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Original Research Article

A Hospital Based Observational Assessment of the Role of Perfusion Index (PI) as a Predictor of Post Spinal Hypotension in Lower Segment Caesarean Section (LSCS)

Saba Ghaffari[1], Khatibur Rahman[2]

[1]Senior Resident, Department of Obstetrics and Gynecology, Gauri Devi Institute of Medical Science & Hospital, Durgapur, West Bengal, India

[2]Senior Resident, Department of Anesthesiology, Gauri Devi Institute of Medical Science & Hospital, Durgapur, West Bengal, India

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Corresponding Author: Dr. Khatibur Rahman
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Abstract

Aim: The aim of the present study was to assess the clinical evaluation of perfusion index (PI) as a predictor of post spinal hypotension in lower segment caesarean section (LSCS).

Methods: The present study was conducted in the Department of Obstetrics and Gynecology, Gauri Devi Institute of Medical Science & Hospital, Durgapur, West Bengal, India. Informed & written consent was obtained from every parturient who came for caesarean section. A total of 50 subjects were analyzed.

Results: Out of 7 parturient had high standard PI (PI>3.5), 6 parturient foster hypotension, though out of 43 parturient had low pattern PI (PI≤3.5), 10 parturient foster hypotension. The parturient with high & low standard PI, systolic pulse diminished altogether after spinal infusion. However, more prominent reduction in systolic pulse at 5-10 min & 25 min in parturient having high benchmark PI had after spinal infusion than parturient having low standard PI.

Conclusion: Perfusion Index (PI) can be used to predict post spinal hypotension in healthy parturient undergoing lower segment caesarean section. Parturient higher risk of developing post spinal hypotension with baseline PI more than 3.5 compared to those with baseline PI less than 3.5.

Keywords: Hypotension, Perfusion index, Sub arachnoid block

Introduction

Spinal anesthesia for lower segment cesarean section (LSCS) is one of the most common procedures. The spinal anesthesia-associated sympathetic blockade is exaggerated in parturients due to physiological changes associated with pregnancy and resultant hypotension may have maternal and fetal implications. [1] Prediction of patients likely to develop hypotension will ensure effective prevention and prompt management, which is of paramount importance for the best quality care. Various parameters have been studied to predict hypotension after spinal anesthesia but a precise indicator was not established. [2,3]

Perfusion index (PI) is a non-invasive, continuous, photo-plethysmographic pulse wave monitored from a pulse oximeter and can be used to assess peripheral perfusion dynamics due to changes in the peripheral vascular tone. [4] It is defined as the ratio of pulsatile blood flow to non-pulsatile blood flow in peripheral vascular tissue and the value ranges between 0.02% and 20%. [5,6] In parturients, at term, due to decreased peripheral vascular tone, blood volume is pooled in the extremities, which increases further after sympathetic blockade of spinal anesthesia resulting in hypotension. [7] Peripheral vascular tone can be monitored as PI. A decrease in tone is associated with higher PI values due to an increase in the pulsatile component. After spinal anesthesia, there is vasodilatation and venous pooling leading to an increase in pulsatile blood flow, which ultimately increases PI. [8] Parturients with high baseline PI are expected to have lower peripheral vascular tone and hence are at higher risk of developing hypotension following spinal anesthesia; however, there is limited literature regarding the use of PI to predict spinal hypotension with contrasting results. [5,8,9]

Non-invasive blood pressure (NIBP) measurement is the standard method of monitoring intraoperative haemodynamics. However, beat to beat variation in perfusion dynamics cannot be measured by this method and limits its efficacy. Perfusion index (PI)

is defined as the ratio of pulsatile blood flow to non-pulsatile blood flow in the peripheral vascular tissue, measured using a pulse oximeter based on the amount of Infrared light absorbed. [10] Hence, PI can be used to assess perfusion dynamics and is being considered as a non-invasive method to detect the likelihood of development of hypotension following subarachnoid block (SAB). [11-13] Various studies carried out previously have employed perfusion index to assess haemodynamic parameters. However, there are limited data regarding its use for prediction of the incidence of hypotension occurring as a result of the central neuraxial blockade.

The aim of the present study was to assess the clinical evaluation of perfusion index (PI) as a predictor of post spinal hypotension in lower segment caesarean section (LSCS).

Materials and Methods

The present study was conducted in the Department of Obstetrics and Gynecology, Gauri Devi Institute of Medical Science & Hospital, Durgapur, West Bengal, India for one year. Informed & written consent was obtained from every parturient who came for caesarean section. A total of 50 subjects were analyzed.

Parturient included in our study, age between 18 to 35 years & American society of Anaesthesiologist Physical Status (ASA) Class I or Class II. Parturient excluded in our study having ASA class III or IV, pre term, post term, parturient with pre- eclampsia, placenta-praevia, gestational diabetes, cardio vascular or cerebro vascular disease & case who are came in contraindications to spinal anaesthesia.

Standard monitoring with electrocardiography for ECG & heart rate, automated noninvasive blood pressure (NIBP) for baseline blood pressure & pulse oximetry (SpO2) for PI & saturation was performed. At the left index finger of hand & toe of foot the perfusion index was measured by using a pulse oximeter probe (Masimo) in all parturient in supine position. Because it was a double-blinded study, the baseline haemodynamic parameters were recorded by an first anaesthesiologist who was not stay in the intraoperative monitoring of the parturient in the supine position. To rule out aortocaval compression effect on the baseline value we use left lateral table tilt of 15◦before sub arachnoid block to end of the surgery. Intra venous line secure with 18G cannula in the left upper limb & prehydrate with 500 ml Ringer lactate. Till the cleaning & draping of the patient foetal heart rate was monitored. A second anaesthesiologist who was unknown the baseline values give spinal anaesthesia under all aseptic precaution in sitting position at L3–L4 or L4–L5 interspinous space by using 25G Quincke spinal needle with 2ml of injection hyperbaric bupivacaine 0.5%. Oxygen was attached by use of face mask at 4 L/min to parturient after returned to supine position. By use of a cold swab level of sensory block was checked 5, 10 & 15 min after spinal injection before starting surgery. Parturient were excluded from our study if T6 sensory block level was not achieved & managed according to advised protocol. Heart rate (HR), Systolic blood pressure (SBP), Diastolic blood pressure (DBP), Mean arterial pressure (MAP), perfusion index (PI), saturation (SpO2) & respiratory rate(RR) were recorded at 2 min intervals upto 10 min & then 5 min intervals till the end of surgery after the SAB by the same anaesthesiologist who given SAB.

A diminishing in SBP > 20% from benchmark were characterized hypotension & treated with 100 ml of Ringer lactate & IV bolus of 3 mg infusion mephenteramine & HR <50 beats/min were characterized bradycardia & treated with IV bolus of 0.6 mg infusion atropine. As uterotonic infusion oxytocin 10 units was given at a pace of 200 mU/min as a different imbuement following child extraction. Parturient were barred from the review requiring extra oxytocin or extra careful/sedative intercessions. The frequency of sickness, retching & opposite incidental effects on the off chance that noticed were recorded.

Parturient information were investigated by Mann Whitney U test & autonomous example t test. Relapse investigation with Karl Pearson relationship technique was finished to evaluate the connection between's different boundaries with baselines PI & Receiver Operating Characteristic (ROC) bend was gotten for hypotension to correspond with the gauge PI. Measurable importance was characterized as $P<0.05$.

Results

Table 1: At baseline perfusion Index 3.5 & prediction of hypotension

Baseline PI	Present	Hypotension Absent	Total
>3.5	6 (True Positive)	1 (False Positive)	7
≤3.5	10 (False Negative)	33 (True Negative)	43
Total	16	34	50

Out of 7 parturient had high standard PI (PI>3.5), 6 parturient foster hypotension, though out of 43 parturient had low pattern PI (PI≤3.5), 10 parturient foster hypotension.

Table 2: Distribution of systolic blood pressure (mm of Hg) in parturient having baseline PI >3.5 & ≤3.5

Time interval	≤3.5 Mean	(N=43) SD	>3.5 Mean	(N=7) SD	Total Mean	(N=50) SD	P value
Baseline Before SAB	125.95	9.91	132.00	6.24	128.52	9.54	>0.05
After SAB At 5 min	116.04	10.75	105.15	5.85	114.46	10.90	0.007
10 min	113.12	10.70	103.87	11.64	110.76	11.25	0.017
15 min	111.49	9.93	110.00	12.00	111.27	10.15	>0.05
20 min	112.55	9.82	108.13	6.15	111.91	9.46	>0.05
25min	114.17	7.79	108.25	5.70	113.31	7.76	0.031
30min	115.98	6.84	111.63	9.50	115.35	7.34	>0.05
35min	117.53	7.66	115.13	5.38	117.18	7.38	>0.05
40 min	118.72	8.31	114.75	5.55	118.15	8.05	>0.05
45min	119.91	7.60	118.00	7.93	119.64	7.61	>0.05

The parturient with high & low standard PI, systolic pulse diminished altogether after spinal infusion. However, more prominent reduction in systolic pulse at 5-10 min & 25 min in parturient having high benchmark PI had after spinal infusion than parturient having low standard PI.

Discussion

In present situation strategy of decision among provincial sedative procedures for elective cesarean areas is spinal sedation. The vitally unfriendly impact is the rate of hypotension. Post spinal hypotension during medical procedure is rely upon diminished vascular opposition, diminished cardiovascular result, gauge volume status, standard fringe vascular tone. Spinal sedation cause thoughtful bar would additionally increment blood pooling. [14] For observing parturient we use screens showing pulse, BP, ECG & Masimo Signal Extraction Technology based perfusion record. In the fringe vascular tissue, the proportion of pulsatile blood stream to non-pulsatile blood stream is known as a Perfusion record 2-4 Perfusion file can likewise use to evaluate perfusion elements. [15-17]

Out of 7 parturient had high standard PI (PI>3.5), 6 parturient foster hypotension, though out of 43 parturient had low pattern PI (PI≤3.5), 10 parturient foster hypotension. The parturient with high & low standard PI, systolic pulse diminished altogether after spinal infusion. However, more prominent reduction in systolic pulse at 5-10 min & 25 min in parturient having high benchmark PI had after spinal infusion than parturient having low standard PI. PI esteem shows the strength of the infrared (940nm) signal getting back from the checking site its worth reaches from for powerless heartbeat 0.02% to solid heartbeat 20%. That demonstrates the strength of the IR (infrared) signal getting back from the checking site. [18]

Decline in foundational vascular obstruction alongside expansion in cardiovascular result is a physiological change in pregnancy. [19] Fall in the resting tone will prompt vasodilatation & ascend in the pulsatile part of perfusion record & cause an ascent in values. The sympathectomy after spinal sedation will impede the thoughtful nerves & loss of vascular tone made hypotension due expanded pooling blood in legs. Higher perfusion list values tell about increment pulsatile part in decline vascular tone vessels. Parturient with ease off fringe vascular volume before spinal sedation mean high gauge perfusion list are supposed to have more gamble to foster post spinal hypotension. Yokose M et al [20] showed that for post spinal hypotension in parturient PI had no prescient worth. This distinction was because of different logical contrasts, definitions, colloids co-stacking, & estimation of gauge Perfusion Index esteem.

Conclusion

Perfusion Index (PI) can be used to predict post spinal hypotension in healthy parturient undergoing lower segment caesarean section. Parturient higher risk of developing post spinal hypotension with baseline PI more than 3.5 compared to those with baseline PI less than 3.5.

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