There are high chances of hemodynamic changes like hypotension and bradycardia in this period¹⁵⁻¹⁶. Preloading before commencement of spinal anaesthesia may be effective but with considerable risk of volume overload. But coload makes available extra fluid in intravascular space during period of the highest risk of hemodynamic changes due to spinal anaesthesia. So it leads to timely compensatory changes in cardiovascular system and limits fluid redistribution and excretion²⁷ with reduced risk of fluid overload. So coload is physiologically more appropriate and rational approach as has been proved in the present study also

V. Conclusion

Rapid crystalloid administration after, rather than over 20 minutes before the induction of spinal anaesthesia prevent hypotension and decrease the requirement of vasopressors and requirement of total fluid given during surgery to maintain stable hemodynamics.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest

References

- [1]. Parameshwara G. Spinal, epidural to combined spinal epidural analgesia. the history of central neuraxial block. Indian J Anaesth 2001; 45(6): 406.
- [2]. Rout CC, Rocke DA, Levin J, Gouws E, Reddy D. A reevaluation of the role of crystalloid preload in the prevention of hypotension associated with spinal anaesthesia for elective caesarean section. Anesthesiology 1993; 79: 262-269.
- [3]. Jackson R, Reid JA, Thorburn J. Volume preloading is not essential to prevent spinal-induced hypotension at caesarean section. Br J Anaesth 1995; 75: 262-265.

- [4]. Vercauteren MP, Hoffmann V, Coppejans HC et al. Hydroxyethyl starch compared with modified gelatin as volume preload before spinal anaesthesia for caesarean section. *Br J Anaesth* 1996; 76: 731-733.
- [5]. Gajraj NM, Victory RA, Pace NA et al. Comparison of ephedrine infusion with crystalloid administration for prevention of hypotension during spinal anaesthesia. *Anesth Analg* 1993; 76: 1023-26.
- [6]. Morgan PJ, Halpern SH, Tarshis J. The effects of an increase of central blood volume before spinal anesthesia for cesarean delivery: a qualitative systematic review. *Anesth Analg* 2001; 92:997-1005.
- [7]. Kamenik M, Paver-Erzen V. The effect of lactated Ringer's solution infusion on cardiac output changes after spinal anesthesia. *Anesth Analg* 2001; 92(3): 710714
- [8]. Cardoso MMSC, Santos MM, Yamaguchi ET, Hirahara JT, Amaro AR. Fluid preload in obstetric patients. How to do it? *Rev. Bras. Anesthesiol.* 2004; 54(1):13-19
- [9]. Edno magalhaes – ephedrine Vs phenylephrine in the prevention of hypotension during spinal block for caesarean section and effects on foetus – *Rev. Bras. Anaesthesiol.* Vol 59 No.1 campines Jan / Feb 2009.
- [10]. Mercier FJ–Phenylephrine added to prophylactic ephedrine infusion during spinal anaesthesia for elective caesarean section- *Anesthesiology* 2001; Sep 95 (3) ; 668- 74.
- [11]. Bouchnak M, Ben Cheikh N, Skhiri A, Yaacoubi M, Menif MA, Smaoui M, et al. Relevance of rapid crystalloid administration after spinal anaesthesia (coload) in prevention of hypotension during elective caesarean section: A685. *Eur J Anaesthesiol* 2006;23:178.
- [12]. Bajwa SJ, Bajwa SK, Kaur J, Singh A, Singh A, Parmar SS. Prevention of hypotension and prolongation of postoperative analgesia in emergency cesarean sections: A randomized study with intrathecal clonidine. *Int J Crit Illn Inj Sci.* 2012;2:63–9. [PMC free article] [PubMed] [Google Scholar]
- [13]. Banerjee A, Stocche RM, Angle P, Halpern SH. Preload or coload for spinal anesthesia for elective cesarean delivery: a meta-analysis. *Canadian Journal of Anesthesia* 2010; 57(1): 24-31
- [14]. Riaz A, Munzar Z. Preloading before spinal anesthesia for Cesarean section. A comparison between colloid and crystalloid preload. *Anesth Pain Intens Care* 2006; 10:9-12.
- [15]. Gunusen I, Karaman S, Ertugal V, Firat V. Effects of fluid preload compared with crystalloid co-load plus ephedrine infusion on hypotension and neonatal outcome during spinal anaesthesia for Caesarean delivery. *Anaesth Intensive Care* 2010; 38(4):647-653

Dr. Jenny Abhy Mammen, et. al. "Comparative Study between Preloading Over Coload and Vasopressor Requirement for Spinal Anesthesia Induced Hypotension." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 21(04), 2022, pp. 06-09