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EFFICACY OF USING DELAYED SUPINE POSITIONING IN THE PREVENTION OF POST-SPINAL ANESTHESIA HYPOTENSION IN FEMALES UNDERGOING CESAREAN DELIVERIES

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ABSTRACT

Background: After a subarachnoid block is administered after a caesarean section delivery, maternal hypotension is a risky and frequent consequence. Maternal hemodynamic profiles are better affected when different pharmaceutical techniques—such as ondansetron and norepinephrine—are used in conjunction with non-pharmacological techniques during delayed supine posture.

Aim: The current study set out to evaluate the risks and advantages of using both pharmaceutical and non-pharmacological approaches in the prevention of hypotension.

Methods: 170 individuals were randomly split into two groups and tested for the study. Group II (control) patients were forced to lie down in a supine posture as soon as the subarachnoid block was administered, whereas Group I subjects were remained sitting for two minutes following injection. Prophylactic intravenous infusion of norepinephrine and ondansetron bolus before to surgery was administered to both groups. Systolic blood pressure was measured in each patient starting with the intrathecal injection and continuing until delivery.

Results: Systolic blood pressure in the sitting group (Group I) was 122±16 mmHg till delivery, a substantial increase from 114±12 mmHg in the control group (p=0.003). The intraoperative systolic blood pressure in the sitting group was higher than in the control group. Additionally, there was a decreased occurrence of hypotension and a lower ephedrine use in comparison to the control group. The two research groups had similar rates of bradycardia.

Conclusion: The current study suggests that improved outcomes for the foetus, nausea and vomiting, vasopressor intake, and maternal hypotension are obtained when pharmacological and non-pharmacological techniques are used in conjunction during caesarean births.

Keywords: supine posture, subarachnoid block, hypotension, ondansetron, caesarean section

INTRODUCTION

One of the frequent and unfavourable effects of a subarachnoid block used for caesarean section births is maternal

hypotension, which can potentially lead to serious problems for both the mother and the foetus. Several strategies, including patient posture, the use of pharmaceutical agents, and fluid administration, can be used to prevent maternal hypotension.

While there is a preference for fluid loading over non-loading techniques following caesarean births, not all fluid-loading regimens significantly reduce the risk of post-spinal hypotension.1. Administering vasopressor drugs like ephedrine and **phenylephrine** can cause a number of adverse consequences, including foetal acidosis and reflex bradycardia. Thus, the adverse effects and usage of vasopressor drugs can be reduced by combining the use of non-pharmacological techniques with vasopressor prophylaxis.2

One medication that is thought to be safe, effective, and to prevent post-spinal hypotension with little side effects is ondansetron. Utilising a variety of methods, including leg warping, sequential compression devices, tilting or flexing the operating table to encourage venous return, head-up and head-down postures, reverse aortocaval compression, and mechanical wedges or displacers.3

In order to postpone the commencement of the subarachnoid block, it is also important to arrange the individuals so that they remain seated for a while after the block is administered. It is thought that the body can adjust to the sympathetic blockade and provide a better hemodynamic profile when the neuraxial block starts slowly. In order to minimise post-spinal hypotension, it is important for patients to maintain their sitting position after subarachnoid block. This helps to stop local anaesthetic drugs from spreading to the upper thoracic dermatomes.4 The dural sac's rapid compression and gravity pull the local anaesthetic and CSF (cerebrospinal fluid) towards the direction of the skull when the patient is supine.

This position causes the vena cava to get blocked and the epidural venous plexus to enlarge, resulting in abnormally high block levels. There is a dearth of evidence available to evaluate the effects of delayed supine placement on a mother's hemodynamics after subarachnoid block anaesthesia.5

Few data from earlier literature research have been gathered about the effects of the multimodal strategy for preventing maternal hypotension with regard to sitting posture. In order to evaluate the advantages and disadvantages of using both pharmaceutical and non-pharmacological approaches in the prevention of maternal hypotension, a clinical trial was conducted.

MATERIALS AND PROCEDURES

The goal of the current randomised controlled clinical trial was to evaluate the risks and advantages of using both pharmaceutical and non-pharmacological approaches in the prevention of maternal hypotension.

The study was conducted between... and.., after approval from the relevant institutional ethical committee. The research participants were chosen from the institute's Department of Obstetrics and Gynaecology. Prior to research participation, informed permission was obtained from all individuals, both verbally and in writing. 170 female participants undergoing caesarean birth at the Institute were evaluated for the research. Subjects who were between the ages of 18 and 35, had singleton pregnancies, were undergoing elective caesarean birth at the institution under subarachnoid block anaesthesia, and were at full term gestation or more than 37 weeks were the inclusion criteria for the research.

Subjects with pre-existing hypertension, contraindication to spinal anaesthesia, pregnancy-induced hypertensive disorders, peripartum bleeding, valvular heart lesions, obese subjects with BMI >35 kg/m2, cardiac arrhythmias with rhythm other than normal sinus rhythm and sinus tachycardia, and foetal anomalies were among those excluded from the study.

The 170 participants that were included were split into two groups at random. Group II (control) patients were forced to lie down in a supine posture as soon as the subarachnoid block was administered, whereas Group I subjects were remained sitting for two minutes following injection. Baseline systolic blood pressure in both groups was measured in the supine position as the average of three successive measures taken at intervals of two minutes.

Prior to the intravenous line (IV) insertion and premedication, all assessments were recorded. The trial individuals received intravenous administration of 50 mg ranitidine and 4 mg ondansetron following the insertion and securing of the IV line. A subarachnoid block was administered in the sitting posture in the L4-L5 or L3-L4 interspace using aseptic and sterile procedures. 25µg of fentanyl and 11 mg of 0.5% bupivacaine were then administered.

Subjects in Group II (control group) were forced to lie down right after injection, whereas those in Group I (sitting group) were left sat for two minutes after the injection. Ringer's lactate solution was used to accomplish co-hydration while all of the participants in both groups were positioned in a left lateral tilt supine posture.

Norepinephrine was continued intravenously in both groups after an initial 0.05 µg/kg/min infusion and a 5µg IV bolus combined with a subarachnoid block anaesthetic agent. Following birth, the patient received an oxytocin bolus (0.5 IU over 5 seconds) and then 2.5 IU/hour. 3L/min of oxygen was used as inspired air augmentation up to delivery. When a foetus is born and receives an intrathecal injection, post-spinal hypotension is defined as a drop in systolic blood pressure to less than 805 of the baseline value. This condition is treated with 9 mg of IV ephedrine.

Subsequently, post-spinal hypotension—defined as a drop in systolic blood pressure to less than 60% of the baseline value—was treated with 15 mg of IV ephedrine. Additionally, when the blood pressure did not respond to the initial dosage within two minutes, a vasopressor bolus was administered. Intraoperative hypertension was managed with a >120% rise of the baseline levels when the norepinephrine infusion was stopped.

Once the subject's blood pressure stabilised, the infusion was resumed. In order to treat intraoperative bradycardia, which was defined as a heart rate of less than 55 beats per minute without hypotension between foetal birth and intrathecal injection, vasopressor infusion was stopped. Subjects who had both bradycardia and hypotension were administered 9 mg of IV ephedrine. A 0.5 mg IV atropine bolus was administered if the bradycardia persisted after the previously stated therapy or if the hypotension did not coexist.

The study data did not include patients who experienced intraoperative blood loss above 1000 millilitres, did not have a successful subarachnoid block with a sensory level below T4, and had high spinal block individuals whose spinal denervation extended to the second or third dermatome during the subarachnoid block.
The main result evaluated was a shift in the subject's systolic blood pressure based on the group to which they were assigned, in addition to the preoperative IV ondansetron and IV norepinephrine infusions. Hemodynamic data, including heart rate, mean pulse pressure, and diastolic blood pressure, were evaluated as secondary outcomes. The percentage of participants with a decreased SBP of less than 80% of the baseline value from intrathecal injection until foetus delivery was used to determine the incidence of post-spinal hypotension. The percentage of patients whose systolic blood pressure was less than 60% of baseline values was used to measure severe post-spinal hypotension.

The research also evaluated post-delivery hypotension, which is defined as the proportion of participants whose systolic blood pressure was less than 80% of the pre-delivery and oxytocin beginning blood pressure. Systolic blood pressure more than 80% of baseline levels is a sign of reactive hypotension, which is diagnosed within two hours. The degree and duration of subarachnoid block analgesia, the need for ephedrine and norepinephrine intraoperatively, and nausea and vomiting during the procedure were among the other factors evaluated.

The time between the skin incision and the delivery of the foetus, the volume of blood lost during surgery, and the duration from the subarachnoid block to the birth was all evaluated as additional data. The umbilical blood gases potential of hydrogen (pH), partial pressure of carbon dioxide (pCO2), pressure of oxygen (pO2), and bicarbonate (HCO3), as well as the newborns' APGAR (appearance, pulse, grimace, activity, and respiration) scores, were measured one and five minutes after birth. The unpaired t-test and SPSS software version 21.0 (IBM Corp., Armonk, NY, USA) were used for the statistical analysis of the collected data. The statistics were presented as percentage, frequency, mean, and standard deviation. An acceptable p-value for statistical significance was <0.05. Repeated measures and ANOVA (analysis of variance) were employed to assess the change in parameters of any group before and after surgery.

RESULT

The goal of the current randomised controlled clinical trial was to evaluate the risks and advantages of using both pharmaceutical and non-pharmacological approaches in the prevention of maternal hypotension. 170 participants in the research were split into two groups at random. Group II (control) patients were forced to lie down in a supine posture as soon as the subarachnoid block was administered, whereas Group I subjects were remained sitting for two minutes following injection.

In the sitting and control postures, the research subjects' mean age was 28.2±2.6 and 28.4±5.2 years, respectively, with a p-value of 0.62. The groups in the sitting and control positions had mean BMIs of 21.3±3.2 and 22.4±4.4 kg/m2, respectively, with a non-significant difference (p=0.87). With a p-value of 0.67, the mean weight for Groups I

and II was 78.6±11.2 and 77.4±10.2 kg, respectively. Groups I and II had baseline heart rates of 97.3±13.22 and 92.5±14.2 bpm, respectively, with p=0.12. Groups I and II had similar baseline systolic blood pressure (p=0.63). Table 1 illustrates that there were no significant differences between Groups I and II in terms of the time from spinal anaesthesia to delivery or the time from incision to delivery (p=0.82 and 0.73, respectively).

When comparing the intraoperative maternal hemodynamics in the two study groups, the findings revealed that none of the individuals in Group I had bradycardia, whereas 1.16% (n=1) of the subjects in Group II had a non-significant difference (p=0.34).Not a single girl from either group experienced a hypotension episode per mother. In females from Groups I and II, the incidence of hypotension was seen in 26.19% (n = 22) and 4.65% (n = 4), respectively, with significant differences observed (p = 0.007). In Groups I and II, norepinephrine infusion was 205.22±47.2 µg and 202.12±38.2 µg, respectively. This was non-significant, with a p-value of 0.43. As shown in Table 2, the mean total ephedrine dose given to research participants in Groups I and II was 0±0.7 and 32±0.43 mg, respectively. This was considerably greater in the control group with p<0.001.

In terms of maternal hemodynamics, it was seen that post-delivery hypotension episodes occurred in 21.42% (n=18) of the seated participants in Group I and in 53.48% (n=46) of the Group II subjects. The control group had a considerably higher rate of post-delivery hypotension episodes (p<0.001). The incidence of post-delivery hypotension was seen in 21.42% (n=18) of Group I patients and 53.48% (n=46) of Group II individuals; the control group had a considerably greater incidence of post-delivery hypotension (p=0.001). There was no incidence of severe hypotension seen in any of the participants in Group I, but 13.95% (n=12) of the subjects in Group II showed a substantially greater incidence (p=0.01). Groups I and II had mean hypotension episodes per mother of 0±0.3 and 1±0.5, respectively, with significant differences (p<0.001).

As shown in Table 2, the incidence of hypotension was seen in 28.57% (n=24) of the patients in Group I and 62.79% (n=54) of the participants in Group II. This was substantially greater in the control group with p=0.001. When the maternal and foetal outcomes of the two study groups were examined, it was observed that the incidence of vomiting was considerably lower in Group I (7.14%; n = 6) than in Group II (30.23%; n = 26; p = 0.007) among the maternal outcomes. With 32 participants in Group II compared to 8 subjects in Group I, the incidence of nausea was considerably greater (p=0.004). In Groups I and II, the urine production was 300±14.23 and 200±13.88 mL, respectively, showing non-significant differences (p=0.15).

With p=0.29, blood loss was similar in Groups I and II. The duration of analgesia in Groups I and II was 120.22±6.24 and 120.22±5.98 minutes, respectively, with p=0.06 indicating non-significant differences. In terms of foetal outcomes, Groups I and II's APGAR 1 min scores were 7±2.2 and 7±1.8, respectively, indicating significant differences (p=0.02). At five minutes, Group I's APGAR scores were substantially higher (p<0.001) at 9±2.1 and 8±1.6. Table 3 illustrates the non-significant difference in umbilical artery blood gas parameters for HCO3, pO2, and pCO2 (p-values of 0.16, 0.95, and 0.13), while Group I had significantly higher pH (7.261.6) than Group II (7.220.8), which was significantly higher for Group I (p=0.01).

DISCUSSION

170 participants in the current study were split into two groups at random.Group II (control) patients were forced to lie down in a supine posture as soon as the subarachnoid block was administered, whereas Group I subjects were remained sitting for two minutes after the injection. With a p-value of 0.62, the mean age of the research individuals in the sitting and control postures was 28.2±2.6 and 28.4±5.2 years, respectively. The groups in the sitting and control positions had mean BMIs of 21.3±3.2 and 22.4±4.4 kg/m2, respectively, with a non-significant difference (p=0.87).

With a p-value of 0.67, the mean weight for Groups I and II was 78.6±11.2 and 77.4±10.2 kg, respectively. Groups I and II had baseline heart rates of 97.3±13.22 and 92.5±14.2 bpm, respectively, with p=0.12. Groups I and II had similar baseline systolic blood pressure (p=0.63).

In Groups I and II, the times from spinal anaesthesia to delivery and from incision to delivery showed non-significant differences (p=0.82 and 0.73, respectively). These results were comparable to those of studies conducted in 2017 by Butwick AJ et al6 and Hasanin A et al7, in which the authors evaluated participants using demographic information similar to that of the current study.

When the intraoperative maternal hemodynamics in the two study groups were compared, it was observed that 1.16% (n=1) of the individuals from Group II had a non-significant difference with p=0.34, while no subject from Group I had bradycardia. Not a single girl from either group experienced a hypotension episode per mother.

Hypotension was observed in 26.19% (n=22) and 4.65% (n=4) of the female participants in Group I and II, respectively. This difference was statistically significant at p=0.007. In Groups I and II, norepinephrine infusion was 205.22±47.2 µg and 202.12±38.2 µg, respectively. This was non-significant, with a p-value of 0.43. The control group received considerably more total ephedrine (p<0.001) than the study individuals from Groups I and II, with mean doses of 0±0.7 and 32±0.43 mg, respectively. These results showed correlations with the maternal hemodynamics reported by the authors in their 2013 study and their 2016 study by Haseen M et al., where the results were similar to those of the current investigation.

According to the study's findings, when comparing maternal hemodynamics, post-delivery hypotension episodes were observed in 21.42% (n=18) of the seated participants in Group I and 53.48% (n=46) of the group II patients. This difference was statistically significant and occurred in the control group with a p-value of less than 0.001. The incidence of post-delivery hypotension was seen in 21.42% (n=18) of Group I patients and 53.48% (n=46) of Group II individuals; the control group had a considerably greater incidence of post-delivery hypotension (p=0.001). There was no incidence of severe hypotension seen in any of the participants in Group I, but 13.95% (n=12) of the subjects in Group II showed a substantially greater incidence (p=0.01). Groups I and II had mean hypotension episodes per mother of 0±0.3 and 1±0.5, respectively, with significant differences (p<0.001).

The incidence of hypotension was seen in 28.57% (n=24) of Group I patients and 62.79% (n=54) of Group II subjects; the control group had a considerably greater incidence of hypotension (p=0.001). These outcomes were in line with those of El-Hakeem et al. (2010) and Kehler F et al. (2002), whose investigations revealed similar hypotension parameters to those of the current investigation.

In relation to the comparison of the foetal and maternal outcomes in the two study subject groups, the incidence of vomiting was seen in 7.14% (n=6) of the subjects in Group I, which was substantially lower than the 30.23% (n=26) of the individuals in Group II (p=0.007).

With 32 participants in Group II compared to 8 subjects in Group I, the incidence of nausea was considerably greater (p=0.004). In Groups I and II, the urine production was 300±14.23 and 200±13.88 mL, respectively, showing non-significant differences (p=0.15). With p=0.29, blood loss was similar in Groups I and II. The duration of analgesia in Groups I and II was 120.22±6.24 and 120.22±5.98 minutes, respectively, with p=0.06 indicating non-significant differences. These results were consistent with investigations by Patel M et al. (1993) and Inglis A et al. (1995), which found comparable maternal outcomes following subarachnoid block to those of the current investigation.

APGAR 1 min scores for foetal outcomes were observed to be 7±2.2 and 7±1.8 in Groups I and II, respectively, indicating significant differences with p=0.02.At five minutes, Group I's APGAR scores were substantially higher (p<0.001) at 9±2.1 and 8±1.6.The umbilical artery blood gas measurements revealed that there was no significant difference in HCO3, pO2, and pCO2 (p-values of 0.16, 0.95, and 0.13, respectively). However, Group I had considerably higher pH (7.261.6) than Group II (7.220.8), which was significantly higher for Group I (p=0.01). These findings were consistent with those published by Polley LS et al. (2008) and Moore A et al. (2014), who reported similar foetal outcomes and umbilical artery blood gas values.

CONCLUSIONS

Considering its limitations, the present study concludes that the combined use of pharmacological and non-pharmacological methods during cesarean deliveries results in better outcomes concerning the fetus, nausea and vomiting, vasopressor consumption, and maternal hypotension. Further longitudinal studies with larger sample sizes and longer monitoring intervals can help with further clarification of the issue.

REFERENCES

1. Loubert C. Fluid and vasopressor management for Cesarean delivery under spinal anesthesia: continuing professional development. Can J Anaesth. 2012;59:604–19.
2. Butwick AJ, Columb MO, Carvalho B. Preventing spinal hypotension during Caesarean delivery: What is the latest? Br J Anaesth 2015;114:183–6.

3. Mercier FJ, Augè M, Hoffmann C, Fischer C, Le Gouez A. Maternal hypotension during spinal anesthesia for cesarean delivery. Minerva Anestesiol. 2013;79:62–73.

4. Caille V, Jabot J, Belliard G, Charron C, Jardin F, Vieillard-Baron A. Hemodynamic effects of passive leg raising: an echocardiographic study in patients with shock. Intensive Care Med. 2008;34:1239–45.

5. Cluver C, Novikova N, Hofmeyr GJ, Hall DR. Maternal position during the cesarean section for preventing maternal and neonatal complications. Cochrane Database Syst Rev. 2010;6:CD007623.

6. Cyna AM, Andrew M, Emmett RS, Middleton P, Simmons SW. Techniques for preventing hypotension during spinal anesthesia for cesarean section. Cochrane Database Syst Rev. 2006;4:CD002251.

7. Hasanin A, Mokhtar AM, Badawy AA, Fouad R. Post-spinal anesthesia hypotension during cesarean delivery, a review article. Egypt J Anaesth 2017;33:189–93.

8. Prakash S, Chaudhary K, Gogia AR, Chellani H, Salhan S, Singh R. A prospective, randomized controlled trial comparing the left lateral, modified lateral and sitting positions for spinal block characteristics for Cesarean delivery. Minerva Anestesiol 2013;79:652-60

9. Heesen M, Klimek M, Hoeks SE, Rossaint R. Prevention of spinal anesthesia-induced hypotension during cesarean delivery by 5-hydroxytryptamine-3 receptor antagonists: A systematic review and meta-analysis and meta-regression. Anesth Analg 2016;123:977–88

10. El-Hakeem EE, Kaki AM, Almazrooa AA, Al-Mansouri NM, Alhashemi JA. Effects of sitting up for five minutes versus immediately lying down after spinal anesthesia for Cesarean delivery on fluid and ephedrine requirement; a randomized trial. Can J Anaesth 2011;58:1083-9.

11. Køhler F, Sørensen JF, Helbo-Hansen HS. Effect of delayed supine positioning after induction of spinal anesthesia for cesarean section. Acta Anaesthesiol Scand 2002;46:441-6

12. InglisA, DanielM, McGradyE. Maternal position during induction of spinal anesthesia for cesarean section. A comparison of right lateral and sitting positions. Anesthesia. 1995;50:363-5.

13. Patel M, Samsoon G, Swami A, MorganB. Posture and the spread of hyperbaric bupivacaine in parturients using the combined spinal-epidural technique. Can J Anaesth 1993;40:943-6.

14. Polley LS. Neuraxial techniques for labor analgesia should be placed in the lateral position. Int J Obstet Anesth 2008;17:149-52.

15. Moore A, Bourrassa-Blanchette S, El Mouallem E, Kaufman I, el-Bahrawy A, Li-Pi-Shan W, et al. The median effective seated time for hypotension induced by spinal anesthesia at Cesarean delivery with two doses of hyperbaric bupivacaine: A randomized up-down sequential allocation study. Can J Anesth. 2014;61:916–21.

TABLES

Characteristics	Group I (sitting)	Group II (control)	p-value
Mean age (years)	28.2±2.6	28.4±5.2	0.62
BMI (kg/m2)	21.3±3.2	22.4±4.4	0.87
Weight (kg)	78.6±11.2	77.4±10.2	0.67
Baseline heart rate (bpm)	97.3±13.22	92.5±14.2	0.12
Baseline systolic BP (mmHg)	125±10.2	126.2±10.4	0.63
Time from spinal anesthesia to delivery (min)	29.5±5.2	29.1±8.3	0.82
Time from incision to delivery (min)	21.2±4.4	21.6±6.1	0.73

Table 1: Baseline demographic data and hemodynamic data in the two groups of study subjects

Parameter	Group I (sitting)		Group II (control)		p-value
	n=84	%	n=86	%	
Bradycardia incidence	0	0	1	1.16	0.34
Hypotension episode per mother	0	0	0	0	0.006
Hypotension incidence	22	26.19	4	4.65	0.007
Norepinephrine infusion (µg)	205.22±47.2		202.12±38.2		0.43

Total ephedrine (mg)	0±0.7		32±0.43		**<0.001**
Post-delivery hypotension episode	0±0.3		1±0.5		**<0.001**
Post-delivery hypotension incidence	18	21.42	46	53.48	**0.001**
Severe hypotension incidence	0	0	12	13.95	**0.01**
Hypotension episode per mother	0±0.3		1±0.5		**<0.001**
Hypotension incidence	24	28.57	54	62.79	**0.001**

Table 2: Comparison of intraoperative maternal hemodynamics in two study groups

Parameter	**Group I (sitting) n=84**	**Group II (control) n=86**	**p-value**
Maternal outcomes			
Vomiting incidence	6	26	0.007
Nausea incidence	8	32	**0.004**
Urine output (mL)	300±14.23	200±13.88	0.15
Blood loss (mL)	750±50.86	700±48.33	0.29
Analgesia duration (min)	120.22±6.24	120.22±5.98	0.06
Fetal outcomes			
APGAR 1 min	7±2.2	7±1.8	**0.02**
APGAR 5 min	9±2.1	8±1.6	**<0.001**
Umbilical artery blood gas parameters			
HCO3	20±1.4	18±0.8	0.16
pO2	23±0.6	23±0.4	0.95
pCO2	42±0.2	45±0.1	0.13
pH	7.26±1.6	7.22±0.8	**0.01**

Table 3: Comparison of maternal and fetal outcomes in two groups of study subjects