Original Article

Efficacy of prophylactic intravenous ondansetron on attenuating spinal anesthesia induced hypotension and bradycardia in lower segment cesarean section

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Abstract: *Hypotension and bradycardia are common drawback of spinal anesthesia during cesarean section. This can have fatal effects on mother and fetus. Ondansetron by blocking Bezold-Jarisch reflex through inhibition of serotonin receptors has been effective in prevention of post-spinal hypotension and bradycardia. The aim of this study was to determine the effectiveness of intravenous ondansetron in the prevention of hypotension and bradycardia during spinal anesthesia in lower segment cesarean section A total of 100 parturients scheduled for elective cesarean section were scheduled in this study. They were randomly divided into two groups of 50 each. Both groups were preloaded with Hartmann's Lactate at dose of 10ml/kg. Group A received 04 mg. of ondansetron diluted in 10 ml normal saline slowly intravenously (IV) 05 minutes prior to spinal anesthesia, whereas Group B received 10 ml normal saline slowly intravenously (IV) 05 minutes prior to spinal anesthesia. Blood pressure and heart rate were recorded every 3 min. interval. The consumption of vasopressors and atropine were recorded. Average age of Group A was 24.76±4.82 years, whereas that of Group B was 25.21±5.73 years (p>0.05). Average weight of group A was 65.23±6.46 kg, whereas that of Group B was 64.83±6.47 kg (p>0.05). Hypotension was noted in 8 patients in group A (16%), whereas it was observed in 32 patients in group B (64%) (p<0.05).Bradycardia was noted in 5 patients in group A (10%) and 17 patients in group B (34%) (p<0.05).Premedication with intravenous administration of 04 mg ondansetron 05 minutes before spinal anesthesia in elective cesarean section significantly reduces hypotension and bradycardia.*

Key words: *Ondansetron, spinal anesthesia, lower segment cesarean section.*

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Introduction

The use of regional anesthesia in lower segment cesarean section (LSCS) has increased a lot in last few decades. Spinal anesthesia is the most practiced amongst all regional anesthesia techniques.[1] Compared to general anesthesia, spinal anesthesia offers reduced maternal mortality. Spinal anesthesia is not free from adverse effects, including potentially harmful hypotension and bradycardia,[2] due to decreased myocardial contractility and peripheral vasodilatation resulting redistribution of central blood volume to splanchnic circulation and lower extremities.[3]

Different methods have been tested to find effective prophylactic technique against

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hypotension and bradycardia for example, crystalloid preloading or coloading, colloid coloding, use of different drugs like ephedrine, phenylephrine or adrenaline but no single method was found effective alone. This hypotension and bradycardia may be due to decreased sympathetic tone, unopposed parasympathetic activity, increased baroreceptor activity or Bezold- Jarisch reflex (BJR).[2]

The Bazold- Jarisch reflex is an inhibitory response usually described as a cardioinhibitory reflex. The heart is innervated by the vagus nerve, which consists of two major fiber types, 25% are myelinated fibers which originate in the walls of the atria and 75% are nonmyelinated fibers found in the walls of all four cardiac chambers.[3] This BJR originates in cardiac receptors with nonmyeelinated type C vagal fibers creating the afferent limb of the reflex. These receptors are both mechanosensitive and chemosensitive and when stimulated produce hypotension, bradycardia and peripheral vasodilatation.[3]These receptors are sensitive to several different chemicals including serotonin, 5-hydroxytryptamine (5-HT).[4]

Serotonin, five-hydroxytriptamine (5-HT) is released during low-volume states has been suggested as a possible trigger for the BJR[5]. Ondansetron is a 5-HT_3 receptor antagonist that offers potentially important therapeutic benefits due to its low side effect profile.[5] Many studies highlight the use of a 5- HT_3 antagonists as ondansetron in prevention of hypotension and bradycardia caused by the BJR in animals, obstetric and non-obstetric patients.[6,7,8] Apart from hypotension, incidence of nausea and vomiting is also very high in patients undergoing LSCS.Without any prophylactic measure, it can vary between 50-80%.[9]Ondansetron is a 5-HT antagonist and has been studied for its prophylactic role for nausea and vomiting in patients undergoing LSCS.[10]

The aim of the study was to determine whether on dansetron was effective for prevention of spinal anesthesia induced hypotension and bradycardia in elective LSCS patients when given in combination with crystalloid preload.

Materials and methods

This controlled prospective clinical study was carried out from January 2017 to December 2017 at different private hospital in Dhaka city and Sylhet City after obtaining informed consent from the patients. This study was performed on 100 ASA physical status-I female patients between 20 to 35 years of age undergoing elective cesarean section under spinal anesthesia. Patients having contraindication to spinal anesthesia, cardiovascular disease, pulmonary disease, renal disease, liver disease, morbidly obese; were excluded from the study. Patients were divided into group A and group B randomly, 50 patients in each group.

When patients arrived in operation theatre, they were weighed and multichannel patient monitor that included heart rate, non-invasive blood pressure and pulse oximetry were applied to all the patients. An intravenous access was established by 18 G IV cannula. Both groups were preloaded with Harttmann's Lactate at dose of 10ml/kg. Then group A received 04 mg of ondansetron diluted in 10 ml normal saline slowly intravenously (IV) 05 minutes prior to spinal anesthesia, whereas group B received 10 ml normal saline slowly intravenously (IV) 05 minutes prior to spinal anesthesia.

Under all aseptic precautions, with the patient on sitting position L4- L5 inter-vertebral space was identified and lumber puncture was performed through midline approach using a disposable sterile 25 G Quincke spinal needle and 2.5 ml of 0.5% heavy bupivacaine was administered to the subarachnoid space after free flow of CSF. Patients were then turned to supine position with a wedge placed under the right hip to avoid aorto-caval compression until the delivery of the baby. Oxygen was delivered to all patients at a rate of

5L/ min via a face mask. Before the surgical incision, the level of sensory blocked was assessed. Surgery was allowed only after sensory level of anesthesia up to T6 reached. A continuous monitoring was done for pulse rate, respiratory rate and oxygen saturation throughout the intraoperative period. Non-invasive blood pressure was monitored at 3 min interval for 30 minutes and in case of hypotension BP was measured every 1 minute. If systolic blood pressure was decreased>20% from base line reading during this time frame, it was labeled as" hypotension present". Heart rate was monitored continuously in this time frame and rate less than 50 per minute, was defined as "bradycardia present". Hypotension was treated by bolus infusion if Hartmann's Lactate and 5 mg of IV ephedrine repeated as necessary until the BP reached to acceptable level. The total dose of vasopressors and atropine was recorded. Apgar score at 1 and 5 min were assessed and recorded.

Statistical analysis: Age and weight of patients were compared using independent sample t-test. Hypotension and bradycardia were noted down as "present" or "absent". Frequency of hypotension and bradycardia between the two groups were compared using Chi-Squire test and p-value <0.05 was taken as significant.

Results

Total 100 patients were included in the study, divided in two groups of 50 each.

Average age of Group A was 24.76±4.82 years, whereas that of Group B was 25.21±5.73 years (p>0.05). Average weight of group A was 65.23±6.46 kg, whereas that of Group B was 64.83±6.47 kg(Table-I) (p>0.05). Hypotension was noted in 8 patients in group A (16%), whereas it was observed in 32 patients in group B (64%) (Table-II)(p<0.05). Bradycardia was noted in 5 patients in group A (10%) and 17 patients in group B (34%) (Table-III)(p<0.05).

Table-I: Average age and weight of both groups.

	Group A	Group B	p value
Age (Years)	24.76 ±4.82	25.21 ±5.73	p>0.05
Weight (kg)	was 65.23 ±6.46	64.83 ±6.47	p>0.05

Table-II: Comparison of hypotension between both groups.

Hypotension	Group A (n= 50)	Group B (n= 50)	p value
Present- number and percent	8 (16%)	32 (64%)	p<0.05
Absent- number and percent	42 (84%)	18 (36%)	p<0.05

Table-III: Comparison of bradycardia between both groups.

Bradycardia	Group A (n=50)	Group B (n= 50)	p value
Present- number and percent	5 (10%)	17 (34%)	p<0.05
Absent- number and percent	45 (90%)	23 (46%)	p<0.05

Discussion

Spinal anesthesia induced hypotension and bradycadia can have fatal effects on mother and fetus. Different techniques for prevention have been studied. Tamilselvan P et al[11] compared crystalloid preloading to colloid preloading. Mercier FJ et al[12] compared pharmacological drugs with fluid loading. Chohedri AB et al[13] tested for sake of prophylaxis with different doses and routs of administration of drugs. However, none of them is effective alone to prevent hypotension. That is why combinations were tested to find preventive strategy against spinal anesthesia induced hypotension.

It was decided here to study a combination of 04 mg IV ondansetron and crystalloid preloading at dose of 10ml/kg for prevention of spinal anesthesia induced hypotension.

Ondansetron is a 5-HT_3 antagonist and has been studied in LSCS for its effects against postoperative nausea and vomiting.[10]It has also been associated with decrease in incidence of post dural puncture headache in patients undergoing LSCS under spinal anesthesia.[14] It also decreases the incidence of shivering associated with spinal anesthesia.[15]

Sahooet al[8] studied ondansetron effect in patients undergoing LSCS. Similar to present study, they had given 4 mg of ondansetron and preloaded with crystalloid at dose of 20 ml/ kg over a period of 30 minutes. They concluded that prophylaxis with IV 4 mg ondansetron is effective against spinal anesthesia induced hypotension.

Wang et al[16] compared different doses of ondansetron for the sake of prophylaxis. They compared placebo with 02, 04, 06 and 08 mg of ondansetron in 150 patients undergoing LSCS (30 in each group). They used Ringer's Lactate at a very low rate, just enough to keep the vein patent. They increased the dose of crystalloid infusion after administration of spinal anesthesia to a maximum dose of 10 ml/kg. They found that 04 mg of ondansetron was the optimal dose.

Similar to this study, Trabelsiet al[17] had used dose of 04 mg ondansetron and 10 ml/kg of crystalloid but they used saline instead if Ringer's Lactate and choose a sample of 80 patients undergoing LSCS. They found that the incidence of hypotension and bradycardia were less in those who were given prophylactic ondansetron.

Marashiet al[18] studied prophylactic effect of intravenous ondansetron in patients undergoing elective orthopedic, urology and gynecologic surgery. They choose 210 patients and divided them in three equal groups. They preloaded their patients with 5 ml/kg of Ringer's Lactate and gave saline as placebo, 06 mg and 12 mg of ondansetron. Frequency of hypotension and bradycardia were less in group which were given ondansetron as compared to placebo. However, there was no statistically significant difference between ondansetron 06 mg and 12 mg groups.

Conclusion

This present study demonstrates that use of 04 mg. of intravenous ondansetron and 10ml/kg crystalloid preload is effective in reducing the frequency of hypotension and bradycardia. Though other effects of ondansetron, like decreasing frequency of post-operative nausea and vomiting, post-dural puncture headache and shivering associated with spinal anesthesia, were not included in this study; however, these effects add more advantages to its use in spinal anesthesia.

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