Original Article

Spinal Anesthesia in Caesarean Section

Comparison of Crystalloid Preload Rapid Administration after Induction of Spinal Anesthesia in Women Undergoing Elective Caesarean Section

Ravi Kumar[1], Aruna Kumari Hira[3], M. Aneeque Alam Khan[4], Kashif Ali[5], Pavan Kumar[6] and Mukhtiar Begum Noonari[2]

ABSTRACT

Objective: To compare crystalloid preload with prompt administration post induction of spinal anesthesia in women undergoing elective caesarian section.

Study Design: Randomized controlled trial study

Place and Duration of Study: This study was conducted at the Department of Anesthesia, Jinnah Postgraduate Medical Centre, Karachi from July, 2018 to January, 2019 for a period of six months.

Materials and Methods: One hundred and fifty-four patients underwent elective caesarian section under spinal anesthesia were included and divided into two groups, coload and pre load (Group C and Group P). All patients were given bupivacaine. In group P, patients were injected 15 ml/kg ringer lactates solution for over 20 minutes prior to spinal block whereas in group C patients, ringer lactate was injected over 20 min post CSF tapping. Presence of nausea and vomiting were recorded. Maternal hypotension was assessed.

Results: The mean age in Group P was 36.32±6.68 years and Group C was 34.77±5.61 years. In Group P, nausea was 27.3%, vomiting was 37.7% and hypotension was 64.9%. In Group C nausea was 16.9%, vomiting was 9.1% and hypotension was 42.9%. Vomiting and hypotension were significantly association with two study groups but nausea was not found any significance.

Conclusion: Crystalloid preload observed more nausea, vomiting, and hypotension as compared to patients of coload.

Key Words: Crystalloid preload, Rapid administration, Spinal anaesthesia, Elective caesarian section

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INTRODUCTION

Spinal anesthesia is commonly associated with hypotension which is a reaction of cardiovascular system. It occurs as a result of accelerated venous capacity and decline in resistance of systematic vascular supply.[1] Almost 70-80% spinal anesthetized patients developed intra-operative hypotension.[2,3] A large volume of crystalloids is given prior (20-30 min) to spinal anesthesia as a prevention measure against spinal-induced hypotension.[4]

The crystalloids efficiency before deliverance of spinal blockers has been verified as non-beneficial by studies on obstetric patients.[5,6] Injecting intra-venous crystalloids makes patients at a greater risk of pulmonary edema especially in vulnerable patients and also resulting in non-catherized patient to retain urine after surgery.[7] Fluids are given prior to spinal blocker for increasing venous-return so that to conserve central volume of blood in addition to output by the heart. Therefore, studies have evidently proved that deliverance of crystalloids prior to spinal blocker does not assist in incidence reduction of spinal generated hypotension.[8]

[1.] Department of Anesthesiology/Surgery & Allied / Obstet & Gynae[2], Sir Syed College of Medical Sciences for Girls Karachi.
[3.] Department of Obstet & Gynae, Dow University of Health Sciences, Karachi.
[4.] Department of Anaesthesia, Sindh Institute of Urology & Transplantation, Karachi
[5.] Department of Anaesthesia, Hussain Lakhani Hospital/Iqra University, Karachi.
[6.] Department of Anaesthesia, Al-Tibri Medical College Karachi.

Correspondence: Dr. Ravi Kumar, Assistant Professor, Department of Anesthesiology/Surgery & Allied, Sir Syed College of Medical Sciences for Girls Karachi.
Contact No: 0333-7361000
Email: ravi2275000@gmail.com

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Crystalloids have minimal intra vascular shelf life.[4] Therefore their deliverance in addition to IV fluids post spinal anesthesia was seemed to be beneficial in reducing cardio related side effects and maintaining arterial pressures.[9]

Hypotension was found in 30(60%) and 23(46%) patients among pre and coload groups respectively. Nausea was found in 19(38%) and 10(20%) patients among pre and coload groups respectively. Vomiting occurred in 14 (28%) and 6 (12%) patients among pre and coload groups respectively.[10]

MATERIALS AND METHODS

This randomized controlled trial was conducted at Department of Anesthesia, Jinnah Postgraduate Medical Centre, Karachi from 8th July 2018 to 7thJanuary 2019 and comprised 154 patients (77 in each group). Age range 18 to 45 years, gestational age 37 to 41 weeks assessed on dating scan, women who underwent elective caesarian through spinal anesthesia and ASA status I & II were included. Patients with chronic hypertension, PIH, cardiovascular or cerebrovascular disease on medications, chronic hypertension, anaemia, eclampsia, PIH, APH, fetal distress or any contra-indication to spinal anesthesia were being excluded.

Patient's allocation into two groups coload and pre load (Group C and Group P) was made. Height was assessed on stadiometer with bare foot and weight was measured in light cloths on bathroom scale with reading nearest to 0.1kg. Ranitidine in addition to metoclopramide was given to each patient on surgery day. Electrocardiography, oxygen saturation, baseline heart rate (HR), systolic (SBP) and diastolic blood pressure (DBP as well as NIBP-instituted and, were recorded. Spinal anesthesia was delivered to each patient through 2.2 milliliter of 0.5 percent hyperbaric bupivacaine inside intervertebral spaces (left lateral location) such as in L3-4 or L2-3 through 23 or 25G Quincke's needle for spine. All preparations were kept aseptic. Ringer lactate (RL) solution was delivered as 15ml/kg in P group before twenty minutes of spinal block administration. In those patients belonging to group C RL was injected around twenty minutes post tapping of CSF. Post blocking and surgery initiation the sensory level of patient was analyzed and T5 levels were aimed to achieve.

Each patient HR, systolic and diastolic blood pressure were monitored after every two minutes until ten minutes followed by five minutes measuring until 30 minutes and finally measurement after every ten minutes until the completion of surgery. Complains of nausea/vomiting were documented. Reduction in systolic blood pressure by a level of ≥20% from the baseline or SBP <90mmHg (absolute estimate) was defined as maternal hypotension. Injection ephedrine three milligram was given to patients with episodes of hypotension in incremental dosage in addition to fluid boluses.

The data was entered and analyzed through SPSS-20. Two groups were compared in terms of nausea, vomiting and hypotension by applying Chi square test. p value ≤0.05 was taken as significant.

RESULTS

The mean age in Group P was 36.32±6.68 years while in Group C was 34.77±5.61 years. The mean parity in Group P was 3.26±1.75 years and in Group C it was 3.25±1.74 years. The mean gestational age in Group P was 39.80±1.19 weeks and in Group C it was 39.73±1.14 weeks. The mean duration of surgery in Group P was 82.31±28.98 min and in Group C it was 86.17±31.58 minutes. The mean weight in Group P was 72.12±9.54 Kg and in Group C it was 72.03±11.15 Kg (Table 7). The mean height in Group P was 1.61±0.12 meters and in Group C it was 1.63±0.08 meters. Mean BMI in Group P was 28.10±5.71 Kg/m^2 and in Group C it was 26.83±3.24 Kg/m^2 (Table 1).

Table No.1: Descriptive statistics of the patients (n=154)

Variable	Group P (n=77)	Group C (n=77)
Age (years)	36.32±6.68	34.77±5.61
Parity	3.26±1.75	3.25±1.74
Gestational age (weeks)	39.80±1.19	39.73±1.14
Duration of surgery (min.)	82.31±28.98	86.17±31.58
Weight (kg)	72.12±9.54	72.03±11.15
Height (m)	1.61±0.12	1.63±0.08
BMI (Kg/m^2)	28.10±5.71	26.83±3.24

Table No.2: Demographic information of the patients (n=154)

Variable	Group P		Group C	
	No.	%	No.	%
ASA Class				
I	37	48.1	36	46.8
II	40	51.9	41	53.2
Diabetes mellitus				
Yes	21	27.3	13	16.9
No	56	72.7	64	83.1

In group P, 48.1% study subjects were found with ASA Class-I, and 51.9% study subjects with ASA class-II. In group C, 46.8% study subjects were found with ASA Class-I, and 53.2% study subjects with ASA class-II. It was observed that in group P, 31.2% were diabetic and in group C, 22.1% study subjects were diabetic (Table 2).

In Group P, nausea was observed by 27.3%, vomiting was observed in 37.7% and hypotension was observed in 64.9% study subjects. While in Group C, nausea was observed by 16.9%, vomiting was observed in 9.1% and hypotension was observed in 42.9%. The results

showed that vomiting (p=0.000) and hypotension (p=0.006) were significantly association with two study groups but nausea (p=0.120) was not found any significance (Table 3).

Table No. 3: Comparison of nausea, vomiting and hypotension among groups (n=154)

Variable	Group P	Group C	P value
Nausea			
Yes	21 (27.3%)	13 (16.9%)	0.120**
No	56 (72.7%	64 (83.1%)	
Vomiting			
Yes	29	7	0.000*
No	48	70	
Hypotension			
Yes	50	33	0.006*
No	27	44	

**Not Significant >0.05 *Significant <0.05 levels

DISCUSSION

Spinal anesthesia is generally used during cesarean sections due to multiple reasons, the most important one is easy to perform[11] and also to avoid other pregnancy related complications. However, it is associated with significant reduction in blood pressure as indicated in various research up to 83%.[12] Hypotension can cause mild problems like nausea and vomiting to deleterious effects like cardiac arrest.[13] Therefore, despite of its advantages, this exacerbated chances of hypotension in women has become the major concern of anesthetist around the globe. Accordingly, several strategies used to prevent hypotension, changing hemodynamic parameters in spinal anesthesia cause sympatholysis.[14]

Sympatholysis causes vasodilation and reduces the pressure on blood vessels. Several studies focused on "filling" the vessels. A study of Muzlifah and Choy[14] compared the effects of two doses of single crystalloid. Result of the study indicated that larger dose is not required to minimize the effect. Another study by Siddik et al[15] compared additional mixture with crystalloid i.e colloid. This study proved that 10% hydroxyethyl starch is better that ringer's lactate in maintaining maternal blood pressure. Findings of another study Tamilselvan et al[16] further elaborate the accurate flow time and cardiac output of the mother. In their study, they used 6% hydroxyethyl starch and ringers lactate. Effect was high but was not enough to maintain normal blood pressure.[17] Another study Teoh and Siah[18] compared the effect of colloid in preload and coload, the result remains the same.

Similarly, another study showed the comparison of various colloid and crystalloid preload with no preload.[19] They still did not observe any difference among all the groups. It concluded that, these are ineffective in attaining normal blood pressure. McDonald et al[20] highlighted that cardiac output of the mother will remain same if she is coloaded either with crystalloid or colloid. However, the major concern with the use of colloids is that, they also have deleterious side effects even including anaphylactic reactions and are also expensive.[21] Likewise, a study of Dyer et al[7] concluded that, despite of the fact, hemodynamic parameters is not effecting hypotension directly but the requirement of the vasopressor was significantly reduced in ringer's lactate coload group.

Mojica et al[9] reported side effects related to this strategy as well. In this study, they made 3 groups on the basis of dosage administration time and compared it with the placebo group. Incidence of hypotension was higher in preloading in contrast to placebo group, but the result was not statistically substantial.

The coloading and placebo had it as similar. Considering cardiovascular side effects, it was observed and concluded by them that coloading is more appropriate. In another study the protocol of preloading was conducted in a group while coloading was performed in the other group.[22]

Post induction the hypotension was recorded at three and five minutes. Their research elaborated no variance between both at three and five minutes. A significant number of patients had hypotension at either three or five minutes gap in the group of preload. The reason behind this could be that within the above mentioned period the deliverance of fluids in preload group were redistributing in comparison to coload group where fluids were constantly delivered. Hypotension frequency was significantly high such as 70% and 84% in the group of preload and coload respectively at three minutes followed by 76% and 86% in preload and coload group respectively at five minutes.[22] These facts emphasizes that both modalities cannot be relied on for hypotension prevention in cases where they are opted alone. Other literature has also stated similar findings that none of the single modality for prevention of hypotension is considered as reliable in cases of spinal anesthesia-induced hypotension.[23]

CONCLUSION

The difference of vomiting and hypotension are significantly associated with the two treatments but difference in nausea had not significant impact. Further, age, parity, gestational age, ASA class, duration of surgery, and BMI are also observed risk factors which can impact on the results.

Author's Contribution:

Concept & Design of Study:	Ravi Kumar
Drafting:	Aruna Kumari Hira, M. Aneeque Alam Khan
Data Analysis:	Kashif Ali, Pavan Kumar, Mukhtiar Begum Noonari,
Revisiting Critically:	Ravi Kumar, Aruna Kumari Hira
Final Approval of version:	Ravi Kumar

Conflict of Interest: The study has no conflict of interest to declare by any author.

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