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SPINAL-INDUCED HYPOTENSION REDUCTION WITH ONDANSETRON IN CESAREAN SECTION PARTURIENTS.

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Abstract.

Background:

During surgery in the lower part of the body especially during c-sections done by obstetricians, the favorable way of anesthetizing patients is by giving spinal anesthesia also called subarachnoid block. However, during subarachnoid block, hypotension and bradycardia may occur which has adverse effects on the fetus as well as the mother. The Bezold Jarisch pathway induced by serotonin after the anesthesia causes the above events. Serotonin acts on 5-HT3 receptors located in the vagal nerve ending of the heart. Ondansetron blocks the activity of serotonin in its receptors.

Aim: This study assesses the effectiveness of ondansetron in blocking the serotonin receptors to prevent hypotension and bradycardia in parturients having c-section surgery which requires subarachnoid block.

Method:

72 women undergoing parturition by c-section were selected for the study. They were divided into two groups randomly. O group consisted of 36 women who were given 4.5mg (2.25 ml) of ondansetron intravenously before spinal anesthesia. S group women also consisted of 36 women who were given 2.25ml of normal saline before spinal anesthesia. 2ml of 0.5% hyperbaric bupivacaine was injected intrathecally. Both groups were closely monitored for their heart rate, blood pressure, and requirements of vasopressor agents.

Results:

The reduction of the average pressure in the arteries was lower than 35 minutes in the group that received ondansetron. The incidence of emesis and nausea was lesser among these patients when compared to the other group. The other group had a reduction of mean arterial pressure around 14 min.

Conclusion:

The requirement for vasopressors decreased among the women having c-sections who had been given Ondansetron 4.5 mg intravenously before anesthesia.

Recommendation:

Ondansetron may be recommended as a prophylaxis for hypotension and bradycardia following spinal anesthesia; the level of evidence was moderate with a high level of heterogeneity.

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1. INTRODUCTION.

Spinal anesthesia is a method of choice while performing elective cesarean deliveries [1]. subarachnoid block has reduced mortality significantly compared to general anesthesia. When spinal anesthesia is given, there is a blockade of the sympathetic nervous system and the shift occurs to the parasympathetic system [2,3]. Around 80% of the women undergoing c-sections without having labor pains experience the hemodynamic events of bradycardia and decreased blood pressure [4, 5].

Decreased blood pressure during the surgery might affect the flow of blood to the placenta and the uterus posing a risk to the life of the mother as well as the fetus [6]. It has been reported that the 5-Hydroxytryptamine receptors present at the end of the vagal nerve in the heart are activated by serotonin. The serotonin thus induces a re- flex arc mechanism known as the Bezold Jarisch arch. The reduced vascular resistance causes the induction of the arch which results in secondary symptoms of reduced heart rate [7, 8].

Ondansetron, a serotonergic blocker that is clinically used to treat nausea and emesis can benefit in this situation [9]. It is a hypothesis that when ondansetron is used prophylactically, it can block the 5-hydroxytryptamine receptor at the vagal nerve ending of the heart and thus prevent the further consequences of reduced blood pressure, reduced heart rate, and requirement of vasopressors [10]. This study aims to evaluate the efficacy of ondansetron as a 5-HT blocker that can prevent the hemodynamic events of bradycardia and hypotension in women undergoing elective cesarean section followed by spinal anesthesia that causes subarachnoid blockade.

2. MATERIALS AND METHODS.

2.1. Inclusion and Exclusion criteria.

Parturients that were selected for the study included those who were undergoing elective cesarean and had no contraindications. The participants who had a history of allergy to ondansetron, those who were receiving 5-HT inhibitors for migraine and other such problems, and those who had cardiovascular problems such as hypertension and arrhythmia were eliminated from the study.

2.2. Data Collection.

One day before the c-section the patient was examined by an anesthesiologist. They were randomly allocated into two groups The O group and the S group, using computer-generated random numbers namely, The O group received 4.5 mg (2.25ml) of ondansetron intravenously, whereas the S group received a placebo of 2.25ml of normal saline IV, the drug was labeled by an anesthesiologist who was not involved in the study and the patient was monitored by a different anesthesiologist. Grouping was done in such a way that both the patient and the monitoring anesthesiol- ogist were blinded to the study. This was given prophylactically five minutes before spinal anesthesia.

Before anesthesia, blood pressure and heart rate were recorded. Irrespective of the groups, all the patients were given lactated Ringer's so- lution for hydration. In the operating area, pa- tients were given spinal anesthesia while they were seated in the lumbar 3rd and 4th positions or the lumbar 4th and 5th positions. Hyperbaric bupi- vacaine 0.5% was instilled intrathecally and the patient was positioned into a supine position and took a light tilt towards the left at 15 .

The anesthesiologist who was blinded towards the drug under study monitored the hemodynamic vitals such as blood pressure, heart rate, and also pain, nausea, and vomiting experienced by the patient.

The patient was monitored for diastolic blood pressure, systolic blood pressure, mean arterial pressure, and heart rate in the period of every 5 minutes until 20 minutes before the surgery. Then, until the surgery ended all of the vitals were monitored for 5 minutes. The patients who had a systolic pressure of less than 90 mm Hg and diastolic blood pressure of less than 60 mm of Hg were given phenylephrine 55 micrograms. Those who had heart rates less than 50 beats per minute were given atropine 0.3 milligrams. Patients who had nausea and vomiting were given promethazine 15 milligrams. Patients who had pain were given

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analgesics such as tramadol and fentanyl 30 milligrams and 60 micrograms respectively. All the above-stated drugs were given intravenously. Patients who could not respond well to analgesics were considered to have a failure of spinal anesthesia and instead, they had general anesthesia. So, the patients of this state were eliminated from the study later on.

2.3. Statistical analysis.

According to a study, the mean arterial pressure difference was 7 mm of Hg and so the calculation of the number of subjects required to have statistically sound results was determined [11]. It was found that 33 patients in each group would be required to apply the statistics. Once the data was obtained, their distribution was analyzed using a t-test, and the categorical distribution was compared using ANOVA. The difference in the values obtained in the two groups was compared with Pearson's value if it was less than 0.05, then the difference was considered significant.

3. RESULTS.

72 patients were selected for the study when the demographics were studied, and statistics were applied to them. At the initial stage, several 200 patients were examined for eligibility, however, 128 patients were excluded from this study due to not being eligible. The bradycardia and decrease in the mean arterial pressure were greater among the group S patients, but the difference was not statistically significant if both group S and group O were compared. However, when individual periods were compared among the groups, the difference in bradycardia was significant at 25 min and 40 min. Similarly, the difference in the mean arterial pressure was significant at 5 min and 6 min. The difference in the use of phenylephrine and nausea was statistically significant when both groups were compared. On the whole, no patients were eliminated due to the failure of spinal anesthesia. However, 6 patients from group S had chest pain, and 10 patients from group O had chest discomfort which was managed by anal- gesics. Table no. 1 summarizes the study and helps identify the significant differences that are obtained when ondansetron is used in parturients.

4. DISCUSSION.

The incidence of hypotension after spinal anesthesia is due to decreased resistance in the vessels, which causes the pooling of the blood and leads to hypovolemia. The hypovolemia triggers the cardiac receptors at the vagal nerve ending. Serotonin binds to these receptors and induces the Bezold Jarisch reflex arch, which, in response to hypovolemia, causes decreases in the heart rate [12]. Chemoreceptors also play a role in bind- ing to 5-HT in response to decreased blood vol- ume. So bradycardia is the secondary effect pro- duced in response to hypotension [13]. The inci- dence of bradycardia after spinal anesthesia is less frequent when compared to the incidence of hypotension. The studies conducted with different dosages of ondansetron demonstrate that the use of ondansetron reduced the incidence of bradycardia in response to hypotension [14].

Various studies conducted prove that using ondansetron prophylactically before a c-section decreases the incidence of bradycardia and hypotension. It was believed that the same could be observed in this study. Although the decrease in systolic blood pressure and mean arterial pressure was observed more among the group that was not given ondansetron, the difference was not statistically significant. The incidence of bradycardia occurred in group S more frequently but none of the patients required atropine to manage it.

5. CONCLUSION.

From the study, it can be concluded that giv- ing ondansetron prophylactically to the parturi- ent attenuates the hypotension and thus decreases the incidence of bradycardia in response to it. The requirements of vasopressors decrease significantly when patients are given ondansetron 4.5 mg prophylactically followed by spinal anesthesia for elective c-section surgery for delivery.

Table 1: **Comparison of the p-value of the factors considered.**

Factors	Pearson's value	Significance
Reduction in mean arterial pressure	0.05	Not significant
Bradycardia	0.49	Not Significant
Nausea	0.049	Significant
Pain	0.703	Not significant
Requirement of vasopressor	0.009	Significant
Weight	0.476	Not significant

6. LIMITATIONS.

The limitation of this study is that the on- dansetron is studied only for its standard dose and not variable dosing and the number of sub- jects in this study is much lesser to obtain stat- ically significant results. The induction of BJR via serotonin is reduced and that is the reason for the lower requirement of vasopressors among the group that received ondansetron

7. RECOMMENDATION.

Ondansetron may be recommended as a pro- phylaxis for hypotension and bradycardia follow- ing spinal anesthesia; the level of evidence was moderate with a high level of heterogeneity.

8. ACKNOWLEDGEMENT.

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9. LIST OF ABBREVIATIONS.

ANOVA- Analysis of Variance

10. Source of Funding.

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11. Conflict of interest.

The authors report no conflicts of interest in this work.

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