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Baseline perfusion index as a predictor of hypotension following spinal anaesthesia in patients undergoing lower segment caesarean section: an observational study at SMS Medical College, Jaipur During 2018-2019

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Abstract

Background: To determine the difference in proportion of patients developing hypotension between two study groups (baseline Perfusion index value <3.5 v/s baseline perfusion index value >3.5)

Methods: This study was conducted in Zenana Hospital, Department of Anaesthesiology, Sawai Man Singh Medical College and Attached Group of Hospitals Jaipur. After the approval of local institutional ethics committee and obtaining written informed consent from all patients before participation. 60 patients of ASA grade I were randomly selected. All patients were between 20-35 years, height >145cm, scheduled to undergo lower segment caesarean section.

Results: Perfusion index values were corresponds during the intraoperative period and the difference was statistically significant during 2^{nd} (p value = <0.001), 4^{th} (p value =<0.001), 6^{th} (p value =0.001), 30^{th} (p value = 0.049), 35^{th} (p value= 0.028) and 40^{th} minutes (p value = 0.011).

Conclusion: We concluded that perfusion index (PI) can be used as a tool for predicting hypotension in healthy parturients undergoing elective caesarean section under subarachnoid block . Parturients with baseline PI >3.5 were at higher risk of developing hypotension following subarachnoid block compared to those with baseline PI <3.5

Keywords: PI, Hypotension, LSCS

Introduction

Caesarean section is commonly performed under spinal anaesthesia, because it has many advantages over general anaesthesia. However, spinal anaesthesia can results in hypotension, which may cause severe adverse effects in mothers, such as nausea vomiting and dizziness and may cause umbilical arterial acidosis in infants.[1]

The peripheral perfusion index (PPI), derived from the photoelectric plethysmographic signal of the pulse oximeter is able to monitor vascular reactivity in critically ill patients. Additionally, the PPI has been suggested to be a useful noninvasive method for the

assessment of peripheral vasomotor tone in healthy volunteers, neonates and critically ill patients. This index is calculated as the ratio between the pulsatile component (arterial compartment) and the nonpulsatile component (venous and capillary blood and other tissues) of the light reaching the detector of the pulse oximeter. Therefore, peripheral vasoconstriction mainly reduces the pulsatile component and directly affects the ratio, thus decreases the PPI.[2-3]

Material & Methods

This study was conducted in Zenana Hospital, Department of Anaeshesiology S.M.S. Medical College and attached group of hospital Jaipur. With Due permission from institutional Ethics committee and written informed consent from patients were obtained.

Study Design: Hospital based observational study.

Study Period: After approval of the research review board till the desired sample size was completed.

Sample size: Sample size calculated was minimum 12 cases of lower segment caesarean section in each group at 95% confidence interval and 80% power and alpha error of 0.05 to verify the expected proportion of incidence of hypotension in both groups (group A perfusion index <3.5 and group B perfusion index >3.5)10.5% and 71.42% respectively in as per the seed article, so for the study purpose total 60 cases of lower segment caesarean section 30 in each group were taken.

Sampling Technique: 30 eligible cases of PI value <3.5 and 30 eligible cases of PI value >3.5 were included in the study on 1st come 1st basis.

Study groups: The patients who were undergoing lower segment caesarean section were divided into two groups of 30 each according to perfusion index value.

Group A (n=30): Patients perfusion index value <3.5.

Group B (n=30): Patients perfusion index value >3.5

Eligibility Criteria

Inclusion Criteria

- Pregnant women age 20 – 35 years.
- ASA grade- 1
- Surgery: Lower segment caesarean section.
- Height - >145 cm

Exclusion Criteria

- Placenta previa
- Pre-eclampsia
- Cardiovascular or cerebrovascular disease
- Gestational diabetes
- Body mass index >40
- Gestational age <36 or >41 wee

Statistical Analysis

SPSS (Statistical Package for the Social Science) version 20.0.0 (SPSS Inc., Chicago, Illinois, USA). The Categorical data was presented as numbers (percent) and were compared among groups using Chi square test. The quantitative data was presented as mean and standard deviation and were compared by student t-test.

Results

Table 1: Socio-demographic profile

Variable	Group-A	Group-B	p-value
Age in yrs	26.93±3.25	28.27±4.09	0.167
weight in kg	62.70 ±5.88	60.37 ± 5.01	0.103
Height (cm)	155.57±4.30	155.40±4.32	0.881

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Incidence of hypotension	0(0.00%)	26(86.67%)	0.01
During intraoperative period total IV fluid used (ml)	1273.63±100.63	1331.33±115.73	0.044

Above table shows that the incidence of hypotension was correspond in both the groups and the results was statistically significant. The incidence of hypotension in group A was 0% compared to 86.66% in group B (p value < 0.001). During intraoperative period total IV fluid used (ml) was comparable and the difference was statistically significant during intraoperative period (p value = 0.044).

Table 2: Comparison of Intraoperative Mean Perfusion Index (%) Among Study Groups

	Group A (N=30)		Group B (N=30)		P value
	Mean	SD	Mean	SD	
Baseline	2.28	0.94	5.63	0.38	p<0.001 (S)
After spinal anaesthesia (1 min.)	3.48	1.49	5.88	1.20	p<0.001 (S)
2min.	3.70	1.68	6.07	1.39	p<0.001 (S)
4min.	4.45	1.90	6.59	1.75	p<0.001 (S)
6min.	4.69	2.13	6.52	2.10	0.001 (S)
8min.	4.91	2.04	5.53	2.31	0.274 (NS)
10min.	5.58	2.18	5.63	2.19	0.934 (NS)
12min.	5.31	1.97	5.26	1.41	0.910 (NS)
14 min	5.46	1.80	5.61	1.55	0.725 (NS)
16min.	5.70	1.87	5.84	2.01	0.790 (NS)
18min.	5.43	1.97	5.75	2.03	0.538 (NS)
20min.	5.18	1.80	5.59	2.21	0.433 (NS)
25min.	5.13	1.78	5.51	2.38	0.494 (NS)
30min.	4.56	1.29	5.57	2.45	0.049 (S)
35min.	4.21	1.56	5.42	2.51	0.028 (S)
40min.	3.97	1.50	5.30	2.35	0.011 (S)

Above table shows that intraoperative mean perfusion index was correspond in both groups. Perfusion index values were corresponds during the intraoperative period and the difference was statistically significant during 2nd (p value = <0.001), 4th (p value =<0.001), 6th (p value

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=0.001), 30th (p value = 0.049), 35th (p value= 0.028) and 40th minutes (p value = 0.011) .

Table 3: Comparison of Dose of Mephentermine (Mg) Used in Intraoperative Period in Both Groups

	Group A (N=30)		Group B (N=30)	
	No.	%	No.	%
0 mg dose	30	100.00	2	6.66
6 mg dose	0	0	19	63.33
12 mg dose	0	0	9	30.00
Total	30	100.00	30	100.00

Chi-square = 52.500 with 2 degrees of freedom; P =< 0.001 (S)

Above table shows that the dose of mephentermine (mg) used in intraoperative period in both the groups. During intraoperative period, the difference in doses of mephentermine used was statistically significant (p value < 0.001).

Discussion

Caesarean section surgery is commonly performed in countries around the world. Spinal anaesthesia is preferred technique for performing caesarean section because it has many advantages over general anaesthesia but hypotension following central neuraxial block is common side effect which in turn results in nausea, vomiting, dizziness and umbilical arterial acidosis in newborn. Pregnant women are more sensitive to local anaesthetic drugs, less responsive to vasopressors and have lower mean arterial pressure (MAP) at term. Hence they can develop profound hypotension following spinal anaesthesia for lower segment caesarean section.

Non-invasive blood pressure (NIBP) measurement is the standard method of monitoring intraoperative haemodynamics. However beat to beat variation in perfusion dynamics.

Perfusion index derived from pulse oximeter is able to reflect vasomotor tone. It is ratio between the pulsatile blood flow and the non-pulsatile blood flow in the peripheral vascular tissue, can be easily measured by the light reaching the detector of the pulse oximeter, a peripheral perfusion index (PI) can be calculated.

Michel E et al [4]reported that perfusion index is an early marker of peripheral vasoconstriction induced by changes in circulatory volume.

Ginosar et al [5] reported that perfusion index was earlier, clearer and more sensitive indicator of sympathectomy following epidural anaesthesia. However, there is paucity of data regarding its use for predicting hypotension following spinal anaesthesia.

Parturients with high baseline perfusion index will have lower peripheral vascular tone and will be prone to develop hypotension following central neuraxial block. Cut off value of baseline perfusion index for prediction of hypotension following spinal anaesthesia was chosen as 3.5 based on a study conducted by **Duggappa DR** et al[6] and **Toyoma S.** et al. [7]

Conclusion

We concluded that perfusion index (PI) can be used as a tool for predicting hypotension in healthy parturients undergoing elective caesarean section under subarachnoid block . Parturients with baseline PI >3.5 were at higher risk of developing hypotension following subarachnoid block compared to those with baseline PI <3.5.

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