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Perfusion index as a predictor of hypotension following spinal anaesthesia in lower segment cesarean section

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Abstract
Background: Perfusion Index is a reliable non-invasive monitoring indicator in predicting the incidence of hypotension following spinal anaesthesia in parturient undergoing elective caesarean section. The present study was undertaken to determine whether a baseline PI >3.5 predicts the development of hypotension after spinal anaesthesia in parturient undergoing elective LSCS.
Methods: A hospital based prospective, randomized, double blinded study was done in 90 patients aged between 20 and 40 years of American Society of Anesthesiologists (ASA) grade II undergoing elective Lower Segment Caesarean Section under spinal anaesthesia. Group I - parturient with PI of ≤3.5: 45 cases Group II- parturient with PI of >3.5: 45 cases.
Results: In Group I, 25 out of 45 patients developed hypotension and in Group II, 37 out of 45 patients developed hypotension. There was significant statistical difference between two groups in terms of incidence of hypotension as their p value ($p = 0.05$) was equal to 0.05.
Conclusion: These findings showed that in our study perfusion index cut-off of 3.5 was able to predict hypotension in parturient undergoing elective caesarean section.

Keywords: Perfusion Index (PI), hypotension, spinal anaesthesia, elective caesarean section, parturient

Introduction

Lower Segment Caesarean Section (LSCS) is commonly performed under spinal anaesthesia, because it has many advantages over general anaesthesia. Hypotension following administration of spinal anaesthesia for LSCS is common which results from the sympathetic blockade and decreased cardiac output. This hypotension may cause severe adverse effects in patient posted for LSCS surgery, such as nausea, vomiting and dizziness, and may cause umbilical arterial acidosis in infants [1]. An ability to identify those who would suffer from hypotension following spinal anaesthesia would give clinicians an opportunity to take preventive measures.

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 [2]. 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) [3-5].

The present study was undertaken to determine whether a baseline PI >3.5 predicts the development of hypotension after spinal anaesthesia in parturient undergoing elective LSCS.

Methodology

After the Institutional Ethics Committee approval, hospital based prospective, randomized, double blinded study was done in 90 patients aged between 20 and 40 years of American Society of Anaesthesiologists (ASA) grade II undergoing elective Lower Segment Caesarean Section under spinal anaesthesia. Group I - parturient with PI of ≤3.5: 45 cases Group II- parturient with PI of >3.5: 45 cases. Baseline values including PI will be recorded in supine position by an anaesthesiologist who will not be involved in further intraoperative monitoring of the patient. Observer who is monitoring intraoperative parameters will be blinded from baseline value. Preoperative evaluation was done followed by All patients were kept NBM for 6 hrs. On the day of surgery, on arrival in the operating room, NBM

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status and Consent was confirmed. The perfusion index was measured in the supine position using Philips pulse oximeter which was attached to the middle finger of all parturient to ensure uniformity in measured PI values. Those with a baseline perfusion index of ≤ 3.5 were taken as Group I and those with a perfusion index of >3.5 were taken as Group II. Spinal anaesthesia was performed by an anaesthesiologist blinded to the baseline PI values. NIBP, heart rate (HR), respiratory rate (RR), SpO2 and PI were recorded at 3 min intervals after the SAB up to 15 min and then at 5 min intervals by the same anaesthesiologist who administered spinal anaesthesia till the end of surgery.

Hypotension was defined as a decrease in MAP <65 mm of Hg and treated with IV Bolus of 50 mcg Injection phenylephrine and 100 ml of Ringer lactate. The first 30 min following spinal anaesthesia was considered for anaesthesia-induced hypotension.
Bradycardia was defined as HR<55 beats/min and treated with Injection Atropine 0.6 mg IV bolus.

Statistical Analysis: The statistical analysis was done by using SPSS, data was tabulated in a Microsoft Excel 2016 Spreadsheet, for detail analysis of continuous variables, unpaired t-test was used to calculate the p value and to establish correlation between study groups.

Results

Table 1: Comparison of parturient according to their clinical characteristics between the two groups:

Sr. No	Clinical characteristics	Perfusion Index ≤3.5 Mean (SD)	Perfusion Index >3.5 Mean (SD)	Mean Difference (Standard error)	P value
1.	Average Age	31.51 ± 2.61	31.46 ± 2.06	0.04 (0.49)	0.92
1.	Body Mass Index	22.15 (1.43)	21.89 (1.70)	0.25 (0.33)	0.43
2.	Gestation age	37.20 (0.20)	36.57 (0.93)	0.62 (0.95)	0.51
3.	Duration of Surgery	112.66 (11.10)	119.66 (12.11)	7 (2.45)	0.005

Table 2: Comparison of average Perfusion Index values in two study groups.

Perfusion Index	≤3.5	>3.5
Mean+SD	2.10 (0.91)	4.35 (0.67)
Mean difference (SE)		2.24 (0.14)
P value		0.00
Significance		Statistically significant

Also, in Group I, 25 out of 45 patients developed hypotension and in Group II, 37 out of 45 patients developed hypotension. There was significant statistical difference between two groups in terms of incidence of hypotension as their p value (p = 0.05) was equal to 0.05.
These findings showed that in our study perfusion index cut-off of 3.5 was able to predict hypotension in parturient undergoing elective caesarean section.
In our study we applied Chi square test to look for incidences of hypotension at different point of time in 2 groups.
In Group with perfusion index less than or equal to 3.5, 31.11% of participants had hypotension at 6 min and in Group with perfusion index more than 3.5, 66.67% of participants had hypotension at 6 min which was statistically highly significant with p value 0.001
In our study, Mann Whitney Test was used for comparison of average perfusion index between the two study groups. In Group I, the average PI was 2.10 ± 0.91 and in Group II, the average PI was 4.35 ± 0.67. There was significant statistical difference between the two groups with respect to their average PI value as their p value (p < 0.000) was <0.05.
Duggappa D, Lokesh M, Dixit A *et al*. and Toyama S, Kakumoto M, Morioka M *et al*. had similar findings. Thus, from the present clinical study following observations can be made: There was no significant difference in the heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure between the two study groups. There was significant difference in the incidence of hypotension between the two study groups. There was significant difference in the SpO2 between the two study groups

Conclusion
The present study was undertaken to determine whether a baseline PI > 3.5 predicts the development of hypotension after spinal anaesthesia in parturient undergoing elective LSCS. The baseline PI measured at the upper limb preoperatively correlated with the degree of decrease in arterial pressure during Spinal anaesthesia for Caesarean delivery, and a baseline PI cut-off point of 3.5 could be used to identify parturient at risk for such hypotension.

We concluded that
1. The Perfusion Index (PI) can be used as a tool for predicting hypotension in healthy parturient undergoing elective caesarean section under spinal anaesthesia.
2. The incidence of hypotension is more in group of PI > 3.5 when compared with group of PI ≤3.5.
3. The parturient with baseline PI > 3.5 were at higher risk of developing hypotension following spinal anaesthesia compared to those with baseline PI ≤ 3.5.

Conflict of Interest
Not available

Financial Support
Not available

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