

Evaluation of pre-emptive intramuscular phenylephrine at different dose for reduction of hypotension under spinal anaesthesia

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Abstract

Background: Incidence of hypotension is a common sequelae following Spinal anaesthesia (SAB). Phenylephrine, a selective alpha₁ adrenergic agonist raises arterial pressure by causing vasoconstriction. In this study we have evaluated Phenylephrine 4 mg and Phenylephrine 2 mg I.M., administered immediately after induction of SAB in terms of incidence of hypotension, requirement of rescue ephedrine and time to first ephedrine administration. **Methods:** In present study preemptive intramuscular (I.M.) Phenylephrine drug administration were evaluated in 120 patients assigned to two groups (60 each) in a randomized study undergoing elective lower abdominal and lower limb surgeries under Spinal anaesthesia. Group I (p4) received preemptive Phenylephrine 4 mg i. m. and group II (p2) received preemptive Phenylephrine 2 mg I.M., both given immediately after induction of Spinal anaesthesia. In this study, hypotension was defined as a 25% decrease in MAP and hypertension as a 25% increase in MAP. Rescue intravenous (I.V.) boluses of ephedrine were given if the patient was hypotensive. **Results:** The incidence of hypotension was only 25% in P4 mg group compared to 46.66% in P2 mg group (p=0.01). The P4 mg group had a significantly lower percentage reduction in MAP compared with P2 mg group (p=0.01). **Conclusion:** We conclude that preemptive I.M. Phenylephrine 4 mg reduces the severity of hypotension following Spinal anaesthesia.

Keywords: Spinal anaesthesia, ephedrine, phenylephrine, mean arterial pressure, hypotension, and hypertension.

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INTRODUCTION

Spinal anaesthesia is become the technique of choice for elective lower abdominal and lower limb surgeries. It is frequently accompanied by hypotension in 50 to 60% of patients¹. Hypotension following spinal anaesthesia is mainly occurs due to sympathetic blockade leading to peripheral vasodilatation and venous pooling of blood. Some studies have suggested the usage of colloids and crystalloids for preloading may prevent hypotension. But,

many studies have found this measure to be inadequate.² Normally vasopressors are used to treat hypotension than to prevent it. Ephedrine which is the commonest vasopressor used has been used, but very little benefit has been found³ Phenylephrine is an α_1 receptor agonist which is used to treat hypotension due to spinal anaesthesia. In, our study we tried to evaluate the effect of giving phenylephrine intramuscularly on the incidence of hypotension in two different doses.

MATERIAL AND METHODS

After obtaining the approval ethical committee 60 patients were enrolled in each group. The patients aged B/W 20-40 Years, ASA physical statues I-II and scheduled for lower abdominal and lower limb elective surgeries under SAB included. Hypertensive's (>160/90mg), cardiovascular, neurological disorder patients and in whom there was failure to achieve cephalic spread up to T6 level excluded. Informed consent was taken and patients posted for elective surgeries were allocated randomly to phenylephrine 4 mg

(P4) group and phenylephrine 2 mg (P2) groups. All patients were fasted for at least six hours. IV access was obtained with 18 G cannula (IV).ECG, Pulse Oximetry and NIBP monitors were connected. All patients were preloaded with 500ml RL over 10 minutes before SAB and HR and NIBP were recorded every 2 minutes during this time. Patients positioned in left lateral position for SAB. SAB was instituted at L3-L4 or L2-L3 space using 25G spinal needles. Inj. 0.5% hyperbaric Bupivacaine 3cc and Inj. Fentanyl 25mcg was administered intrathecally. Phenylephrine 4mg/ 2mg administered i.m. to left vastus lateralis muscle immediately after positioning the patients in supine position. Both study medications made up to 2 ml with 0.9% saline. Block height with cephalad spread up to T6 level was mandatory in both the groups. HR,

Oxygen saturation and NIBP were recorded every 3 minutes thereafter. Hypotension was defined as a 25% decrease in MAP from baseline which was taken as the lowest MAP recorded in the initial 10 minutes before the patient received study medication. Hypertension was defined as a 25% increase in MAP from baseline which was taken as the lowest MAP recorded in the initial 10 minutes before the patient received study medication. Side effects like bradycardia, vomiting, nausea and any other side effects were noted during the study. The MAP, Incidence of hypotension and hypertension were noted in both the groups. The first dose of ephedrine given, frequency of ephedrine given and total dose of ephedrine given were noted.

RESULTS

Table 1: Patient Characteristics

Sr. No.	Name	Phenylephrine 4 mg group (N=60)	Phenylephrine 2 mg group (N=60)
1	Mean age (Years)	32.0 (7.95)	31.90 (8.06)
2	Mean weight (Kgs)	62.5 (7.94)	64.45 (9.09)
3	Baseline MAP (mm hg)	87.08 (8.88)	86.25 (9.64)
4	Baseline HR (Beats/min)	95.05 (14.07)	95.80 (12.67)
5	Type of Surgery I Lower Abdominal	30	34
	II Lower Limb	30	26

Table 2: Parameters Evaluated

Sr. No.	Name	Phenylephrine 4 mg group (N=60)	Phenylephrine 2 mg group (N=60)
1	Incidence of Hypotension	12 (25%)	28.0(46.66%)
2	Incidence of Hypertension	10 (16.66)	03.0 (05%)
3	Frequency of ephedrine requirement	2 Cases required 2 times	7 Cases required 2 times
4	% Fall in MAP	15.45 (8.54)	19.17 (8.50)
5	Dose of rescue ephedrine	6.8 mg (2.11)	7.53 mg (3.02)
6	Time to first ephedrine	10.73 (11.20) minutes	8.07 (5.49) minutes

All patients completed the study. The data was analyzed using SPSS software ver 15. T test and Chi square test was applied. Both groups were similar in term of age, weight and dermatological sensory levels. Haemodynamic response in both the groups (baseline MAP and baseline HR) and type of surgeries in both the groups shown in table 1. In present study incident of hypotension (25% decrease in MAP from baseline) were 15 from 60 patients i.e. 25 % in p4 group and 28patients i.e. 46.6% in p2 group. Incidence of hypertension (25% increases in MAP from baseline) were 10 patients i.e. 16.6% in p4 group and 03 patients i.e. 05% in p2 group shown in table 2. The hypotension in both the group was found to be statistically significant when Chi Square test was applied (p value-0.01333). Incident of fall in MAP both the group are 15.45 (8.54%) p4 and 19.17(8.50%) p2. Percentage fall in MAP was found to be significantly lower in P4 group than in p2 group (p value-0.01836). Frequency of ephedrine requirement was high in P2

group, 7 cases required administration of rescue ephedrine compared to only 2 cases in P4 group. Time to first requirement of rescue i.v. ephedrine therapy was shorter in P2 group 8.07 minutes as compared to 10.73 minutes in P4 group but was not statistically significant (p=0.10). Only 4 patients developed bradycardia (3 in P4 and 1 in P2 group), they were administered Inj. Glycopyrrolate 0.2mg i.v.

DISCUSSION

The prevention and treatment of hypotension associated with spinal anesthesia for lower abdomen and lower limb surgeries remained different problem with no consensus as to the optimal mode of management. Kararmaz. *Et al* observed that 45-55% hypotention in spinal anaesthesia with bupivacaine 7.5 mg and fentanyl 25ug for transurethral prostactomy. Mohammad qamarul hoda. *Et.al* observed 48% hpotention with bupivacaine at 10mg with or without fentanyl for spinal anesthesia for hip

surgery. Although fluid preloading is still widely used its place in the management of hypotension induced by spinal anesthesia has been questioned². Giving I V vasopressor for correction hypotension due to spinal anesthesia is well established. Commonly used vasopressor are ephedrine and phenylephrine. Phenylephrine is a synthetic noncatecholamine that stimulates principally alpha-1 adrenergic receptors by a direct effect. The dose of phenylephrine necessary to stimulate alpha-1 receptors is far less than the dose that stimulates alpha-2 receptors. Resulting venoconstriction is greater than arterial constriction⁴. In M. C. Henneby *et al* used prophylactic infusion phenylephrine at rate of 16.6ug/min to prevent hypotension in caesarean section⁵. By M. Tanaka *et al* used intermittent I V dose of phenylephrine with 40ug first dose and 10ug subsequent dose to prevent spinal induced hypotension in elective cesarean delivery. By B.T. Ayorinde *et al* used two different dose of phenylephrine (4mg and 2mg) intramuscular injection as pre-emptive drug to prevent spinal induced hypotension during caesarean section⁴. Our study showed that phenylephrine 4mg IM and phenylephrine 2mg IM given preemptively after giving spinal for lower abdomen surgeries to reduce the severity of hypotension and reducing total dose of rescue drug ephedrine. However the incidence of use of rescue drug was significantly different between the groups. Phenylephrine 4mg i. m. used preemptively before SAB, reduce the severity of hypotension and also marginally reduce the dose of rescue i.v. ephedrine therapy during spinal anesthesia. In this study we investigated the effect of IM vasopressure given before the onset of hypotension and found a therapeutically useful effect⁶. Phenylephrine effectively restores SAP, MAP and diastole arterial pressure but decreases heart rate and CO. Giving I V vasopressure for correcting hypotension due to spinal anesthesia is well established, however giving IM vasopressure before spinal anesthesia is more controversial because of concern above reactionary hypertension if SAB fails. We justified delaying the administration of IM vasopressure until induction of spinal anesthesia because of these concerns. The timing of I M drug administration to achieve optimum efficacy can be unpredictable, pharmacokinetic that the peak effect of I M Phenylephrine is 10-15 min after administration This suggests that giving I M vasopressor immediately after the intrathecal injection is not too late to achieve a beneficial effect. The groups were similar in term of age, weight and dermatological sensory levels. The incidence of hypotension was 25% in P4 group compared to 46.66% in P2 group. The above difference was found to be statistically significant when Chi Square test was applied (p value-0.01333) and 16.7% of patients

developed hypertension in P4 group compared to only 5% in P2 group. B.T. Ayorinde *et al* concluded in their study that the incidence of hypotension was 33% in P4 group and 70% in P2 group. In a similar study, no hypertension was noted by B.T. Ayorinde *et al*⁴. Frequency of ephedrine requirement was high in P2 group, 7 cases required administration of rescue ephedrine compared to only 2 cases in P4 group. Percentage fall in MAP was found to be significantly lower in P4 group than in P2 group (p value-0.01836). Ayorinde *et al* observed that patients who received phenylephrine 4 mg and ephedrine 45 mg had a significantly lower percentage reduction in MAP compared with controls and phenylephrine 2 mg groups. Dose of rescue ephedrine was lower in P4 group, but this did not reach statistical significance (p=0.12). B.T. Ayorinde *et al* concluded P 4mg group required significantly lower doses of rescue i.v. ephedrine. This is similar to your study. Only 4 patients developed bradycardia (3 in P4 and 1 in P2 group), they were administered Inj. Glycopyrrolate 0.2mg i.v. as compared to no instances of bradycardia in Ayorinde *et al* study. When Phenylephrine used as IV infusion to maintain hypotension used Thomas D G *et al* observed 58% observed bradycardia but in our study bradycardia seen in only 4 cases⁷. This may be over riding chronotropic effect of ephedrine when it was given as a rescue vasopressor. In this study ephedrine used as rescue vasoconstriction it maintains SAP mainly by increasing CO and HR. Time to first requirement of rescue I v ephedrine therapy was shorter in P2 group 8.07 minutes as compared to 10.73 minutes in P4 group but was not statistically significant (p=0.10). Similarly, the time to first requirement for rescue i.v. ephedrine was not significant between the groups in B.T. Ayorinde *et al* study.

CONCLUSION

Phenylephrine 4mg i.m used preemptively before SAB, reduce the severity of hypotension, maintain the MAP and also marginally reduce the dose of rescue i.v. ephedrine therapy during spinal anesthesia for lower abdominal and lower limb surgeries with minimal side effects.

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