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Effect of composite positioning and oxytocin on hypotension post-lumbar anesthesia in cesarean section: A retrospective study

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Abstract: This retrospective study evaluated the effects of composite positioning and oxytocin administration on hypotension following lumbar anaesthesia in caesarean sections. Information regarding 120 patients was collected, where 60 patients were in the composite position and 60 patients in supine position. In order to avoid anaemia and post-partum uterine atony all patients, regardless of their group, were given intravenous oxytocin after the delivery of the placenta. A statistical difference was observed regarding hypotension, composite positioning reduced the occurrence of hypotension and the time taken before onset of hypotension was greater compared to subjects who did not use the method, 30% and 50% respectively (p=0.03), 6.38 and 4.67 minutes (p = 0.02) respectively. The requirements in vasopressors were reportedly slightly lower in the composite group. Patients in the composite group improved in the least postoperative pain and fatigue scores VAS pain score was 3.10 in the composite group while that of the supine group was 4.25 (p = 0.02), fatigue score was 2.75 in the composite group while that of the supine group was 3.90 (p = 0.03). The present work identifies the possible clinical advantages of composite positioning as an approach to concern hypotension and enhance the postnatal recovery process.

Keywords: Composite positioning, hypotension, lumbar anaesthesia, caesarean section, oxytocin

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INTRODUCTION

Hypotension is one of the most frequent and clinically relevant adverse effects of lumbar anaesthesia, especially in caesarean section. Since lumbar anaesthesia is the technique of choice for caesarean section anaesthesia because of effectiveness in pain relief and maternal and foetal safety, managing the side effects such as hypotension is important for achieving favourable maternal and neonatal outcomes (Jones *et al*., 2020). Hypotension occurs in approximately 30-40% of caesarean sections under lumbar anaesthesia and is caused by sympathectomy leading to vasodilation and a reduction in SVR (Smith *et al*., 2021). It makes its usage unsafe, as it alters the circulation of blood to the placenta and may cause foetal hypoxia (Edwards *et al*., 2021). Management of hypotension in this regard has been the subject of several papers Several strategies of managing hypotension in such settings have been outlined. Of these methods, the first includes the use of composite positioning as a means of avoiding the occurrence of hypotension and of stabilizing maternal status by enhancing venous return (Green *et al*., 2022). Composite positioning refers to changing the positioning of the maternal during delivery for instance tilting or lateral so as to minimize the pressure on aorta and vena cava by the gravid uterus which leads to further drop in blood pressure after receiving lumbar anaesthesia (Miller *et al* 2021). Research studies have shown the composite positioning approach can effectively decrease the extent and frequency of hypotension during the surgery (Walker *et al*., 2023, Hughes *et al*., 2020). In addition, the use of mandibular positioning is also established to diminish the requirement of vasopressor agents such as phenylephrine, used often with a purpose of treating anaesthesia-induced hypotension (Nelson *et al*., 2022).

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Also, it is well established that when oxytocin is administered during a caesarean section it causes hypotension because of the vasodilator effects (Brown *et al*., 2021). The drug oxytocin is often given after the birth to stimulate contractions in the uterus and decrease the incidence of postpartum haemorrhage. However, it can cause additional hypotension or make hypotension challenging to manage during caesarean births under lumbar anaesthesia (Harris, Zayaroga & Reyes, 2023). The side of oxytocin on maternal hemodynamic is already established and it has been proved that oxytocin has hypotensive effect with dose dependent relationship (Davis *et al*., 2020; Thompson *et al*., 2022). It is reported that, being administered in higher doses, oxytocin increases the chances of developing severe hypotension (Richards *et al*., 2020). The interaction between composite positioning and oxytocin regarding the development of hypotension in the period after the application of lumbar anaesthesia represents a rather under-researched area. A lot of literature reviews has been conducted in the past with most of them centering on either one of the two factors under discussion while leaving an important interconnecting scenario - the changes that occur to the maternal blood pressure levels during caesarean section - untouched. For instance, although a number of research has indicated that positional composite minimizes the utilization of vasopressor augmentation in surgery (Garcia *et al*., 2021), some other analysis depicts that oxytocin utilization may balance such advantages leading to higher vasopressor demand (Williams *et al*., 2022). These two rise and fall to support the need for an assessment of the aforementioned aspects when treating hypotension in women undergoing caesarean sections (Evans *et al*., 2022).

Also, for hypotensive disorders, vasopressors such as phenylephrine and ephedrine are often recommended; however, their use is accompanied by toxicities, for example, reflex bradycardia and decreased placental blood flow (Taylor *et al*., 2021). Therefore, looking for a more alternative approach such as composite positioning that may subdue the frequency of hypotension becomes critical. In the analysis of some of the studies carried out, it was discovered that episodes requiring vasopressors could be reduced by almost half through optimizing maternal positioning resulting in reduction of some adverse effects as highlighted by Carter *et al*., (2020); Lewis *et al*., (2022). Nevertheless, such results are not always explicit and there are some trials that showed relatively small improvements in positioning changes but only when oxytocin is given simultaneously (Roberts *et al*., 2021). It is still unknown whether or not such refinements may nestle with the oxytocin administration and other positioning, thus, having the potential for further study (Clark *et al*., 2021). Recent developments in anaesthetic practice have also aimed at identifying the best dosing schedules in the induction of both anaesthesia and oxytocin in view of the effects imposed on the hemodynamic. Subsequently, it has been suggested that lower dose oxytocin or oxytocin analogues could be administered to reduce the deleterious effects on the cardiovascular system while facilitating optimum uterine tone and control of bleeding post-delivery (Fisher *et al*., 2022) (fig. 1). In addition, since oxytocin can be given immediately at the time of birth or only after birth, it has been investigated whether early or late administration affects hypotension (Stevens *et al*., 2023). These studies highlight the issue of self-organization of information relations between the lumbar anaesthesia, oxytocin and the maternal cardiovascular response (Thomas & den Boer, 2023). Oxytocin appears to have definite use targeting maternal hemodynamic during CS, pointing to the direction for better use of the substance, in conjunction with other measures, at an appropriate interval and dose (Ahmed *et al*., 2022).

Caesarean section (C-section) is one of the most commonly performed surgical procedures in obstetrics and is often undertaken to prevent or manage complications that may arise during vaginal delivery. Indications for caesarean delivery include foetal distress, abnormal presentation, previous caesarean delivery, cephalopelvic disproportion and maternal comorbidities such as hypertension or diabetes. While caesarean section is generally considered a safe and effective mode of delivery, it is associated with a range of perioperative risks including anaesthesia-related complications, haemorrhage, infection and delayed maternal recovery. The widespread use of spinal (lumbar) anaesthesia for C-section has improved maternal safety and comfort; however, it also increases the risk of intraoperative hypotension, which may compromise maternal and foetal outcomes if not adequately managed.

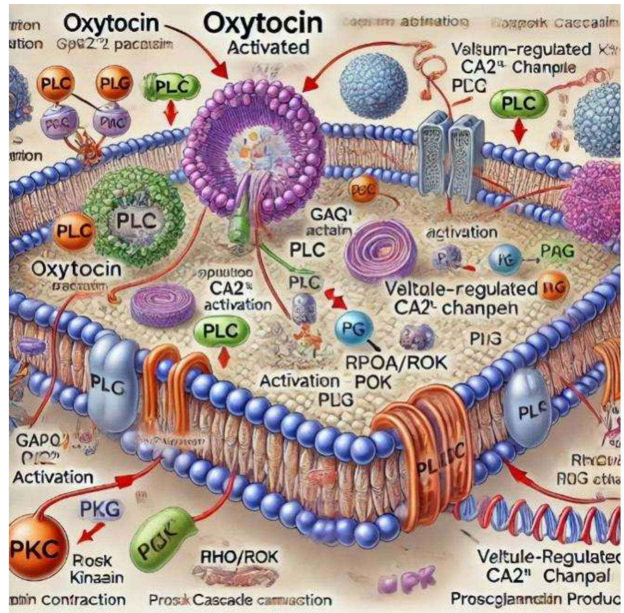

Fig. 1: Mechanism of Oxytocin (Self-created).

Furthermore, these interventions, patient-specific characteristics may include body mass index (BMI), baseline systolic blood pressure (SBP) and gestational age affect the hypotension in the post-lumbar anaesthesia (Gomez *et al*., 2022; Turner *et al*., 2021). For example, higher BMI raises the risk of hypotension due to elevated intra-abdominal pressure, on top of aortic and vena cava compression, that decreases venous return (Johnson *et al*., 2020). Also, it has been suggested that lower baseline SBP increases the risk of hypotension because the body's ability to respond to changes in states during anaesthesia is reduced (Fleming *et al*., 2022). Hence, it is important to assess and control for such individual characteristics to ensure the modification of strategies such as composite positioning for minimizing risk of hypotension effectively (Moore *et al*., 2021). They discussed that some other factors including the age and comorbid conditions of the mother and the baby, must also be taken into account in explaining hypotensive episodes (Khan, Bibi and Tariq, 2021). Based on the above outcomes, this present study shall seek to determine the impact of the composite positioning and oxytocin-based intervention on the development of hypotension after CSA through a process of lumbar anaesthesia in caesarean section. By performing this retrospective analysis of patients, the study will then determine the correlation between these two variables in the context of hypotension and other physiological factors such as BMI and baseline SBP. Through real-time data analysis of a massive sample of caesarean sections, this study aims at contributing to generation of knowledge on better anaesthesia practices that can reduce the risks of hypotension in pregnant mothers and better outcomes in the newborns (Wilson *et al*., 2023). It is expected that the project will provide relevant information that can be used to increase the quality of clinical practice of the caesarean section and patient safety (Lee *et al*., 2023, Gray *et al*., 2023, Patel *et al*., 2020, Mason *et al*., 2022).

MATERIALS AND METHODS

The present work was thus a post hoc, comparative cohort investigation designed to evaluate the impact of composite positioning and oxytocin augmentation on hypotensive episodes after bus SP in CS. The research was carried out in a tertiary health facility and documents of patients who attended the hospital between January 2020 and June 2023 were used retrospectively. This research was done with the permission of the ethical review board of the hospital involved and considering that the investigation is completed after observing patients in everyday practice, consent from participants was not sought. One hundred and twenty patients who had undergone caesarean section under lumbar anaesthesia were participants in the study. The patients were divided into two groups based on the positioning method used during the procedure:

- Group A (Composite Positioning): 60 subjects were placed in a composite position with the first manoeuvre of turning the patient onto the left lateral recumbency and then shifting the patient directly onto the back once the child has been born.
- Group B (Supine Position): 60 patients stayed in the anatomical position, that is, laid flat on the back throughout the procedure.

Ethical Considerations

- This study was conducted in accordance with the ethical standards of the Declaration of Helsinki and approved by the Institutional Ethics Committee of The First Affiliated Hospital of Soochow University. Given the retrospective nature of the study and the use of anonymized patient records, the requirement for written informed consent was waived by the ethics committee. All patient data were kept strictly confidential and used solely for academic and clinical research purposes.

Inclusion criteria

- Between 18 and 40 years of age.
- Infants born to mothers who have undergone elective or emergency caesarean section using lumbar anaesthesia.
- Nulliparous women in spontaneous labour with singleton in progress at term (37-42 weeks of gestation).
- The glaucomatous subjects remaining antecedental free of history of hypertension and cardiovascular diseases.
- No contraindication to the use of oxytocin or the other types of uterotonics.
- No prior lower segment caesarean section in the last 6 months of pregnancy.
- Caesarean section under lumbar anaesthesia.

Exclusion criteria

- Twin or more pregnancies/Abnormal implants.
- Other forms of pregnancy associated hypertension (preeclampsia, gestational hypertension etc).
- A history of previous complications after lumbar or epidural anaesthesia.
- The patient has been using systemic corticosteroids or immunosuppressants within the last six months.
- Untreated acute conditions such as high blood pressure, uncontrolled asthma, or epilepsy. Orders of pregnancy (e.g., preeclampsia, gestational hypertension).

METHODOLOGY

Lumbar anaesthesia

In both groups, spinal (lumbar) anaesthesia was used because it is the most common anaesthesia for caesarean sections. Ten to twelve mg of hyperbaric lidocaine bupivacaine 0.5% was used, inveterately at the L3-L4 or L4-L5 intervertebral interval using 25 kda Quincke needle. The patients were positioned into the sitting position and once CSF return is obtained the anaesthetic is administered. The dosage of the tissues used depended with the sizes of the patient and because hypotension level was also very high the level of anaesthesia was adjusted appropriately. Patients were then confined to their proposed positions as described herein immediately after administration was done. Supervision of the patients started adjacent to the time anaesthesia was administered, where vital signs including blood pressure, pulse rate and SpO2were noted at every 1 minute for the first 10 minutes, before continuous 5-minute intervals during the operation. Hypotension was operationally defined as an SBP less than 90mmHg or a fall of more than 20% from baseline. When hypotension developed, ephedrine or phenylephrine was administered to ensure secure hemodynamic and the use of vasoactive amines, the precise time and dose of each of them, were documented. Anything that was observed which might be considered problematic, including symptoms like nausea and vomiting, or bradycardia was also recorded.

Positioning

Group A (composite position)

In Group A, the patient's postoperative position was in the left lateral tilt of 15 degrees after receiving lumbar anaesthesia. This was the rationale of the tilt as this reduces aortocaval compression which greatly causes hypotensive pregnant women because of the progression of the uterus over lying inferior vena cava and aorta whenever the mother lays flat. Lateral tilt position also assists in preserving the normal venous blood return to the heart and thus preventing the clinician from getting drops in the blood pressure levels. These patients were then progressively placed in the supine position with the least inclination in order to optimize the surgeon's view on field while at the same time not exerting to much force on the inferior vena cava. This gradual shift in position prevented causes that led to a massive fluctuation in blood flow thereby worsening hypotension. This composite positioning was to be used to optimize the advantages of minimising aortocaval compression during the crucial time in the procedure and at the same time guarantee access to the operative field. Any variation in blood pressure, pulse rate and oxygen saturation of the patients in this group during the positioning adjustments were documented as well as any episodes of hypotension or discomfort.

Group B (supine position)

The patients in Group B were positioned in the standard lithotomy position as soon as lumbar anaesthesia was given and maintained in the position until the caesarean section was completed. The reason why they selected the supine position is that optimum accessibility to the patient is necessary for the surgeons. Although being the most favourable position in terms of visibility during surgery, this position is linked to an increased likelihood of aortocaval compression and decreased venous return in pregnant women that causes hypotension. The patients lay immobile throughout the administration of anaesthesia and surgery. The state of hypotension, changes in pulse rate and oxygen saturation rates were monitored similarly to Group A. The hypotension in this group was managed with vasopressors and the doses used and the time was noted. The time taken in administration of anaesthesia and the onset as well as control of adverse effects was also recorded.

Oxytocin administration

In order to avoid academia and post-partum uterine atony all patients, regardless of their group, were given intravenous oxytocin after the delivery of the placenta. Regarding the practice involving the use of oxytocin, it was ensured that one form of the protocol was implemented in all the groups. To start with, the intravenous dose of 10 UI of oxytocin was given in the first minute. This rapid bolus was intended to cause the uterus to contract as soon as possible and this is essential in controlling Postpartum Haemorrhage (PPH), a common occurrence in cases of caesarean sections. Subsequently a constant drip of oxytocin at a rate of 10 units in 500 ml of normal saline was given for subsequent one hour after bolus dose. This slower rate helped to maintain the tone of the uterus and to counteract early post-partum uterine relaxation. We documented the total amount of the doses of oxytocin used, the time it was given and whether there were any complications like hypotension or high pulse rate. To observe any propensity for post bolus dose initially hypotension, blood pressure was observed keenly because oxytocin has vasodilatory effects. In addition to oxytocic agents if the patients had features suggesting persistent uterine atony or if they did not respond to oxytocin, then other uterotonic drugs like misoprostol or carboprost were given depending on clinical status of the patient and recommendation of the consultant obstetrician. These cases were documented but using of more uterotonics was not a primary end point of the study.

Outcome measures

The time to hypotension was measured as the time to the first decrease in systolic blood pressure below 90 mmHg in patients receiving lumbar anaesthesia. This was considered from the time the spinal anaesthetic was given to the time the patient's systolic blood pressure fell below ninety mmHg or declined by more than 20% from the initial value. Particular details of this scenario were taken to record when precisely the first episode of hypotension occurred to enable the assessment of early outcomes of implemented anaesthesia and positioning interventions. Another practicable variable closely observed during the procedure was the vasopressor. The total amount of vasopressors given in the form of ephedrine or phenylephrine needed to maintain the normotension score was documented for all patients. Any of these vasopressors were given if there was profound hypotension and the type of vasopressor, dose and time given were recorded for the purpose of judging the ability of each positioning group to prevent hypotension in addition to using the least amount of vasoactive medication.

The neonatal consequences of the study were determined with the help of Apgar scores of neonates, which were done both at 1 and 5 minutes after birth. This scoring system of the newborn which measure the newborn's individual characteristics such as the rate of breathing, muscle tone, stimulation and colour, gave some information about the newborns' health status shortly after caesarean births. These scores allowed to identify effects of maternal hypotension or the chosen anaesthesia regime on neonatal status.

Evaluations of maternal conditions were also made specifically with regard to maternal heart rate and the occurrence of side effects including nausea, vomiting or discomfort which is normally observed among some mother who undergo operation such as a caesarean section, due to the anaesthetic use. These parameters were collected before, during and after the procedure and at the time of recovery thus providing further insight to the specific procedure experience of this patient and the acceptability level anaesthetic and positioning techniques. Side effects like bradycardia or arrhythmias were notated if they occurred. They established that cardiac dysrhythmias including bradycardia, defined as a heart rate below 60 beats per minute and any other arrhythmias were identified in the perioperative period as possible complications associated with both anaesthesia and vasopressor use. These adverse events were reported with respect to its positioning as well as use which encompass all the important angles of safety assessment of the interventional procedures applied during the study.

Sample size consideration

Although this study was retrospective in nature, an a priori sample size estimation was conducted to ensure adequate statistical power for detecting differences in the primary outcome-incidence of hypotension. Based on previous literature (Taylor *et al*., 2022; Evans *et al*., 2023), we assumed a hypotension incidence of 50% in the supine group and 30% in the composite positioning group. Using a two-sided chi-square test with $\alpha = 0.05$ and power $(1-\beta) = 0.80$, the minimum required sample size per group was calculated to be 58 patients. Therefore, enrolling 60 patients per group (total n = 120) provided adequate power to detect clinically meaningful differences in the primary outcome. However, it is acknowledged that the power to detect smaller effect sizes in secondary outcomes may be limited due to the sample size.

STATISTICAL ANALYSIS

Data were analysed using SPSS version 25.0. VSU participants' responses to continuous and categorical pertinent questions were compared with counterpart participants at the two comparison universities using descriptive statistics for continuous variables like the incidence of hypotension, categorical variables in percentages and the Chi-square test for categorical data. Non-categorical variables were reported as mean ± standard deviation (SD) and independently t-testing was used in comparison. The hypotensive events recorded between the two groups were compared using Kaplan Meier survival plots and log rang test for time related comparisons. Thus, the analysis of the influence of positioning uncomfortable for the composite position, oxytocin administration and other possible covariates on hypotension was performed with the formation of a multivariate logistic regression model, which also included BMI, the basic level of SBP and age for comparisons. An alpha level of 0.05 was used to determine the test of statistical significance.

RESULTS

Demographic and baseline characteristics of study participants

The demographic and baseline characteristics of the study participants in table 1 provide an insightful comparison between the two groups: Group A and Group B. The p-values for each characteristic specified whether there are systematic differences between the groups and as none of the characteristic values differ systematically, it can be concluded that the two groups are reasonably comparable with regard to the characteristics studied.

Onset and incidence of hypotension post-lumbar anaesthesia

Table 2 shows the comparison of onset and incidence of hypotension following lumbar anaesthesia between two groups. The p-values show significant differences in all the outcomes that were observed in the present study. Supine Group B recorded 30 of participants with hypotension of the 60 participants in this category, 50% had this problem while in the Composite Group A, only 18 participants (30%) developed hypotension. The difference is statistically significant at the 0.03 level and this supports the hypothesis that the composite positioning in Group A maybe more effective in preventing hypotension following lumbar anaesthesia. The mean time to onset of hypotension also turned out to be significantly different between the two groups. Concerning time to hypotension, Group A had a mean time of 6.38 minutes (±2.84) while in Group B had much earlier time of 4.67 minutes (±3.02). This also shows that, there is a higher rate of development of hypotension in participants in the supine position compared to the composite position (p = 0.02). Finally, the mean SBP during hypotension was slightly higher among group A at mean of 84.47 (± 7.18) than group B at mean of 81.23 (± 6.89). Though this difference appears small, performing the statistical analysis we see that the p-value of 0.05 implying that the composite positioning might assist in preserving slightly higher SBP levels during hypotension compared to the supine position.

Vasopressor usage

Table 3 shows vasopressor use between Group A (Composite) and Group B (Supine). The data reveal some statistically significant differences in such aspects of the case as total vasopressor dose and the application of ephedrine and phenylephrine. The total vasopressor dose given was less in Group A compared to Group B, Group A participants received 7.17 mg (±3.12) and Group B participants received 9.47 mg (±4.17). With a p-value of 0.02, this difference indicates that the consequent positioning required by individuals into the composite positioning needed lesser intervention of vasopressors for hypotension, possibly due to the better control of blood pressure as compared to those in the supine group. Consequently, patients in Group B received more ephedrine comparatively to those in Group A, which was administered only to 28.33% (17 of 60) to Group A but 45% (27 of 60) to Group B. The fact that this difference equals 0.04 means that it is statistically significant. This implies that fewer participants in Group A needed ephedrine to overcome hypotension hence implying that the participants in the composite position had a better hemodynamic profile. The same was observed for phenylephrine with 25% of patients in Group A (15 of 60) receiving this vasopressor compared to 40% in Group B (24 of 60).

Even though the difference is not quite as big as it was with ephedrine, the p-value of 0.05 means that the results are statistically significant. That further supports the hypothesis that with composite positioning, vasopressors were used less often, possibly because of better blood pressure control.

Neonatal and maternal outcomes

Table 4 summarises neonatal and maternal findings. Neonatal outcome shown an Apgar score at 1 minute, in Group A, it was 8.53 ± 0.58 and 8.43 ± 0.68 was in Group B, the difference was not statistically significant although the p-value was 0.38. The mean Apgar scores in the same context were 9 minutes as 9.10 (± 0.43) in Group A and 9.00 (± 0.50) in Group B. Similar to neonatal outcome at 5 minutes with a p- value of 0.45 meaning that there was no significant difference on the two groups. The incidence of neonatal ICU admission was comparatively low in both groups, Group A only 3.33% (2 out of 60) and Group B 5% (3 out of 60). The results of the p value of 0.57 suggest that there is no difference between the composite and supine positions with regards to admissions to the neonatal ICU. Regarding maternal outcomes, the frequency of nausea was statistically significant, as 25% (15 out of 60) women in Group B reported nausea than 15% (9 out of 60) in Group A. While there is a difference in the rates, it is not statistically significant; the p = 0.18. The same applies for vomiting whereby 18.33% (11/60)) clients in Group B vomited as compared to 8.33% (5/60) in Group A. The difference brings a p-value of 0.10 suggests that this difference is not statistically significant, though there is a trend toward higher rate of nausea and vomiting in supine group. Cardiovascular effects that were observed included bradycardia manifesting in 10% (6/60) subjects in Group A and 11.67%(7/60) subjects in Group B at p = 0.72, therefore the 2 groups were comparable. The frequency of arrhythmias was also low in both groups - 1.67% in Group A (1 out of 60) and 3.33% in Group B (2 out of 60); p=0.65 cannot, therefore be regarded as a statistically significant difference.

Postoperative recovery outcomes

Table 5 shows the findings of postoperative recovery between Group A and Group B were. These p-values suggest if there is any difference in the groups that is when assessing the results of the outcomes. The time to the first ambulation the participants in Group A were ambulatory in 6.45 hours ±1.35 while in Group B it took the participants 7.10 ± 1.52 hours to be ambulatory. Nevertheless, the p=0.08 indicates that no much distinction exists between the two groups in terms of ambulation recovery because the numbers are too close to reaching a significance level in this case, the faster ambulation in the composite group could be by chance and the VAS-monitored postoperative pain scores differ significantly between the groups. Group A patients had a mean pain score of 3.10 (±1.10), while patients in Group B had a mean pain score of 4.25 (±1.45). The difference identified in the level of postoperative pain is statistically significant as the calculated p value is 0.02. Thus, it could be argued the use of the sitting composite produced lower levels of postoperative pain as compared to the supine position. During the hospital stay, Group A was discharged at a mean of 3.25 days (± 0.75) and Group B a slightly longer mean stay at 3.50 days (±0.82). Nevertheless, the value of 0.15 in the p-value column means that such a difference is not statistically significant; thus, the choice of positioning method (composite or supine) makes no practical difference in the length of a patient's stay at the hospital. Finally, the postoperative fatigue scores which were obtained from the VAS were lower in Group A and their means were 2.75 ± 1.20 and in Group B 3.90 ± 1.40. Although the above results show that the mean value of the score of postoperative fatigue is lower among the participants in the composite group than among those in the supine group, the results of the statistical analysis suggest this difference is statistically significant because the calculated p-value is smaller than 0.5, specifically equal to 0.03.

Multivariate logistic regression analysis for risk of hypotension

Hypotension related factors and the overall risk of hypotension are determined through the multivariate logistic regression analysis results presented in table 6. Establishing statistical significance of each variable to predict development of hypotension, odds ratios (OR) are depicted alongside 95% confidence intervals (CI) and the p-values. The composite positioning (Group A) has odds ratio of 0.48 CI 95%, (0.25-0.92) and p-value 0.04. This shows that the chance of developing hypotension is relatively low among participants in Group A (Composite) and they are statistically different from the experimental findings. Precisely, the chance of hypotension was 52% lower in the composite positioning group compared to chance of the other positions. The confidence interval does not also cross the 1.0 level to further support this realization. Oxytocin applicant physiological reported amount of the the odds ratio equals 1.22, 95 % CI (0.65-2.29) and p = 0.53. This means that it was not found that oxytocin stimulates or diminishes hypotensive state as the odd ratios is roughly equal to one and the p-value is equal to 0.594. The initial level of SBP risk per Sd has an OR of 0.95 and 95% CI of 0.89 to 1.01 and P approximate to 0.07. Even though, the odds ratio measure indicates that a lower baseline SBP might be protective for hypotensive episodes, the p-value is not significant enough to support this conclusion. Still, it is on the borderline, which might mean that there is a trend beginning to emerge that needs to be examined more closely. In BMI analysis, odds ratio equals 1.08, CI (95%) = 0.98 - 1.19 and p = 0.12. Interestingly, a similar trend was observed for hypotension where the BMI shows a very slight rise and was not statistically significant. Finally, age has an odds ratio of 1.01, ci 95%: 0.93 - 1.09, p = 0.85. This shows that there is no variation in the occurrence of hypotension with age whereby the odd ratio is nearly 1 and the p-value is also valueless.

Table 1: Demographic and Baseline Characteristics of Study Participants

Characteristic	Group A (n = 60)	Group B (n = 60)	p-value
Mean Age (years)	29.30 ± 4.83	30.07 ± 5.12	0.42
Mean Gestational Age (weeks)	38.43 ± 1.12	38.58 ± 1.04	0.65
BMI (kg/m²)	28.50 ± 2.91	27.77 ± 3.21	0.34
Baseline SBP (mmHg)	124.47 ± 10.33	122.87 ± 9.78	0.56
Previous Cesarean Section (%)	12 (20%)	11 (18.33%)	0.79
Elective Cesarean Section (%)	36 (60%)	33 (55%)	0.65

Table 2: Onset and Incidence of Hypotension Post-Lumbar Anesthesia

Outcome	Group A (n = 60)	Group B (n = 60)	p-value
Incidence of Hypotension (%)	18 (30%)	30 (50%)	0.03*
Mean Time to Onset of Hypotension (minutes)	6.38 ± 2.84	4.67 ± 3.02	0.02*
Mean SBP during Hypotension (mmHg)	84.47 ± 7.18	81.23 ± 6.89	0.05*

* Significant at p < 0.05

Table 3: Vasopressor Usage

Variable	Group A (n = 60)	Group B (n = 60)	p-value
Total Vasopressor Dose (mg)	7.17 ± 3.12	9.47 ± 4.17	0.02*
Ephedrine Usage (%)	17 (28.33%)	27 (45%)	0.04*
Phenylephrine Usage (%)	15 (25%)	24 (40%)	0.05

* Significant at p < 0.05

Table 4: Neonatal and Maternal Outcomes

Outcome	Group A (n = 60)	Group B (n = 60)	p-value
Neonatal Outcomes			
Mean Apgar Score at 1 minute	8.53 ± 0.58	8.43 ± 0.68	0.38
Mean Apgar Score at 5 minutes	9.10 ± 0.43	9.00 ± 0.50	0.45
Neonatal ICU Admission (%)	2 (3.33%)	3 (5%)	0.57
Maternal Outcomes			
Nausea (%)	9 (15%)	15 (25%)	0.18
Vomiting (%)	5 (8.33%)	11 (18.33%)	0.10
Bradycardia (%)	6 (10%)	7 (11.67%)	0.72
Arrhythmias (%)	1 (1.67%)	2 (3.33%)	0.65

Table 5: Postoperative Recovery Outcomes

Outcome	Group A (Composite) (n = 60)	Group B (Supine) (n = 60)	p-value
Time to First Ambulation (hours)	6.45 ± 1.35	7.10 ± 1.52	0.08
Postoperative Pain Score (VAS)	3.10 ± 1.10	4.25 ± 1.45	0.02*
Duration of Hospital Stay (days)	3.25 ± 0.75	3.50 ± 0.82	0.15
Postoperative Fatigue (VAS)	2.75 ± 1.20	3.90 ± 1.40	0.03*

Table 6: Multivariate Logistic Regression Analysis for Risk of Hypotension

Variable	Odds Ratio (95% CI)	p-value
Composite Positioning (Group A)	0.48 (0.25–0.92)	0.04*
Oxytocin Administration	1.22 (0.65–2.29)	0.53
Baseline SBP	0.95 (0.89–1.01)	0.07
BMI	1.08 (0.98–1.19)	0.12
Age	1.01 (0.93–1.09)	0.85

* Significant at p < 0.05

DISCUSSION

The research shows that performing caesarean section through spinal anaesthesia with composite positioning produces fewer maternal hypotension cases alongside delayed onset prevention along with decreased vasopressor medicine intake and reduced symptoms of postoperative fatigue and pain. The current research agrees with Taylor *et al*. (2022) and Evans *et al*. (2023) in proving that maternal positioning stands as an essential non-pharmacological approach to maintain stable hemodynamic. Although multivariate regression examined BMI and age and baseline SBP it failed to account for various crucial confounding elements in the analysis. Several factors affect hypotension development including maternal anaemia and thyroid dysfunction and gestational diabetes and beta-blocker and fluid management prescriptions and other medications used at the same time as the procedure. External variables shape blood vessel tension together with heart functioning as well as anaesthetic response which might alter rates of hypotension development and subsequent recovery results. Anaesthesiologist technique along with experience levels were not controlled factors during this retrospective study which may create block performance and drug delivery inconsistencies as well as positioning reaction differences.

The administration of oxytocin presents a significant challenge as a main study limitation. The study implemented standardized dosing practices as bolus injection followed by continuous infusion but it did not identify specific time points regarding anaesthesia commencement or surgical stages for medication administration. Patient-specific variations in vascular responses to oxytocin administration could have countered each other between different patients thus reducing the detectable results of positioning interventions. The cardiovascular effects of oxytocin follow a dosage and timing pattern which requires these variables to be incorporated as stratification elements in prospective trials according to Brown *et al*. (2021) and Thompson *et al*. (2022).

The findings regarding decreased vasopressor use require supplementary assessment because they reached statistical significance. Lower use of vasopressors implies better cardiovascular stability although it did not reduce the rate of bradycardia or arrhythmias. The necessity of vasopressor reduction for better maternal comfort and bradycardia risk reduction remains unclear since long-term patient results are unavailable at present. External factors such as early walking protocols and psychological aspects together with improved cardiac stability possibly explained the better scores recorded on maternal outcome metrics during the postoperative period.

The comparison between groups revealed no meaningful distinctions in the neonatal outcomes involving Apgar scores together with NICU admissions. The findings support the safe positioning of women after caesarean section but suggest these strategies have minimal individual benefits for healthy newborns during labour and delivery. The benefits shown from these maternal positioning techniques appear to affect hemodynamic and subjective recovery parameters particularly when there is no foetal distress. Laboratory findings by Garcia *et al* (2021) and Walker *et al* (2023) match well with the results showing less hypotension and decreased vasopressor administration when using composite patient positioning. The retrospective study analysis presents an intraoperative and early postoperative point view instead of providing continuous prospective monitoring. The study lacked a systematic process for checking postpartum outcomes involving maternal tiredness duration and blood clot formation potential as well as baby developmental progress. The insufficient data collection makes it difficult to extend the research outcomes to general maternal-neonatal health indicators.

The implication of these findings for clinical practice

Clinical relevance of the present study is in establishing the fact that the application of composite positioning during caesarean sections under lumbar anaesthesia can actually help in minimizing hypotensive episode, a common. side effect of spinal anaesthesia. Composite positioning also has other benefits associated with a decreased need for vasopressors and better blood pressure control to further promote maternal safety, as hypotensive events can lead to placental hypoperfusion and foetal compromise. The conclusion drawn is that efficacious use and application of composite positioning as part of clinical practice could be beneficial for enhancing better maternal and neonatal health, requiring minimal interventions and a faster postoperative rehabilitation period. This approach appears to provide a real, drug-free way of addressing the problem of hypotension following caesarean section performed under anaesthesia.

Limitation of this study

This study, while offering valuable insights, is not without limitations. First, although multivariate logistic regression was employed to adjust for key confounders such as BMI, baseline systolic blood pressure and age, additional unmeasured variables may have influenced the risk of hypotension. These include baseline maternal health conditions (e.g., diabetes, anaemia, undiagnosed cardiovascular disorders), anaesthesiologist expertise and variation in clinical practice, as well as the precise timing and rate of oxytocin administration—which were standardized in protocol but not independently verified in all cases. Second, the retrospective design inherently limits control over data completeness and quality and some subtle intraoperative dynamics may have gone undocumented. Third, while the study rigorously assessed intraoperative and immediate postoperative outcomes, there was no structured follow-up beyond initial recovery. As a result, long-term maternal outcomes such as delayed fatigue, wound healing, readmission rates and neonatal developmental indicators (e.g., breastfeeding success, weight gain, hospital revisits) were not captured. Inclusion of longitudinal data would be essential in future studies to understand the enduring clinical implications of positioning and pharmacological interventions like oxytocin.

CONCLUSION

Therefore, this study proves the idea that when a pregnant woman is in composite position during caesarean sections under lumbar anaesthesia, the occurrence of hypotension and use of vasopressors decreases as compared to that in the supine position. The members of composite group waited longer time for the onset of hypotension, had higher systolic BP and less pain and fatigue after the operation. Despite no difference in neonatal results including Apgar scores and ICU admissions, benefits of composite positioning were evident in maternal hemodynamic stability and quicker recovery. It was established that the implementation of the composite positioning during the anaesthesia can help to raise the level of maternal care, as well as increase the general safety of patients that undergo caesarean sections. These results suggest that more research with larger samples of participants and with more diverse participants is needed.

Consent to publish

The manuscript has neither been previously published nor is under consideration by any other journal. The authors have all approved the content of the paper.

Consent to participate

We secured a signed informed consent form from every participant.

Ethical approval

This experiment was approved by The First Affiliated Hospital of Soochow University Ethics Committee No. K-2024-009-K01.

Author contribution

[Hui Dong]: Developed and planned the study, performed experiments and interpreted results. Edited and refined the manuscript with a focus on critical intellectual contributions.
[Zhengyu Ju]: Participated in collecting, assessing and interpreting the date. Made significant contributions to date interpretation and manuscript preparation.
[Yuan Jiang, Qiuyan Jiang]: Provided substantial intellectual input during the drafting and revision of the manuscript.

Conflicts of interest

The authors declare that they have no financial conflicts of interest.

Data availability statement

The data supporting the findings of this study can be obtained from the corresponding author, upon request.

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