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CLINICAL EVALUATION OF PERFUSION INDEX (PI) AS A PREDICTOR OF POST-SPINAL HYPOTENSION IN LOWER SEGMENT CESAREAN SECTION (LSCS)

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Abstract
Background: Hypotension is a frequent complication following spinal anaesthesia during lower segment cesarean section (LSCS), leading to adverse maternal and fetal outcomes. The Perfusion Index (PI), derived from pulse oximetry, is a non-invasive indicator of peripheral perfusion and autonomic tone.
Objective: To evaluate the usefulness of baseline PI in predicting post-spinal hypotension in parturients undergoing LSCS.
Methods: This was a prospective observational study involving 60 ASA I–II parturients scheduled for elective LSCS under spinal anaesthesia. Baseline PI was measured using a Masimo pulse oximeter before administering spinal anaesthesia. The primary outcome was the occurrence of hypotension post spinal block. Receiver Operating Characteristic (ROC) analysis and Karl Pearson correlation were used for statistical evaluation. Results: The incidence of post-spinal hypotension was 34.5%. A PI cutoff value >3.5 predicted hypotension with 97% specificity. A significant positive correlation was observed between baseline PI and the magnitude of blood pressure drop ($r = 0.436$, $p < 0.05$). Conclusion: A higher baseline PI (>3.5) is a strong, non-invasive predictor of post-spinal hypotension in parturients. This parameter may be valuable in pre-anaesthetic assessment and for initiating early preventive measures.

Keywords: Perfusion Index, Post-spinal hypotension, LSCS, Spinal anaesthesia, Predictive marker, ROC analysis

Introduction

Spinal anaesthesia is commonly employed during LSCS due to its safety profile and effectiveness. However, post-spinal hypotension remains a significant challenge, occurring in approximately 20–70% of cases. The resultant reduction in systemic vascular resistance and sympathetic tone can compromise uteroplacental perfusion, potentially affecting fetal outcomes.
The Perfusion Index (PI), measured non-invasively via pulse oximetry, reflects the ratio of pulsatile to non-pulsatile blood flow and is influenced by peripheral vasodilation. Several studies suggest that PI could serve as a surrogate for autonomic tone and vascular resistance. This study aimed to evaluate

whether preoperative PI could predict the development of hypotension after spinal anaesthesia in LSCS.

Materials and Methods

Study Design: Prospective observational study
Setting: SSIMS & RC, Davangere
Participants: Sixty parturients (ASA Physical Status II) scheduled for elective LSCS under spinal anaesthesia.
Exclusion Criteria: Emergency LSCS, PI measurement failure, Coexisting cardiovascular or autonomic dysfunction
Methodology: Baseline PI was recorded using a Masimo pulse oximeter probe placed on the left index finger before spinal block. Spinal anaesthesia was performed with 0.5% hyperbaric bupivacaine. Blood pressure was measured every 2 minutes for 20 minutes post spinal anaesthesia. Hypotension was defined as a >20% drop from baseline systolic blood pressure or an absolute value <90 mmHg.
Statistical Analysis: Data analyzed using SPSS. Receiver Operating Characteristic (ROC) curve determined the optimal PI cutoff. Karl Pearson's correlation assessed the relationship between PI and blood pressure drop. $p < 0.05$ was considered statistically significant.

Results

Incidence of hypotension: 34.5% (21 out of 60 patients)
Mean baseline PI: Significantly higher in patients who developed hypotension.
ROC Analysis:
- Cutoff PI value: >3.5
- Specificity: 97%
- Sensitivity: Moderate

Correlation: Baseline PI significantly correlated with fall in systolic BP ($r = 0.436$, $p < 0.05$)

Discussion

The findings align with previous literature that PI reflects peripheral vascular tone and can predict vasodilation-related hypotension after neuraxial blockade. A baseline PI >3.5 was significantly associated with post-spinal hypotension, emphasizing the importance of PI as a predictive tool.
Early identification of at-risk patients allows for preemptive strategies such as fluid loading, vasopressor readiness, or adjusted anaesthesia planning. However, variability due to ambient temperature, anxiety, or probe placement must be considered.

Conclusion

Baseline Perfusion Index is a valuable, non-invasive predictor of post-spinal hypotension in parturients undergoing LSCS. A PI >3.5 provides high specificity and may be incorporated into routine preoperative assessment protocols.

Limitations

Small sample size
Single-center study
External factors affecting PI readings not controlled (e.g., temperature, stress)

Future Scope

Larger multicentric trials are recommended to validate these findings across diverse populations and settings. Integration with other hemodynamic monitoring tools could improve predictive accuracy.

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