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ORIGINAL ARTICLE

Comparison Between Prophylactic use of Atropine and Glycopyrolate in Prevention of Spinal Induced Hypotension in Patients Undergoing C-Section

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ABSTRACT

Objective: The purpose of this study is to compare the efficacy of atropine and glycopyrrolate in reducing the risk of hypotension caused by spinal anesthesia in patients undergoing caesarean sections.

Methods: After ethical approval from institution review board, this randomized control was carried out at Liaqat national hospital and medical college. 332 pregnant women in a row who had chosen to have a caesarean section were enlisted through non-probability consecutive sampling technique. Subjects were randomly assigned to one of two groups of 166 using computer-generated randomization tables. Group A Patients received intravenous atropine in dose of 0.01mg/kg before inducing spinal anesthesia. Group B Patients received intravenous glycopyrrolate in dose of 0.01mg/kg before inducing spinal anesthesia. Pre-surgical, operational, and post-operative treatment for all patients was adhered to the same established protocols.

Results: The mean age of the participants in both study groups were 26.28±4.03 and 26.07±3.78 years. The mean weight of the participants in both study groups were 75.24±7.6 and 74.17±7.54 Kg. The mean gestation age of the participants in both study groups were 38.82±1.17 and 38.70±1.19 months. The heart rate (HR) 15-minutes after the administration of atropine in group A was 94.89±11.8, and in Group B after administration of glycopyrrolate was 98.18±11.5. A significant difference (P=0.045) in the mean HR of the participants in both study groups was observed. The Mean Arterial Pressure (MAP) 15-minutes after the administration of atropine in group A was 76.63±7.9, and in Group B after administration of glycopyrrolate was 79.6±10.5. A significant difference (P=0. 0.029) in the mean MAP of the participants in both study groups was observed.

Conclusion: Glycopylorate, atropine, spinal anesthesia, hypotension, heart rate

INTRODUCTION

The majority of caesarean sections (CS) nowadays are performed under spinal anesthetic (SA). It is nonetheless common to have hypotension after spinal anesthesia (1). Neonatal prognosis may be negatively impacted if hypotension after spinal anesthesia is not avoided or treated (2), in addition to the possibility of maternal side effects. It is advisable to take precautions against spinal-induced hypotension because of the potential risks it poses to both the mother and the infant. Phenylephrine infusion with crystalloid co-loading is a reliable and recommended technique for preventing hypotension and maintaining blood pressure, as evidenced by recent meta-analysis and guidelines (3, 4). Phenylephrine is used to normalize cardiac output (CO) and restore systemic vascular resistance. Nonetheless, reflex bradycardia occurs with continuous infusion or higher dosages of phenylephrine to avoid hypotension (3, 5). If phenylephrine decreases maternal heart rate (HR), which is a surrogate metric of cardiac output (CO), then phenylephrine will have a negative effect on CO [5, 6]. The hemodynamics may deteriorate if spinal anesthesia-related bradycardia develops as a result of high sympathetic block. Also, as CO is necessary for uterine blood flow, a drop in CO might lead to fetal acidosis. (7) Emergency caesarean sections are riskier for a fetus in already precarious health. Keeping the mother's heart rate up during CS is essential for keeping the CO stable. By increasing the heart rate of the mother, glycopyrrolate indirectly keeps carbon monoxide levels stable. (8, 9) Further, since glycopyrrolate does not pass the placental barriers, it has a negligible impact on the fetal heart rate (10). Studies examining the impact of intravenous glycopyrrolate on hemodynamic changes following spinal anesthesia for caesarean delivery have yielded conflicting results (8, 11, 12). While a recent meta-analysis found that prophylactic glycopyrrolate did not reduce the need for vasopressors during elective caesarean deliveries under spinal anesthesia, it did reduce the incidence of spinal-induced hypotension. Atropine is a compound made by reacting an aromatic acid with an organic base to form an ester (13). By preventing acetylcholine from attaching to its receptor and activating the receptor, it inhibits the effects of acetylcholine on cells. Overall, atropine reduces parasympathetic activity in all parasympathetically-controlled muscles and glands and increases heart rate by blocking the effect of vagal tone on the heart's M2 receptor. Atropine is an anticholinergic medication with a tertiary amine structure, making it highly bioavailable and able to penetrate both the blood brain barrier and the placenta (17). However, because of its quaternary amine composition, glycopyrrolate is not able to pass these membranes and is hence the drug of choice for pregnant women. (14, 15) Anticholinergic drugs such as glycopyrronium (or glycopyrrolate) are often used nowadays. Glycopyrrolate is often administered before surgery to reduce saliva and breathlessness. A quaternary amine having a pyridine and cyclopentane moiety, synthesized in a laboratory. There is no evidence that glycopyrrolate crosses the blood-brain barrier or the placenta. When compared to other anticholinergic medications like atropine and scopolamine, its diffusion rate is lower. You may inject glycopyrrolate directly into your muscle, take it orally, use it topically, or even inhale it. When administered intravenously, glycopyrrolate starts working within a minute and has a half-life of around 50 minutes until it's eliminated from the body completely. Glycopyrrolate is eliminated and excreted in the urine. It's a quaternary amine, unlike atropine, and it contains cyclopentane and pyridine moieties. Patients undergoing LSCS who were given prophylactic glycopyrrolate had no impact on the mother or the fetus, according to a meta-analysis, although it did lead to a minor decrease in vasopressor needs and an increase in maternal HR (16). The goal of this research is to examine whether atropine or glycopyrrolate is more effective in preventing spinal anesthesia-induced hypotension in patients having c-section.

METHODOLOGY

After ethical approval from institution review board, this randomized control was carried out at Liaqat national hospital and medical college. 332 pregnant women in a row who had chosen to have a caesarean section were enlisted through non-probability consecutive sampling technique. All participants provided written informed consent. Patients were eligible if they were between the

ages of 18 and 40, had a singleton pregnancy, and were scheduled for an elective CS (category 3 or 4) with spinal anesthesia. Contraindications to spinal anesthesia, numerous pregnancies, pregnancy-induced hypertension aberrant placentation, patient refusal, emergency c-sections and the presence of comorbid diseases were the exclusion factors. Subjects were randomly assigned to one of two groups of 166 using computer-generated randomization tables. Patients, as well as the anesthesiologists who would be giving them the medicines and evaluating their effectiveness, were kept in the dark about their group assignment. For the sake of secrecy, assignments to groups were concealed in opaque, sealed envelopes. Each person had taken 150mgof ranitidine and 10 mg of metoclopramide orally the night before, and had fasted. Patients were permitted to drink clear beverages up to 2 hours before operation. Heart rate, systolic and diastolic blood pressures, and peripheral oxygen saturation (SpO_2) were obtained as baseline data using conventional monitors (non-invasive blood pressure, 3 lead electrocardiogram, pulse oximetry) in the operating room. In order to define hypotension, the 90% values of baseline systolic blood pressure (SBP) were determined. Group A Patients received intravenous atropine in dose of 0.01mg/kg before inducing spinal anesthesia. Group B Patients received intravenous glycopyrrolate in dose of 0.01mg/kg before inducing spinal anesthesia. Pre-surgical, operational, and post-operative treatment for all patients were adhered to the same established protocols. Before the anesthetic medicines were given, blood pressure (BP) wasbe taken at the systolic, diastolic, and mean arterial pressure (MAP), heart rate (HR), and peripheral capillary oxygen saturation (SPO2) was be monitored at 5-minute intervals during the intraoperative time. If the mean arterial pressure (MAP) drops by more than 20% from the baseline value, an intravenous bolus of phenylephrine 50 mcg was be given, and the dosage may be repeated after 5 minutes if necessary. A custom proforma was be used to keep track of all the information.

All of the data was imported into SPSS version 26 for thorough analysis. Means and standard deviations were provided for quantitative variables such as age, body mass index (BMI), ASA-PS score, length of operation, and pre-operative blood pressure (BP), heart rate (HR), and oxygen saturation (SpO2). We used an independent t-test to assess the decline in systolic and diastolic blood pressure, mean arterial pressure, heart rate, and oxygen saturation levels across groups. Quantitative information were shown as means and medians, while qualitative information such appropriate sensory block, the modified Bromage scale, and the adequacy of surgical condition will be reported as frequencies and percentages and compared across groups using the chi-square test ($p \leq 0.05$).

RESULTS

Demographic and clinical parameters of the participants in study group A and B is presented in Table 1. The mean age of the participants in both study groups were 26.28±4.03 and 26.07±3.78 years. No significant difference (P=0.609) in the mean ages of the participants in both study groups was observed. The mean weight of the participants in both study groups were 75.24±7.6 and 74.17±7.54 Kg. No significant difference (P=0.138) in the mean weights of the participants in both study groups was observed. The mean gestation age of the participants in both study groups were 38.82±1.17 and 38.70±1.19 months. No significant difference (P=0.212) in the mean gestation age of the participants in both study groups was observed. Multiple Gravidity and parity were observed in both study groups. Majority of the participants in both groups belong to ASA Class II. Table 2 and Figure 1 Shows the hemodynamic parameters in the study groups after administration 0.01mg/kg atropine and 0.01mg/kg glycopyrrolate. The heart rate (HR) 0-minutes after the administration of atropine in group A was 98.84±10.7, and in Group B after administration of glycopyrrolate was 97.18±11.6. No significant difference (P=0.249) in the mean HR of the participants in both study groups was observed. The Mean Arterial Pressure (MAP) 0-minutes after the administration of atropine in group A was 78.75±10.33, and in Group B after administration of glycopyrrolate was 80.12±11.3. No significant difference (P=0. 0.87) in the mean MAP of the participants in both study groups was observed. In 17% participants Vasopressure was given group A and 10% in Group B. The heart rate (HR) 15-minutes after the administration of atropine in group A was 94.89±11.8, and in Group B after administration of glycopyrrolate was 98.18±11.5. A significant difference (P=0.045) in the mean HR of the participants in both study groups was observed. The Mean Arterial Pressure (MAP) 15-minutes after the administration of atropine in group A was 76.63±7.9, and in Group B after administration of glycopyrrolate was 79.6±10.5. A significant difference (P=0. 0.029) in the mean MAP of the participants in both study groups was observed. In 19% participants Vasopressure was given group A and 15% in Group B. The heart rate (HR) 30-minutes after the administration of atropine in group A was 95±8.1, and in Group B after administration of glycopyrrolate was 97.2±10.3. No significant difference (P=0.13) in the mean HR of the participants in both study groups was observed. The Mean Arterial Pressure (MAP) 30-minutes after the administration of atropine in group A was 78.2±7.8 , and in Group B after administration of glycopyrrolate was 80.4±10.2. No significant difference (P=0. 0.076) in the mean MAP of the participants in both study groups was observed. In 16% participants Vasopressure was given group A and 14% in Group B.

Table 1: Demographic and clinical characteristic of the participants in study groups

Parameters	Group Atropine (n=166)	Group Glycopyrrolate (n=166)	P Value
Age	26.28±4.03	26.07±3.78	0.609
Weight	75.24±7.6	74.17±7.54	0.138
Gestation age	38.82±1.17	38.70±1.19	0.212
Gravida and parity	Multiple	Multiple	
ASA Class			
I	6	5	
II	160	161	

Table 2: Hemodynamics characteristic of the participants in study groups

		Group Atropine (n=166)	Group Glycopyrrolate (n=166)	P Value
0 Mins	HR	98.84±10.7	97.18±11.6	0.249
	MAP	78.75±10.33	80.12±11.3	0.87
	Vasopressure given	28	17	0.67
15 Mins	HR	94.89±11.8	98.18±11.5	0.045*
	MAP	76.63±7.9	79.6±10.5	0.029*
	Vasopressure given	31	25	0.519
30 Mins	HR	95±8.1	97.2±10.3	0.13
	MAP	78.2±7.8	80.4±10.2	0.076
	Vasopressure given	27	24	0.624
Mean HR		80.1±28.5	79.9±29.8	0.375
Mean MAP		58.15±34.8	58.4±36.7	0.482

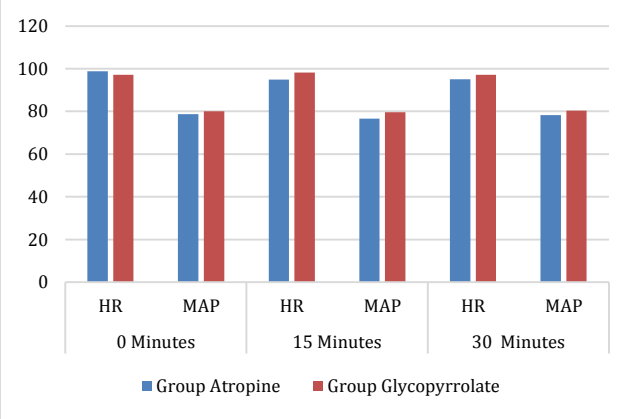

Figure 1: Comparison of hemodynamics characteristic of the participants in study groups

DISCUSSION

In closed claims surveys of 40,000-550,000 spinal anesthetics, the frequency of cardiac arrest ranges from 0.04 to 1/10,000 (19,20). Hypotension and bradycardia are the most prevalent significant side effects of spinal anesthesia. Height more than T5, age 40 or more years, a systolic blood pressure at rest of less than 120 mmHg, and a spinal puncture higher than L3-L4 all increase the likelihood of developing hypotension block. Baseline heart rate of less than 60 bpm, ASA PS I, use of beta-adrenergic blockers, extended PR interval on ECG, and block height T5 or above are all risk factors for the development of bradycardia (18,21). Pre or co-loading of intravenous fluid, vasopressors, and physical procedures including table tilt, leg cuffs, and compression devices are only some of the approaches now used to avoid hypotension and bradycardia (22, 23). A Cochrane study, however, found that none of these methods worked better than others, and it was recommended that researchers focus on combining treatments in the future (24). Using intravenous atropine or glycopylorate, this research attempted to reduce the risk of hypotension caused by spinal anesthesia. Esters of an aromatic acid and an organic base, atropine (25, 26). The cellular effects of acetylcholine are blocked because it competitively inhibits acetylcholine binding to its receptor. Atropine reduces parasympathetic activity in all parasympathetically-controlled muscles and glands and increases heart rate by blocking the effect of vagal tone on the heart's M2 receptor. In the present study we observed a significant increase in HR and MAP was observed in the Group B who were administered with 0.01kg/weight of glycopylorate after 15 minutes. More participants in the atropine group received Vasopressure dosage to maintain their HR and MAP. A number of additional research' conclusions mirrored these ones. Hwee et al. (27) showed that administering intravenous atropine (IV) following a crystalloid infusion in patients undergoing SA might rapidly boost HR in a dose-dependent manner and reduce the occurrence of substantial hypotension. The use of prophylactic intravenous bolus atropine to prevent hypotension generated by spinal anesthesia was also shown to diminish the incidence and severity of hypotension in parturient having caesarean delivery under spinal anesthesia (28). In contrast, Hirabayashi et al. (29) found no improvement in hemodynamic stability when IM atropine was given during SA. This might be due to the fact that the drug's absorption is unexpected and its onset is too sluggish in comparison to the beginning of hypotension following SA. Glycopyrrolate, another anticholinergic agent, when given intravenously (IV) after SA in women presenting for elective caesarean section at term, increased HR and decreased the severity of hypotension (30).

CONCLUSION

In conclusion, in comparing the efficacy of atropine and glycopylorate in inducing hypotension after spinal anesthesia, glycopylorate have better HR and MAP after 15 minutes of administration and the participants in the glycopylorate group needed less Vasopressure dosage as compared to who had atropine.

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