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Prevention of Hypotension with a Single Prophylactic Dose of Ephedrine (9mg) In Patients during Spinal Anaesthesia

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Abstract

Objective: The aim of the study was to assess the efficacy of single prophylactic dose (9mg) of ephedrine given to prevent hypotension in patients during spinal anaesthesia. This study was conducted at Anaesthesia Department of J.L.N.M.C.H from August 2017 to December 2018.

Material And Methods: Sixty patients, who were to be operated under spinal anaesthesia, for lower abdominal general surgery, obstetric-gynecological and lower limb orthopedic surgery, were divided into two groups. Group A (n=30) received Ringer's lactate solution 15 ml/kg as preload and group B (n=30) received Ringer's lactate solution 15 ml/kg as preload along with single prophylactic dose of injection ephedrine 9 mg intravenously which was given after administering spinal anaesthesia. Various parameters of the patients were recorded and the comparison was made between groups A and group B. Heart rate, systolic and diastolic blood pressures and oxygen saturation were monitored at 5 minutes interval till the completion of surgery.

Results: Out of 60 patients 32 were males and 28 were females. 38 patients belonged to American Society of Anesthesiologist (ASA)-1 and 22 patients belonged to ASA II. In group A the average age of the patients was 26.44±6.8 years while in group B it was 24.56±3.8 years. There were no significant statistical differences for age, weight and height of the patients between two groups. The changes in heart rate, systolic and diastolic blood pressures were compared between groups, after taking baseline readings, at 5 minutes interval till the end of surgery. The base line readings were not significantly different statistically but subsequent readings showed significantly low incidence of hypotension in group B as compared to group A.

Conclusion: Administration of single prophylactic dose (9mg) of ephedrine prevents hypotension in patients during spinal anaesthesia

Keywords: Blood Pressure, Ephedrine, Heart Rate, Spinal Anaesthesia.

Introduction

In anaesthesia practice the role of neuraxial anaesthesia is gaining more and more importance with passage of time. With the advancement in drugs and equipment, the use of local anaesthetic technique is increasing day by day. According to studies, it has been claimed that neuraxial block reduces the incidence of venous thrombosis, pulmonary embolism, bleeding and transfusion requirements, cardiac complications, vascular graft

occlusion, pneumonia and respiratory depression following lower abdominal surgeries[1]. It has also been involved in sympathetic mediated increase in tissue blood flow and suppression of neuroendocrine response. As far as caesarean section is concerned, there is no exposure of neonate by depressant drugs and mother remains awake at birth of her child[2]. Therefore currently it is the technique of choice in obstetric practice all over the world[3].

Spinal anaesthesia is associated with some disadvantages as well i.e. hypotension and bradycardia which commonly occur during this technique. A number of strategies for preventing hypotension have been tried like fluid administration as pre-load, anticholinergics, compression devices on the legs, and prophylactic vasopressors[4]. How-ever, no method has been proved entirely satisfactory. Of the available vasopressors, ephedrine is most commonly used. Ephedrine, an indirectly acting sympathomimetic amine, is probably the vasopressor of choice. Although ephedrine has mixed α and ß-adrenoreceptor activity, it maintains arterial pressure mainly by positive inotropic and chronotropic effects as a result of its predominant activity on ß1- adrenoreceptors. Use of Intramuscular ephedrine has been described, but its efficacy has been inconsistent[5], and its use may be associated with unacceptable hypertension, particularly if spinal anaesthesia is unsuccessful[6] . As an alternative, intravenous ephedrine given immediately after the induction of spinal anaesthesia has been described[7,8]. The aim of this study was to determine the efficacy of single dose (9mg) of ephedrine given intravenously prophylactically to prevent hypotension in patients during spinal anaesthesia.

Patients and Methods

This study was conducted at Anaesthesia Department of J.L.N.M.C.H from August 2017 to December 2018. Sixty patients belonging to ASA I and II, undergoing elective surgeries under spinal anaesthesia, for lower abdominal general surgery, obstetrics-gynecological and lower limb orthopaedic surgery, were included. Informed consents were taken from the patients at pre-anaesthetic visit. Following patients were included and excluded.

Inclusion Criteria: All those patients with ASA I and II, age above 18 years of both sexes undergoing elective surgery were included in this study.

Exclusion Criteria: All those patients who refused , patients with history of local anaesthetic allergy, patients with coagulation abnormalities and patients with infection at lumbar puncture site were excluded in this study.

These 60 patients were divided into two groups: Group A and group B. Group A (n=30) received Ringer's lactate solution 15 ml/kg as preload and group B (n=30) received Ringer's lactate solution 15 ml/kg as preload along with single prophylactic dose of ephedrine 9 mg intravenously. Intravenous line was secured routinely in all patients in operation theatre; monitors were attached, base line readings of heart rate and blood pressure were taken. Ringer's lactate (15ml/ kg) was used to preload the patients. The patient was placed in sitting position. After explaining the procedure and taking all aseptic precautions, interspinous space between L3 and L4 was identified and skin overlying was infiltrated with 2 % lidocaine. 26 G spinal needle was then introduced between interspinous space L3 and L4 and after confirming its intrathecal position by observing clear outflow of CSF, 1.5-3.0 ml of 0.5% hyperbaric bupivacaine was injected, dose depending upon type and duration of surgery. After removing spinal needle, sterile dressing was applied and patient was put in supine position. 9 mg of ephedrine was then injected in group B intravenously. Heart rate, systolic and diastolic blood pressures and oxygen saturation were monitored at 5 minutes interval, starting immediately after spinal anaesthesia till the end of surgery.The level of

sensory block reached was up to T10 level and it remained so till the completion of surgery.

Statistical Analysis

Mean and standard deviation of the quantitative variables like age, weight and height, systolic blood pressure, diastolic blood pressure and heart rate for both groups, were determined. Independent sample t test was used to compare percentage changes in mean heart rate, systolic and diastolic blood pressures between groups. Chi square test was also applied to check proportion difference of hypotension between groups. P value <0.05 was considered significant.

Results

In this study, sixty patients were divided into two groups: Group A and group B. Group A(n=30) received Ringer's lactate solution 15 ml/kg as preload and group B (n=30) received Ringer's lactate solution 15 ml/kg as preload along with single prophylactic dose of ephedrine 9 mg intravenously. Out of 60 patients, 32 were males and 28 were females. 38 patients belonged to ASA-1 and 22 patients belonged to ASA-II. In group A, the average age of the patients was 26.44±6.8 years while in group B it was 24.56±3.8 years (table 1).

Variables		Group A (n=30) Mean ± SD	Group B (n=30) Mean ± SD
Age (years)		26.44±6.8	24.56±3.8
Weight (kilograms)		54.56±7.45	55.52±5.68
Height (cm)		152.20±2.2	152±4.4
Gender	Male	15	17
	Female	15	13
Male: Female Ratio		1:1	1.3:1
ASA	I	19	19
	II	11	11

Table 1: Demographic and clinical characteristics of the patients

There were no significant statistical differences for age, weight and height between the two groups.

The changes in heart rate, systolic and diastolic blood pressures were compared between the groups, after taking baseline readings, at 5 minutes interval starting immediately after spinal anaesthesia till the end of surgery. The base line readings were not significantly different statistically (table 2).

Haemodynamic Characteristics	Group A (n=30) Mean ± SD	Group B (n=30) Mean ± SD	P-Value
Systolic blood pressure (mm Hg)	118.06±5.7	110.0±5.3	0.11
Diastolic blood pressure (mm Hg)	75.27±4.5	73.47±4.4	0.84
Mean blood pressure (mm Hg)	93.14±5.6	87.10±5.6	0.12
Heart Rate (per min)	94.43±10.1	93.33±18.2	0.73

24 (80.00%) patients in group A developed hypotension whereas only 7(23.33%) patients in group B developed hypotension.

The hypotension usually developed 10-15 minutes after spinal anesthesia was given. Only 6 (20.00%) patients in group A did not develop hypotension where as in group B 23 (76.66%) patients did not develop hypotension (table 3).

Hypotension	Group A (n=30)	Group B (n=30)	Total (n=60)
Yes	21 (70.00%)	12(40.00%)	33(55.00%)
No	9 (30.00%)	18 (60.00%)	27 (45.00%)

Table 3: Comparison of frequency of hypotension between groups

The incidence of hypotension was significantly low in group B. So it can be concluded that incidence of hypotension was significantly reduced by single prophylactic dose of 9 mg ephedrine in addition to preload with Ringer's lactate as compared to patients who received only Ringers lactate solution as preload.

DISCUSSION: Regional anaesthetic techniques particularly central blocks i.e. epidural and spinal anaesthesia are safer anaesthetic techniques and play an important role for decreasing the mortality and morbidity in patients. Hypotension and bradycardia occur commonly during this technique. Prevention and management of this hypotension is still a major issue. A number of strategies for preventing hypotension have been investigated including the use of vasopressors like ephedrine. In addition to ephedrine pre-treatment, the contribution of small dose intrathecal anaesthesia and rehydration play key roles.

In our study, ephedrine was used prophylactically as single 9 mg dose intravenously to observe its efficacy to prevent hypotension in patients during spinal anaesthesia along with preloading them with crystalloid solution i.e. Ringer's lactate in dose of 15 ml/kg mmediately after administration of spinal anaesthesia and attainment of supine position. The results of our study are supported by other studies as well. Gutsche, in his study, demonstrated that 25-50 mg ephedrine, given intramuscularly within 30 minutes of instituting a subarachnoid block, significantly decreased the incidence of hypotension[4].

Kang et al[9], in their study, found that intravenous route for administering ephedrine, either as an incremental dose or by infusion, may be more effective and predictable than the intramuscular route. Vercauteren et al[10], in their study observed that a small dose of ephedrine may significantly lower the incidence and limit the severity of hypotension during elective caesarean delivery under small dose spinal anaesthesia. Dsalu and Kushimo[11] concluded that prophylactic ephedrine given by standard infusion set was more effective than crystalloid prehydration in prevention of hypotension during spinal anaesthesia. Crystalloid prehydration is also important to prevent hypotension. Rout et al[12] demonstrated that the incidence of hypotension decreased significantly from 71 % to 55 % for unpreloaded versus preloaded subjects, respectively. Increasing the crystalloid preload from 10 to 30ml/kg may further reduce the incidence of hypotension. In our study, all patients in group A and B were preloaded with Ringers lactate solution in dose of 15 ml/kg before giving injection of 0.5 % hyperbaric bupivacaine and patients in group B were given prophylactic 9mg dose of ephedrine intravenously. Hypotension developed in 24 patients in group A and in 7 patients in group B which was treated with additional 200 ml boluses of Ringers lactate solution.

Conclusion

Our study suggest that the prophylactic single 9 mg intravenous dose of ephedrine is effective in preventing hypotension during spinal anaesthesia when given in addition to preload as compared to preload alone.

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