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The Effect of Post Spinal Hypotension on Cerebral Oxygenation Using Near-Infrared Spectroscopy and Neonatal Outcomes in Full Term Parturient Undergoing Lower Segment Caesarean Section: A Prospective Observational Study

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Abstract : Introduction: Spinal anesthesia is considered a standard anesthesia technique for caesarean delivery. The incidence of spinal hypotension during caesarean delivery is 70 -80%. Spinal hypotension may cause cerebral hypoperfusion in the mother, but physiologically cerebral autoregulatory mechanisms accordingly prevent cerebral hypoxia. Cerebral blood flow remains constant in the 50-150 mmHg of Cerebral Perfusion Pressure (CPP) range. Near-infrared spectroscopy (NIRS) is a non-invasive technology that is used to detect Cerebral Desaturation Events (CDEs) immediately compared to other conventional intraoperative monitoring techniques. Objective: The primary aim of the study is to correlate the change in cerebral oxygen saturation using NIRS with respect to a fall in mean blood pressure after spinal anaesthesia and to find out the effects of spinal hypotension on neonatal APGAR score, neonatal acid-base variations, and presence of Postoperative Delirium (POD). Methodology: NIRS sensors were attached to the forehead of all the patients, and their baseline readings of cerebral oxygenation on the right and left frontal regions and mean blood pressure were noted. Subarachnoid block was given with hyperbaric 0.5% bupivacaine plus fentanyl, the dose being determined by the individual anaesthesiologist. Co-loading of IV crystalloid solutions was given to the patient. Blood pressure reading and cerebral saturation were recorded every 1 minute till 30min. Hypotension was a fall in MAP less than 20% of the baseline values. Patients going for hypotension were treated with an IV Bolus of phenylephrine/ephedrine. Umbilical cord blood samples were taken for blood gas analysis, and neonatal APGAR was noted by a neonatologist. Study design: A prospective observational study conducted in a population of Thirty ASA 2 and 3 parturients scheduled for lower segment caesarean section (LSCS). Results: Mean fall in regional cerebral saturation is 28.48 ± 14.7% with respect to the mean fall in blood pressure 38.92 ± 8.44 mm Hg. The correlation coefficient between fall in saturation and fall in mean blood pressure is 0.057, and p-value {0.7} after subarachnoid block. A fall in regional cerebral saturation occurred 2±1 min before a fall in mean blood pressure. Twenty-nine out of thirty patients required vasopressors during hypotension. The first dose of vasopressor requirement is needed at 6.02±2 min after the block. The mean APGAR score was 7.86 and 9.74 at 1 and 5 min of birth, respectively, and the mean umbilical arterial pH of 7.3±0.1. According to DRS-98 (Delirium Rating Scale), the mean delirium rating score on postoperative day 1 and day 2 were 0.1 and 0.7, respectively. Discussion: There was a fall in regional cerebral oxygen saturation, which started before with respect to a significant fall in mean blood pressure readings but was statistically not significant. Maximal fall in blood pressure requiring vasopressors occurs within 10 min of SAB. Neonatal APGAR scores and acid-base variations were in the normal range with maternal hypotension, and there was no incidence of postoperative delirium in patients with post-spinal hypotension.

Keywords : cerebral oxygenation, LSCS, NIRS, spinal hypotension
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