Original Article

Comparative Evaluation between the Efficacy of Preload Versus Coload to Avoid Spinal Induced Hypotension in Patients Undergoing Emergency Caesarean Section

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ABSTRACT

Objective: To compare effectiveness of coload over preload in terms of frequency of spinal induce hypotension in patients undergoing emergency caesarean section.

Study Design: Randomized controlled trial study

Place and Duration of Study: This study was conducted at the Department of Anesthesiology, Pakistan Institute of Medical Sciences Islamabad from 30th November 2018 to 29th May 2019.

Materials and Methods: Two hundred women undergoing emergency caesarean section, 18-40 years of age were included. Extreme fetal distress, dying emergency, eclamptic patients, patients with coagulopathy, spine surgery or deformity, increased risk of bleeding and serious cardiac issues were excluded. Group A women were given preload of 10ml/kg within 20 min prior to subarachnoid block while Group B were given coload of 10ml/kg was given just after the subarachnoid block. After giving spinal anesthesia to the patient, mean arterial blood pressure was monitored and hypotension was recorded at 1 minute, 3 minutes, 5 minutes, 8 minutes and 10 minutes.

Results: The mean age of patients in group A was 26.27±6.38 years and in group B was 27.09±6.41 years. Majority of the patients 135 (67.50%) were between 18 to 30 years of age. The spinal induced hypotension in Group A (preload) was seen in 77(77.0%) while in Group B (coload) was seen in 46 (46.0%) patients (p=0.0001).

Conclusion: Spinal induced hypotension can be reduced with coload as compared to preload in patients undergoing emergency caesarean section.

Key Words: Spinal anesthesia, Hypotension, Coload

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INTRODUCTION

Subarachnoid block, also known as spinal anesthesia is a type of regional anesthesia believed to be a better option for patients undergoing lower abdominal surgeries, perineum surgeries and surgeries of lower limb then general anesthesia thus avoiding life threatening complications such as failure to intubate and reintubation in operating room or recovery room due to inadequate reversal of neuromuscular blockers or overdose of opioids and aspiration of gastric contents.[1]

Spinal anesthesia is commonly being used as a sole type of anesthesia to carry out caesarean sections nowadays worldwide. Despite of all advantages described earlier there are many disadvantages and most common among them is hypotension.[2] Technically, it is the physiological manifestation of neuraxial blockade, due to sympathetic block thus causing vasodilatation, increasing compliance and decreasing peripheral vascular resistance.[3] These effects are more appreciated and marked in pregnant women having decreased vascular resistance already and aortocaval compression due to mass effect of uterus and fetus.

Sustained maternal hypotension is associated with fetal hypoxia and acidosis, as a result of hypoperfusion of placenta. Prevention and treatment of this hypotension within time is crucial. There are many techniques which are being used in common practice to prevent spinal induced hypotension, but none of the alone is sufficient enough to prevent hypotension. These

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techniques include preload with crystalloids within 20 minutes prior to block, preload with colloids, left uterine displacement to avoid aortocaval compression and prophylactic administration of vasopressors.[2-5]

Preloading a patient with a bolus of 10-15ml/kg crystalloids is aimed to increase venous return to preserve mean arterial pressure after subarachnoid block.[3] But rapid infusion of such a high volume in such a short time may cause pulmonary edema and postoperative urinary retention.[1]

Timings of preload with crystalloids is very important because intravascular half -life of crystalloids is only 20 min because of rapid redistribution in interstitial compartment of the body.[6]

Now the technique of coload is being introduced to prevent and to coup up with spinal induced hypotension i.e. administration of crystalloids rapidly at the time of block, cause intravascular volume expansion at vasodilatation when block is established thus avoiding the problem of overload, pulmonary edema and above all utilizing less time in preparing the patient for surgery especially at the time of emergency.[4] The incidence of hypotension was lower in the coload group compared to the preload (53% vs 83%, p=0.026).[3]

The rationale of this study was to reduce spinal induced hypotension with coload as compared to preload in patients undergoing emergency caesarean section. Earlier studies were mostly on non-obstetric or obstetric patients undergoing elective caesarean section. In our practice preload is being used which causes spinal induced hypotension. So with coload, spinal induced hypotension can be reduced in patients undergoing emergency caesarean section and it will be safe for mother and fetus.

MATERIALS AND METHODS

This randomized controlled trial was conducted at Department of Anesthesiology and Critical Care, Pakistan Institute of Medical Sciences, Islamabad from 30th November 2018 to 29th May 2019. Two hundred total patients were taken and they were divided in two equal groups; each group comprised 100 patients. Group A given preload of 10ml/kg within 20 min prior to subarachnoid block and Group B coload of 10ml/kg was given just after the subarachnoid block. All pregnant women undergoing emergency caesarean section, age between 18-40 years and ASA class 2E and 3E were included. Extreme fetal distress, dying emergency, eclamptic patients, coagulopathy, non-cooperative patients, spine surgery or deformity, increased risk of bleeding and serious cardiac issues were excluded. All the patients were pre-medicated with injection Ranitidine 50mg and Injection Metoclopromide 10mg intravenous stat as soon as the patient arrives in the operation room. In operation room two wide bore intravenous cannulas were inserted and monitoring for heart rate, blood pressure, electrocardiograph and SpO2 was initiated. The patients were randomly allocated to one of the two groups using computer generated random table. Baseline mean arterial pressure was recorded. Thereafter, subarachnoid block was given to Group A with preload of 10ml/kg within 20 min prior to subarachnoid block and coload of 10ml/kg was given to group B just after the block.

Under full aseptic conditions, subarachnoid block was given with 25 gauge cutting spinal needle through midline approach in sitting position at L3-L4 interspace 2.5ml of 0.5% hyperbaric bupivacaine was used. In case of failure or insufficient block, general anesthesia was our backup plan and patient was excluded from the study. After giving spinal anesthesia to the patient, mean arterial blood pressure was monitored and hypotension was recorded at 1, 3, 5, 8 and 10 minutes. Decrease in mean arterial pressure greater than 20% along with heart rate above 60 beats/minutes was treated with 50µg phenylepherine bolus and decrease in mean arterial pressure greater than 20% along with heart rate less than 60 beats/minutes was treated with 10 µg epinephrine bolus accordingly. The data was entered and analyzed using SPSS-20. Spinal induced hypotension was compared between both groups using Chi square test. P value ≤0.05 was significant.

RESULTS

The mean age of patients in group A was 26.27±6.38 years and in group B was 27.09±6.41 years. Majority of the patients 135 (67.50%) were between18 to 30 years of age, ASA status, mean BMI in group A was 29.02±3.37 kg/m^2 and in group B was 29.33±3.48 kg/m^2 were shown in Table 1.

Table No.1: Demographic information of the patients in both groups (n=200)

Variable	Group A (n=110)		Group B (n=110)	
	No.	%	No.	%
Age (years)				
18 - 30	69	69.0	66	66.0
31 - 40	31	31.0	34	34.0
ASA status				
2E	68	68.0	66	66.0
3R	32	32.0	34	34.0
BMI (kg/m^2)				
≤ 27	42	42.0	40	40.0
> 27	58	58.0	60	60.0

Table No.2: Comparison of spinal induced hypotension in both groups

Hypotension	Group A (n=110)		Group B (n=110)	
	No.	%	No.	%
Yes	77	77.0	46	46.0
No	23	23.0	54	54.0

P=0.0001(Significant)

Spinal induced hypotension in Group A (preload) was seen in 77 (77%) while in Group B (coload) was seen in 46(46%) patients, statistically the significant (p=0.0001) was found (Table 2).

DISCUSSION

Hypotension cause deteriorating effects in healthy person as well as in pregnant females. It can cause mild effects to serious complications including cardiovascular collapse, organ ischemia and loss of consciousness.[7] Various methods were administered to prevent and to treat maternal hypotension. Fluid administration is mainly used to treat hypotension. However, its timing of administration and optimal fluids are important things that need to be considered.

Various studies showed that colloids showed better results in the prevention of hypotension as compared to the crystalloids, among colloid group, preload show better efficacy than coload group and extra administration within the therapeutic window.[8-10] However, several harmful effects are associated with colloids including severe allergic reactions, coagulation and it is also not cost effective. Consequently, crystalloids show many advantages and are considered more preferable by many anesthesiologists. Crystalloid infusion timings are also very important for effective treatment and its effect is also very high during early stage. Traditionally, preload is generally administered but coload administration during spinal anesthesia show better results.[11,12]

In the present study, frequency of spinal induced hypotension in Group A (preload) was seen in 77 (77%) while in Group B (coload) was seen in 46 (46.0%) patients, statistically the significant p=0.0001 was found. Rout et al[13] demonstrated that, preload infusion leads to elevated CN pressure and hypotension was also not treated and reduced. Another study compared different fluids by administrating at different timings and concluded that preloading was less effective as compared to the coload.[14] The comparison of preload and coload was conducted on parturient but these results can be employed to the general population as well. Due to the variance in the results of preloading, coloading gained widespread acceptance due to their better results and efficacy.[13,14]

On the other, crystalloid also showed better outcome and increased in cardiac output after spinal anesthesia.[15] Different studies on the kinetics of coload IV infusion of crystalloid have shown reduction in the frequency of hypotension. Coloading appeared to be increase in intravascular volume and cause vasodilatations after spinal anesthesia administration and thus reducing hypotension.[16,17] A large number of benefits are achieved through coloading technique though one major concerns are also associated with it. Sometime it causes reduction in oxygen carrying capacity and escalates the chances of oedema in pregnant females.[18]

On the other hand, few studies which are conducted on colloids also show no difference in the effect of pre and coloading administration technique and concluded that similar findings have achieved following spinal anesthesia. These studies show one variation i.e. in the requirement of vasopressor in both methods.[18,19] Moreover, similar finding was also obtained when this study was repeated with crystalloids.[21,22]Another meta-analysis highlighted that, similar results have been achieved when a comparative study was done to determine the difference in pre and coloading. Even similar side effects are also observed including nausea and vomiting in both study groups.[23]

CONCLUSION

Spinal induced hypotension can be reduced with coload as compared to preload in patients undergoing emergency caesarean section. So, we recommend that coload during induction of spinal anaesthesia for emergency caesarean section should be used routinely in our general practice for preventing spinal induced hypotension rather than to wait for the completion of preload.

Author's Contribution:

Concept & Design of Study:	Muhammad Arslan Zahid
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Revisiting Critically:	Muhammad Arslan Zahid, Gotam Kumar
Final Approval of version:	Muhammad Arslan Zahid

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

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