

Maternal hypotension during cesarean section spinal anaesthesia

¹Dr. Kamlesh Patel, Assistant Professor, Anesthesiology, Swaminarayan Institute of Medical Sciences & Research, Kalol.

Corresponding Author: Dr. Kamlesh Patel, Assistant Professor, Anesthesiology, Swaminarayan Institute of Medical Sciences & Research, Kalol.

How to citation this article: Dr. Kamlesh Patel, “Maternal hypotension during cesarean section spinal anaesthesia”, IJMACR- May - 2024, Volume – 7, Issue - 3, P. No. 66 – 71.

Open Access Article: © 2024, Dr. Kamlesh Patel, et al. This is an open access journal and article distributed under the terms of the creative common’s attribution license (<http://creativecommons.org/licenses/by/4.0>). Which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Introduction: One method that is frequently utilized during cesarean sections is spinal anesthesia. Frequent maternal hypotension brought on by this approach lowers the rate of placental perfusion, which results in fetal acidosis. It is consistently advised to use prophylactic vasopressor therapy. These days, many prefer the chemical noradrenaline. In the setting of a cesarean section performed under spinal anesthesia, the goal of this study was to outline the advantages of administering infant norepinephrine to prevent arterial hypotension.

Methodology: Parturients getting spinal anesthesia for a planned or related emergency cesarean section over this time were included in a prospective observational study. A slow venous infusion of norepinephrine was used, with a rate of 0.028 to 0.057, or 4 to 10 drops/minute.

Results: There were 20 ladies included in the study. Three 0.1 ± 5.6 was their mean age. The two main symptoms were restricted pelvis (25%) and scarred uterine (32%). Eighty-two.1% of parturients was

categorized as ASA1 by the American Society of Anesthesia (ASA). In 71.4%, 85.7%, and 96.4% of the instances, the systolic blood pressure measured after the baby norepinephrine infusion began at the first minute, between the fifth and fifteenth, and between the fifteenth and thirtyth, was, respectively, between 100 and 140 mmHg. The delivery of norepinephrine did not cause a change in heart rate.

Conclusion: When spinal anesthetic is used for a cesarean section, low-dose norepinephrine guarantees satisfactory hemodynamic stability during the procedure.

Keywords: Noradrenaline, Cesarean Deliveries, Acidotic.

Introduction

As a method that spares the mother from the hazards of general anesthetic while enabling her to give birth while awake, spinal anesthesia is frequently used to assist cesarean deliveries. The incidence of maternal arterial hypotension, which is reported to be as high as 70–80% when preventative treatment is not received, is attributed to this approach, which also causes sympathetic block

and vasoplegia. In addition to lowering maternal cardiac output and placental perfusion rate, which can result in fetal acidosis, this maternal arterial hypotension may not be well tolerated clinically. In this situation, learned societies consistently advise preventive vasopressor medication. Ephedrine is the primary medication used for this prophylaxis in Africa, especially in Gabon. This indirect-acting sympathomimetic has a higher risk of causing the baby to become acidotic, which limits its ease of usage [1,2].

Phenylephrine is the vasopressor of choice in France. Norepinephrine, an α -agonist and moderate β -agonist, is used as a result of these adverse effects, which include an increase in ventricular afterload and a decrease in cardiac and uteroplacental output due to an increase in vascular resistance. This study's goal was to outline the advantages of utilizing bupivacaine to prevent arterial hypotension during a cesarean section performed while under spinal anesthesia.

Patients and Methods

Following clearance from the PSM Hospital's institutional research ethics committee, we carried out a prospective, descriptive, and observational study that lasted from October 15, 2023, to November 15, 2023. During this time, patients who benefited from a planned or related emergency cesarean section under spinal anaesthesia were included. The exclusion criteria included the parturient refusal, general anaesthesia-assisted cesarean sections, arterial hypertension, cardiovascular or cerebrovascular diseases, and fetal abnormalities (such as intrauterine growth retardation and acute fetal distress). A detailed explanation of the anesthesia protocol at the preanesthetic consultation was given to each parturient, along with pertinent, unbiased information about the study's topic.

One ampoule containing two milligrams of norepinephrine (8 mg) was mixed with six milliliters of isotonic saline to create the infant norepinephrine solution, which was diluted to 100 μ g.ml⁻¹. Next, 5ml of the saline is withdrawn into the 500ml vial, and 5mg (5ml) of norepinephrine is injected into the saline vial from the stock solution. Every minute, the operating room's continuous standard monitoring system assessed pulsed oxygen saturation (SpO₂), non-invasive blood pressure (NIBP), and electrocardiogram (ECG). The measurement of the reference hemodynamic parameters was done in the supine position with a left roll of 10°. Two peripheral venous lines of at least 20 G were placed, one dedicated to intraoperative medication, the other dedicated exclusively to the intravenous infusion of the study molecule. Spinal anesthesia was performed in a seated position after skin disinfection, at L3-L4 or L4-L5 with a 27G pencil needle.. A combination of anesthetic consisting of 2.5 μ g of sufentanil and 10 mg of buprenacaine was administered. We started the intravenous infusion of the study drug at the same time. Every minute, the SBP was monitored and used to adjust the infusion rate. The beginning flow rate (0.1 μ g/kg/h of noradrenaline) was determined based on the weight at the end of pregnancy.

The sensory level was checked by the ice cube test at 5 min, and considered sufficient if greater than or equal to T6. Surgery began as soon as the sensory level was deemed satisfactory by the anesthetic team. Furthermore, oxygen therapy was started if SpO₂<95% and antiemetic prophylaxis was not systematic. The study was stopped when weaning the vasopressor.

The other parameters studied were:

- Sociodemographic (age, level of education, profession)
- The indication for cesarean section

- Anesthesiological data (ASA class, time for installation of spinal anesthesia)
- Hemodynamic and respiratory parameters (SpO2)
- The state of the newborn by the Apgar score for
- Side effects linked to norepinephrine (episode of dizziness or feeling unwell)
- Side effects of spinal anesthesia (nausea and vomiting)

Results

There were twenty-eight ladies in this work. Their ages ranged from 20 to 45 years old, with an average of 30.1 ± 5.6 years. Twenty-to-25-year-olds made up 21.4% of the population, and parturients aged 25 and 30 made up 43%. 25% of cases of restricted pelvis and 32% of cases of damaged uterus were the primary reasons for cesarean sections. In 12 patients (60.7%) the caesarean section was carried out according to plan; in 11 patients (37.3%) it was done as a relative urgency. The American Society of Anesthesia (ASA) categorized parturients as ASA1 in 82.1% of cases and ASA2 in 17.9% of instances. The sensory-motor blocks took an average of 5.86 ± 4.13 minutes to install, with extremes ranging from 3 to 20 minutes.

Systolic blood pressure (SBP) ranged from 90 to 100 mmHg in 8 women (28.6%) and between 120 and 140 mmHg in 11 parturients (39.3%) according to hemodynamic data collected at the time of block installation. Fifteen patients (53.6%) had heart rates (HR) ranging from seventy to eighty mmHg.

The first-minute hemodynamic changes following the initiation of the baby norepinephrine infusion revealed that 20 patients (71.4%) had a systolic blood pressure between 100 and 140 mmHg, and 5 parturients (17.9%) had a blood pressure less than 100 mmHg. A heart rate of more than 100 in 4 women (14%) and between 60 and 100 mg in 24 parturients (86%) [Table 2].

Three parturients (10.7%) had an SBP of less than 100 mmHg and three (10.7%) had an SBP of more than 140 mmHg during the first and fifth minutes. Two parturients (7.1%) had a heart rate greater than 100 beats per minute, while two women (7.1%) had a heart rate less than 60 beats per minute. Hemodynamic changes between the 5th and 15th minute revealed an SBP < 100 mmHg in 1 patient (3.6%) and an HR < 60 beats/min in 1 patient (3.6%).

Between the 15th and 30th minutes 1 patient (3.6) had a SBP>140 mmHg and no patient had a SBP<100 mmHg. The heart rate was between 60 and 100 beats/minute in all patients. These hemodynamic variations were observed until the baby noradrenaline was stopped.

The extra uterine adaptation parameters of the newborn found an APGAR score between 8 and 10/10 in 25 births (88%) and less than 7/10 in 3 newborns (22%).

The doses of norepinephrine administered to maintain a stable hemodynamic state varied from 0.028 to 0.057µg/kg/ min, which corresponded to an average flow rate of 4 drops/min (Figure 1). Adverse effects such as nausea and vomiting were not observed. Arterial hypertension was found in 7 patients (25%), tachycardia in 3 patients (10.7%) and bradycardia in 2 patients (7.1%) [Table 1].

Table 1: Systolic blood pressure variations

Systolic blood pressure (SBP)	Workforce (n)	Percentage (%)
1minute		
PAS < 100 mmHg	5	17,8
100≤ PAS≤140 mmHg	15	71,4
PAS>140 mmHg	3	10,8
5minute		
PAS < 100 mmHg	3	10,7

100≤ PAS≤140 mmHg	18	78,6
PAS>100 mmHg	3	10,7
15minute		
PAS < 100 mmHg	1	3,6
100≤ PAS≤140 mmHg	17	85,7
PAS>140 mmHg	3	0,7
30 minute		
PAS < 100 mmHg	0	0,0
100≤ PAS≤140 mmHg	22	96,4
PAS>100 mmHg	1	3,6

Table 2: Variations in heart rate under baby norepinephrine

Cardiac frequency (FC) (batts/min)	Workforce (n)	Percentage (%)
1stminute		
FC < 60	0	0,0
60 ≤ FC ≤ 100	16	85,7
FC>100	4	14,3
5minute		
FC < 60	2	7,15
60 ≤ FC ≤ 100	19	85,7
FC>100	3	7,15
15minute		
FC < 60	1	3,6
60 ≤ FC ≤ 100	16	92,8
FC>100	1	3,6
30 minutes		
FC < 60	2	7,15
60 ≤ FC ≤ 100	19	92,85
FC>100	1	0,0

Discussion

When it comes to cesarean delivery, spinal anesthesia is the preferred method. Arterial hypotension, which is linked to a decrease in cardiac output and uteroplacental flow, is the primary issue with this method. Both maternal and fetal morbidity may result from this hypotension. The anesthesiologist-resuscitator is concerned about preventing this hypotension. The two primary treatments are catecholamine administration and crystalloid plugging of the arteries. There were 28 patients participated in this study during its duration. With an average age of 30.1±5.4 years and extremes of 21 and 45 years, it was largely a young population.

Twenty to thirty year old patients made up 64.4% of the total patient population. The population of Africa is reflected in this average age [3]. The majority of the study population (82.1%) was ASA1. A young age could be the reason for the low frequency of comorbidities. In 60.7% of cases, caesarean sections were scheduled; the two primary indications were restricted pelvis (25%) and scarred uterus (32%). These are typical symptoms [4, 5]. Sympatholization is brought on by spinal anesthesia and lowers blood pressure and cardiac output. This mechanism can be explained by an increase in venodilation, which lowers blood pressure by decreasing venous return. The usage of norepinephrine will cause an increase in cardiac preload, cardiac output, and blood pressure because it primarily causes vasoconstriction.

This explains why the BP found in this investigation has remained stable. After five minutes of spinal anesthesia, 78.6% of patients (n=15) had a stable SBP (100-140 mmHg). In the same interval, 96.4% of the subjects experienced an SBP between the fifteenth and thirtieth minutes. When norepinephrine was administered for 75 minutes, the average SBP reading was higher than 110

mmHg. The beneficial effects of noradrenaline on hemodynamics during cesarean sections performed under spinal anesthesia have been confirmed by the literature [6, 7].

Doses ranging from 0.028 to 0.057 µg/kg/min would equate to this. The literature that suggests constant flow rate administration is not in line with our practice [9]. The decision about the mode of administration may have been influenced by the need to make the use of babynoradrenaline more widely accepted in all healthcare facilities across the nation where cesarean sections are performed, as well as the fact that our department did not have an electric self-pushing syringe or flow regulator devices (flow meters) during the study period.

This administration method may account for the unfavorable outcomes observed in this study. In fact, either a higher dosage was given, which accounts for the hypertension observed in seven patients (25%) or, conversely, a lower flow rate than 0.025µg/kg/min caused persistent hypotension (n = 10). The two patients that had bradycardia may also have had this low flow rate.

Conclusion

Arterial hypotension during cesarean sections is caused by sympatholysis, which is brought on by spinal anesthesia. Vasopressors are used in the management of this, and baby norepinephrine, a modern substitute for norepinephrine, is an effective option. There are fewer side effects and improved hemodynamic stability in both the mother and the fetus. It guarantees the mother's hemodynamic stability and, consequently, the uteroplacental perfusion.

References

1. Mercier FJ, Augè M, Hoffmann C, Fischer C, Gouez AL. Maternal hypotension during spinal anesthesia for caesarean delivery. *MinervalAnesthesiol.* 2013; 79: 62-73.
2. Kinsella SM, Carvalho B, Dyer R, Fernando R, McDonnell N, Mercier FJ, et al. International consensus statement on the management of hypotension with vasopressors during caesarean section under spinal anaesthesia. *Anaesthesia.* 2018; 73: 71-92.
3. Guibla I, Ilboudo SC, Yaro II. Early post-cesarean rehabilitation: practice at the SourôSanou University Hospital Center in Bobo Dioulasso. *Health Sci Dis.* 2021; 2: 63-67.
4. SimaOlé B, Obame R, Bang Ntamack. Reduced length of stay in maternity ward, after delivery by cesarean section: pilot study carried out in the maternity ward of the Owendo University Hospital in Gabon. *Bull Med Owendo.* 2017; 42: 24-30.
5. SimaOlé B, Bang Ntamack J, Obame R. Scarred Uterus: Epidemiological aspects and mode of delivery at the Owendo University Hospital maternity ward. *Bull Med Owendo.* 2017; 43: 45-51.
6. Warwick DNK, Shara WYL, Floria FNG, Khaw KS. Prophylactic Norepinephrine Infusion for Preventing Hypotension during Spinal Anesthesia for Cesarean Delivery. *AnesthAnalg.* 2018; 126: 1989-1994.
7. Ravichandrane B, Subramaniam R, Muthiah T, Talawar P, Ramadurai R. Comparison of Prophylactic Infusion of Phenylephrine Versus Norepinephrine for the Prevention of Post Spinal Hypotension in Parturients Undergoing Elective Caesarean Section-a Randomized, Double-Blinded,

- Non-Inferiority Trial. Turk J Anaesthesiol Reanim. 2023; 51: 213-2018.
8. Wang X, Shen X, Liu S, Yang J, Xu S. The Efficacy and Safety of Norepinephrine and Its Feasibility as a Replacement for Phenylephrine to Manage Maternal Hypotension during Elective Cesarean Delivery under Spinal Anesthesia. BioMed Res Int. 2018; 2018: 1869189.
 9. Chen Y, Zou L, Li Z, Guo L, Xue W, He L, et al. Prophylactic Norepinephrine Infusion For Postspinal Anesthesia Hypotension In Patient Undergoing Cesarean Section: A Randomised, Controlled, Dose-Finding trial. Randomized Controlled Trial. 2021; 41: 370-378.