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Role of Prophylactic Intramuscular. Glycopyrolate In Preventing Hypotension and Bradycardia in Patients Undergoing Elective Lower Abdominal and Limb Surgery.

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Abstract
Background: Spinal anaesthesia is frequently used for lower abdominal and limb surgeries, but it is commonly associated with hypotension and bradycardia due to sympathetic blockade. Glycopyrrolate, an antimuscarinic agent, may prevent these hemodynamic changes. While intravenous glycopyrrolate has shown benefits, limited evidence exists on intramuscular administration.
Objective: To evaluate the efficacy of prophylactic intramuscular glycopyrrolate in preventing hypotension and bradycardia in patients undergoing elective lower abdominal and limb surgeries under spinal anaesthesia.
Methods: A randomized, double-blind, placebo-controlled study was conducted on 120 patients (ASA I and II, aged 18–60). Patients were divided into two groups: Group G received 0.2 mg IM glycopyrrolate and Group S received normal saline, 15 minutes before spinal anaesthesia. Hemodynamic parameters, vasopressor requirements, and adverse effects were monitored and analyzed using SPSS v22.0.
Results: The incidence of hypotension was significantly lower in the glycopyrrolate group (3.33%) compared to the saline group (53.33%, p<0.001). While bradycardia was less frequent in the glycopyrrolate group (3.33% vs. 16.66%), the difference was not statistically significant (p=0.197). The glycopyrrolate group required less phenylephrine and maintained higher heart rates throughout surgery.
Conclusion: Prophylactic intramuscular glycopyrrolate effectively reduces the incidence of hypotension and maintains hemodynamic stability during spinal anaesthesia, making it a valuable premedication in elective lower abdominal and limb surgeries.
Keywords: *Spinal anesthesia , glycopyrrolate as a intramuscular*

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I. INTRODUCTION

Spinal anaesthesia is a widely used anaesthetic procedure due to its technical simplicity, fast onset, and effective sensory and motor blockade. It can cause significant hypotension and bradycardia due to sympathetic blockade.Prophylactic measures to prevent these adverse effects are crucial for patient safety and comfort. Glycopyrrolate is a quaternary amine with an antimuscarinic effect. It can attenuate reflex vagal responses and subsequent bradycardia.(1) Although a few previous studies have observed that Intravenous glycopyrrolate is effective in preventing spinal-induced bradycardia and hypotension in parturient patients. There is lack of studies on intramuscular glycopyrrolate.

II. METHODOLOGY

- Randomised double blind placebo control, study was conducted in Akash hospital medical college in Bangalore, Karnataka, India.
- A total of 120 patients of either sex and 60 each group of G received IM Glycopyrrolate 0.2mg (1ml) & group S received 1ml of NS 15 minutes prior to spinal anaesthesia.
- Inclusion criteria: A total of 120 patients aged 18-60 years, of either sex, with ASA physical status I and II, undergoing elective lower limb and abdominal surgeries under spinal anaesthesia.
- Exclusion criteria: Patients with contraindications for spinal anaesthesia, known allergy to Glycopyrrolate, and those receiving any antihypertensive agents were excluded from the study.
- Patients were placed in the sitting position. Lumbar puncture was performed under strict aseptic conditions at the L3-L4 or L4-L5 vertebral interspace with a 25G Quincke needle. Hyperbaric bupivacaine (0.5%) 3 mL and fentanyl (25 mcg) 0.5 mL were injected intrathecally.

- Heart rate and NIBP were recorded at three minute intervals until 15 minutes and at five minute intervals there after. Any side effects, such as nausea, vomiting and dry mouth, were also noted.
- Hypotension was defined as a fall in mean arterial pressure of more than 20% from the baseline value. Hypotension was treated with a bolus dose of phenylephrine 100 mcg Intravenously.
- Bradycardia was defined as a HR of less than 50 beats per minute(bpm). Patients received atropine 0.6 mg IV, when the heart rate was less than 40bpm.
- The collected data was analysed using SPSS software 22.0. Mean and standard deviation was calculated for all the parameters. Chi-square test was used to find the statistical significance. P value of <0.05 was considered as statistically significant.

III. RESULTS

Reduced incidence and severity of hypotension, ephedrine use and the incidence of nausea and vomiting in elderly patients receiving prophylactic. intramuscular glycopyrrolate

The two groups were comparable in terms of demographic profile and baseline haemodynamic parameters.

Two patient(3.33%) in group G developed bradycardia, whereas 10 (16.66%) patients in group N experienced bradycardia. However, the difference was not statistically significant (p=0.197). No patient required atropine intraoperatively as the HR was more than 40 BPM in all patients.

The incidence of hypotension was significantly lower in group G compared to group N (3.33% vs 53.33% with p<0.001).

Parameters	Group G (n=60) n (%)	Group N (n=60) n (%)
Age (in years)	40.4	42.4
Sex (male:female)	26:19	24:21
ASA(1&2)	38:22	36:24
Baseline HR(per minute)	76.56	78.46
Baseline MAP (mmHg)	98.92	100.52

Incidence of bradycardia	2 (3.33)	10(16.66)
Incidence of hypotension	2(3.33)	32(53.33)

Number of patients requiring phenylephrine	2(3.33)	32(53.33)
Mean amount of phenylephrine used (mcg)	100	200
Mean volume of i.v. fluid used(mL)	1400	1700

Incidence of dry mouth	26	10
Incidence of nausea and vomiting	0	6

Studies

- Hwang J et al., 2014 Seoul National University Hospital, Seoul conducted a study with a total of 66 patients above 60 years of age scheduled for elective surgery under spinal anaesthesia. Glycopyrrolate 0.2 mg vs normal saline was given IM 15 minute before spinal anaesthesia. Incidence of hypotension and bradycardia, ephedrine use, mean arterial pressure, heart rate, and the incidence of nausea and vomiting, it was concluded that

there was reduced incidence and severity of hypotension, ephedrine use and the incidence of nausea and vomiting in elderly patients receiving prophylactic. intramuscular Gycopyrrolate.

- Deshar R et al.,2022 University ,Hospital of BP Koirala Institute of Health Sciences, Dharan, Nepal. conducted a study with a total of 258 patients undergoing non-elective caesarean section for category 2 and 3 under spinal anaesthesia. Glycopyrrolate 0.2 mg vs normal saline administered IV before the patient was placed in sitting position for spinal anaesthesia. Intraoperative requirement of phenylephrine, incidences of hypotension, reactive hypertension, bradycardia use for atropine, tachycardia, intraoperative nausea and vomiting, shivering, pruritus, dry mouth and dizziness were recorded.It was concluded that prophylactic Glycopyrrolate does not reduce the vasopressor requirements to prevent postspinal hypotension. Mean SBP and the incidence of tachycardia were higher in Glycopyrrolate group. Other parameters were comparable.

IV. DISCUSSION

- Hypotension and bradycardia are two common complications of spinal anaesthesia. Spinal anaesthesia induces systemic vasodilation and sympathetic blockade, leading to venous pooling of blood and a decrease in cardiac output. It also results in a decrease in systemic vascular resistance, leading to hypotension.
- Various management strategies, including preloading with IV fluids and the use of vasopressors like phenylephrine and ephedrine, have been attempted to reduce the incidence of post-spinal hypotension.
- Preloading may not always be effective and can be detrimental in patients with compromised cardiac conditions.(3)
- Bradycardia is another serious complication of spinal anaesthesia. It occurs when the cardiac accelerator fibers (T1-T4) are affected. Decreased venous return and increased inotropy of the left ventricle are potential contributing factors to bradycardia. The role of the Bezold-Jarisch reflex has also been postulated.(2)
- In the present study, HR was significantly higher in group G compared to group N throughout the intraoperative period and at 60 minutes postoperatively.
- Glycopyrrolate is an anticholinergic drug that reversibly binds to muscarinic cholinergic receptors, preventing the binding of acetylcholine. This results in an increased HR due to the antagonism of acetylcholine's action on the heart(4).
- The lower heart rate in group N may also be attributed to the higher consumption of Phenylephrine to manage hypotension.
- Therefore, prophylactic Glycopyrrolate can help maintain a higher heart rate and reduce the requirement for Phenylephrine, thus preventing further bradycardia.
- Intravenous administration of Glycopyrrolate may cause an abrupt rise in heart rate, which could be detrimental to patients.
- Therefore, intramuscular Glycopyrrolate was used in the present study to avoid sudden tachycardia. The incidence of hypotension was significantly lower in group G compared to group N ($p<0.001$).

LIMITATION

V. CONCLUSION

- The prophylactic use of intramuscular Glycopyrrolate is effective in preventing hypotension and bradycardia in patients undergoing elective lower limb surgeries under spinal anaesthesia. It can maintain a higher HR compared to placebo, thus rejecting the null hypothesis and favouring the alternative hypothesis. Additionally, patients receiving Glycopyrrolate require fewer vasopressor agents as there is less of a decrease in intraoperative mean arterial pressure.

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