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ORIGINAL ARTICLE

Effectiveness of Preload Verses Coload of Crystalloid during Spinal Anesthesia for Cesarean Delivery

RIZWAN ANSARI[1], ARSALAN JAMIL[2], HAIDER ALI KHAN[3], NAILA ZAHOOR[4], ZAMIR AHMAD[5], FAISAL FAROOQ[6]
[1]Consultant, Department of Anesthesia, CDF Hospital, Hyderabad
[2]Consultant, Department of Anesthesia, Aga Khan University Hospital, Karachi
[3]Senior Registrar, [5]Consultant, [6]Assistant Professor, Department of Anesthesia, Sindh Institute of Urology & Transplantation Karachi
[4]Assistant Professor of Anesthesia, Baqai Medical University, Karachi
Correspondence to: Dr. Rizwan Ansari, E-mail: truerepentence@gmail.com, Cell: 0333-2601883

ABSTRACT

Objective: To compare the effectiveness of preload verses coload of crystalloid during spinal anesthesia for cesarean delivery

Study design: Randomized controlled trial

Place and Duration of Study: Department of Anaesthesia, Civil Hospital Karachi from 1st November 2017 to 30th April 2018.

Methodology: Sixty patients with age in between 18 to 35 years irrespective of parity having ASA physical status I and II and gestational age 37 completed weeks underwent cesarean section under spinal anesthesia were enrolled. Patients were randomized into one of two groups (P or C). A decrease of systolic blood pressure by 20% or more from the baseline value was taken as hypotension.

Results: The mean age, weight, height, BMI and gestational age of the patients was 29.5±4.83 years, 60.16±5.17 kg, 1.54±0.60 m, 27.04±5.07 kg/m^2 and 38.13±1.07 weeks respectively. Efficacy was significantly higher 25 (83.3%) among patients in preload group as compared to coload group 17 (56.7%) [P=0.024].

Conclusion: Effectiveness of preload was found to be less than coload of crystalloid during spinal anesthesia for cesarean delivery

Keywords: Crystalloid, Preload, Coload, Spinal anesthesia, Cesarean delivery

INTRODUCTION

Spinal anesthesia is commonly used for cesarean delivery, due to its fast onset, dense neural blockage, low risk of local anesthetic toxicity and limited transfer of the medication to the fetus and low risk of block failure. A higher frequency of hypotension is still one of the drawbacks. Intravenous fluid management, avoidance of arterial compression and careful blood pressure control at regular intervals steps that have been listed to reduce the risk of hypotension to different degrees, but none has been shown to be sufficient.[1-2]

Maternal hypotension is exacerbated by an intravascular volume deficiency which increases sympathetic blocking during spinal anesthesia. Pre-hydrating fluids has traditionally been prescribed for hypotension prevention following spinal anesthesia. However, the effectiveness of the preload was under discussion and experiments were conducted to assess the prevention impact of preloading the fluid comparing coload i.e. hydration during the actual block delivery of the cesarean fluid. There were no major discrepancies in the occurrence of maternal hypotension or neonatal outcomes between the two approaches in previous studies using colloid fluid.[3-5] As far as crystalloids are concerned, its impact is still under discussion. Some studies have also shown that crystalloid prehydration had low effectiveness in preventing hypotension during cesarean delivery.[6,7] The recently studies have shown that colloids are more effective than crystalloids in hypotension prevention, many institutions use crystalloids due to possible colloid drawbacks, such as cost, allergy and coagulation effects.[8,9] Crystalloids do not stay intravascular, but rapidly distribute into the extracellular fluid and the time remaining intravascular in crystalloids is much shorter than in colloids. Therefore, the timing of the infusion can therefore be the main key to prevent hypotension, because the volume expanding effect is maximal at the time of administration. In a recent analysis, the frequency of hypotension in the coload group was less than in the preload group (53% vs. 83%, P=0,026).[10]

Hypotension remains a permanent problem in spinal anaesthesia, although different experiments have been conducted with crystalloids to fight hypotension and to facilitate healthy operation while investigating the timeframe for crystalloid. The present study is therefore planned with an intension to compare the various times for crystalloid loading (pre and coload) to prevent hypotension. The better of the two timings was then used in future among women undergoing C section.

MATERIAL AND METHODS

This randomized controlled trial study was conducted at Department of Anaesthesia, Civil Hospital Karachi from 1st November 2017 to 30th April 2018. Sixty patients with age more than 18 to 35 years irrespective of parity, undergoing cesarean section under spinal anaesthesia, ASA physical status I and II and gestational age 37 completed weeks assessed on dating scan were included. Multiple gestations assessed on ultrasound, fetal distress, preeclampsia (SBP ≥140 mmHg and protein urea 3$^+$ on dipstick), H/O cardiovascular disease and H/O diabetes mellitus were excluded. Patients were randomized by drawing process into one of two classes (P or C). The preload group "P" and the coload group "C" was named. On arrival at the spinal anesthesia, group "P" obtained a rapid infusion of 15 ml/kg of Hartmann 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). In group "C," the same

volume and form of fluid was injected only after intrathecal administration of local anesthetic solution. The systematic blood pressure was measured three times in a wedged supine position before beginning spinal anesthesia, and the average of three readings is taken as baseline. An anesthesiologist had more than 2 years' experience in the right lateral decubitus role in the spinal anesthesia. Following lidocain skin penetration, a 26-gage spinal needle was inserted at the intersection L 3-4. 0.5% hyperbaric bupivacaine 8 mg and fentanyl 15 µg were administered after clear cerebrospinal fluid. Then patients were positioned in a tilted supine position immediately. For all women, urinary catheter was inserted. Systolic Blood pressure was measured at a time of 1 minutes from 1 minute to 20 minutes after intrathecal injection. A 20% or more drop in systolic blood pressure from the baseline value was taken from Hypotension and treated with IV ephedrine in increments of 5 mg. This data was recorded along with age, gestational age, ASA status, parity, height and weight. The data was entered and analyzed through SPSS-20. The two groups were compared in terms of efficacy, applying Chi square test and P value ≤ 0.05 was considered as significant**.**

RESULTS

Insignificant difference of age, weight, height, BMI, gestational age, baseline and final systolic blood pressures was observed between groups (Table 1). There were 28 (46.7%) patients with ASA status I and 32 (53.3%) patients with ASA status II. Most of the patients 18 (60%) with ASA status I were presented in preload group while in coload group, most of the patients were presented with ASA status II (Fig. 1). There were 30 (50%) patients with multiparous status, 23 (38.3%) with primiparous and 7 (11.7%) with nulliparous status. In preload group, majority of the patients 19 (63.3%) were presented with multiparous status while in coload group, majority of the patients were presented with primiparous status (Fig. 2). Maternal hypotension was observed 18 (30%) patients. Majority of the patients in coload group were presented with no maternal hypotension (Fig. 3). Comparison of efficacy with respect to group showed that efficacy was significantly higher 25 (83.3%) among patients in coload group as compared to preload group 17 (56.7%) (p-value 0.024). (Table 2)

Table 1: Comparison of age, weight, height, gestational age, baseline and final systolic blood pressures in both groups

Variable	Coload Group	Preload Group	P value
Age (years)	28.7±5.01	30.3±4.58	0.184
Weight (kg)	60.5±5.30	59.86±5.11	0.657
Height	1.55±0.64	1.53±0.56	0.171
BMI (kg/m^2)	26.11±5.42	27.99±4.60	0.152
Gestational age (weeks)	38.20±1.15	38.06±0.98	0.632
Baseline systolic blood pressure	87.43±6.06	85.46±4.25	0.151
Final systolic blood pressure	101.73±9.43	99.40±7.90	0.304

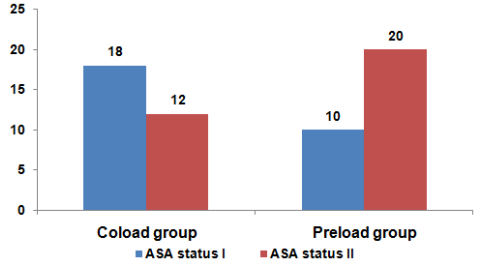

Fig. 1: Comparison of ASA status in both groups

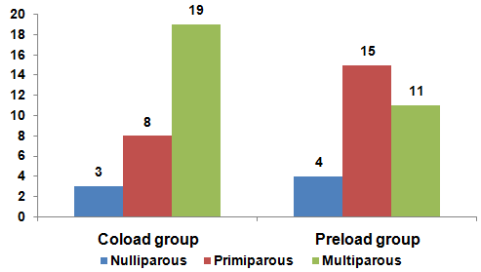

Fig.2: Comparison of parity in both groups

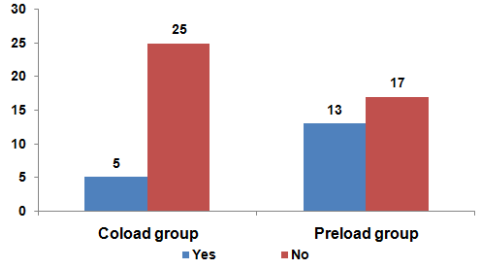

Fig.3: Comparison of hypotension in both groups

Table 2: Comparison of efficacy according to groups (n= 60)

Efficacy	Coload	Preload	P value
Yes	25 (83.3)	17 (56.7)	0.042
No	5 (16.7)	13 (43.3)	

DISCUSSION

Maternal hypotension is exacerbated by an intravascular volume deficiency which increases sympathetic blocking during spinal anesthesia. Pre-hydrating fluids has traditionally been prescribed for hypotension prevention following spinal anesthesia. However, the effectiveness of the preload was under discussion and experiments were conducted to assess the prevention impact of preloading the fluid comparing coload i.e. hydration during the actual block delivery of the cesarean fluid. There were no major discrepancies in the occurrence of maternal hypotension or neonatal outcomes between the two approaches in previous studies using colloid fluid.[3-5]

Some studies have also shown that crystalloid prehydration had low effectiveness in preventing hypotension during cesarean delivery.[6,7] The recent studies have shown that colloids are more effective than crystalloids in hypotension prevention, many institutions use crystalloids due to possible colloid drawbacks, such as cost, allergy and coagulation effects.[8,9] Crystalloids do not remain intravascular space but rapidly distribute into the

extracellular fluid and the time left intravascular in crystalloids is much shorter than colloids. In a recent analysis, the frequency of hypotension in the coload group was less than in the preload group (53% vs. 83%, P = 0.026).[10]

In this study, efficacy in preload group 25 (83.3 %) among patients was significantly higher (P=0.0234) as compared to coload group 17 (56.7 %). In four different experiments, the impact of a colloid coload was comparable to the colloid preload.[11-14] None of these studies showed the superiority of one regimen over another either with regard to maternal hypotension and vasopressor requirements, or in terms of Apgar scores and the fetal acid-base balance. In one study, Teoh et al[14] found that increase in cardiac output significantly in patients who were preloaded with 15 mL.kg-1 hydroxyethyl starch relative to baseline, but this increase was not maintained after ten minutes after spinal anesthetism.

To date, only one reported study compares co-loading with 1.000 mL of hydroxyethyl starch and co-loading in parturients that have also obtained phenylephrine infusion with an equal amount of crystalloids.[15]

Colloids are likely to provide more versatility as their administration offers the same advantages as preloading or coloading. Hydroxyethyl starches, on the other hand, are more expensive than crystalloid solutions. Pruritus, haemastasis changes and renal failure can be associated with them. They are also at risk for anaphylaxis with 0.06% incidence.[16] With modern hydroxyethyl starches, these risks are negligible at the clinical doses widely used (usually\1 L).[17]

CONCLUSION

Effectiveness of preload was found to be less than coload of crystalloid during spinal anesthesia for cesarean delivery

REFERERNCES

1. Birnbach DJ, Browne IM. Anesthesia for Obstetrics. In Miller RD, editor. Miller's Anesthesia. Philadelphia: Elsevier Churchill Livingstone, 2010; 2203-40.
2. Cyna AM, Andrew M, Emmett RS, Middleton P, Simmons SW. Techniques for preventing hypotension during spinal anaesthesia for caesarean section. Cochrane Database Syst Rev 2006, 4: CD002251.
3. Siddik-Sayyid SM, Nasr VG, Taha SK, Zbeide RA, Shehade JM, Al Alami AA, et al. A randomized trial comparing colloid preload to coload during spinal anesthesia for elective cesarean delivery. Anesth Analg 2009;109(4):1219–24.
4. Nishikawa K, Yokoyama N, Saito S, Goto F. Comparison of effects of rapid colloid loading before and after spinal anesthesia on maternal hemodynamics and neonatal outcomes in cesarean section. J Clin Monit Comput 2007;21(2):125-9.
5. Teoh WH, Sia AT. Colloid preload versus coload for spinal anesthesia for cesarean delivery: the effects on maternal cardiac output. Anesth Analg 2009;108(5):1592–8.
6. 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 anesthesia for elective cesarean section. Anesthesiology 1993;79(2):262-9.
7. Jackson R, Reid JA, Thorburn J. Volume preloading is not essential to prevent spinal- induced hypotension at caesarean section. Br J Anaesth 1995;75(3):262-5.
8. Tamilselvan P, Fernando R, Bray J, Sodhi M, Columb M. The effects of crystalloid and colloid preload on cardiac output in the parturient undergoing planned cesarean delivery under spinal anesthesia: a randomized trial. Anesth Analg 2009;109(6):1916-21.
9. Madi-Jebara S, Ghosn A, Sleilaty G, Richa F, Cherfane A, Haddad F, et al. Prevention of hypotension after spinal anesthesia for cesarean section: 6% hydroxyethyl starch 130/0.4 (Voluven) versus lactated Ringer's solution. J Med Liban 2008;56(4):203–7.
10. Oh AY, Hwang JW, Song IA, Kim MH, Ryu JH, Park HP, et al. Influence of the timing of administration of crystalloid on maternal hypotension during spinal anesthesia for cesarean delivery: preload versus coload. BMC Anesthesiol 2014, 14:36.
11. Nishikawa K, Yokoyama N, Saito S, Goto F. Comparison of effects of rapid colloid loading before and after spinal anesthesia on maternal hemodynamics and neonatal outcomes in cesarean section. J ClinMonitComput 2007; 21: 125-9.
12. Carvalho B, Mercier FJ, Riley ET, Brummel C, Cohen SE. Hetastarch co-loading is as effective as pre-loading for the prevention of hypotension following spinal anesthesia for cesarean delivery. Int J ObstetAnesth 2009; 18: 150-5.
13. Siddik-Sayyid SM, Nasr VG, Taha SK, et al. A randomized trial comparing colloid preload to coload during spinal anesthesia for elective cesarean delivery. AnesthAnalg 2009; 109: 1219-24.
14. Teoh WH, Sia AT. Colloid preload versus coload for spinal anesthesia for cesarean delivery: the effects on maternal cardiac output. AnesthAnalg 2009; 108: 1592-8.
15. McDonald S, Fernando R, Ashpole K, Columb M. Maternal cardiac output changes after crystalloid or colloid coload following spinal anesthesia for elective cesarean delivery: a randomized controlled trial. AnesthAnalg 2011; 113: 803-10.
16. Laxenaire MC, Charpentier C, Feldman L. Anaphylactoid reactions to colloid plasma substitutes: incidence, risk factors, mechanisms. A French multicenter prospective study (French). Ann Fr Anesth Reanim 1994; 13: 301-10.
17. Westphal M, James MF, Kozek-Langenecker S, Stocker R, Guidet B, Van Aken H. Hydroxyethyl starches: different products–different effects. Anesthesiology 2009; 111: 187-202.