

Assessment of the efficacy of single dose of ephedrine given prophylactically to prevent hypotension in patients during spinal anaesthesia

Fawad Ahmed Khan, Rumina Tabassum, Saleem Sabbar

Abstract

Objective: The aim of the study was to assess the efficacy of single dose (10mg) of ephedrine given prophylactically to prevent hypotension in patients during spinal anaesthesia.

Study design: Quasi experimental

Place and duration of surgery: This study was conducted at Anaesthesia Department of Lyari General Hospital Karachi over a period of 3 months from May 2008 to July 2008.

Patients and methods: In this study sixty patients, who were on operation theatre list under spinal anaesthesia, were divided into two groups. Group I (n=30) received Ringers lactate solution 15 ml/kg as preload and group II (n=30) received Ringers lactate solution 15 ml/kg as preload along with single prophylactic dose of inj ephedrine 10 mg intravenously which was given after administering spinal anaesthesia. Data from the patients was recorded on a proforma. The comparison was made between groups I and group II. Heart rate, systolic and diastolic blood pressures and oxygen saturation were monitored at 5 minutes interval till the end of surgery.

Results: Out of 60 patients 32 were males and 28 were females. 37 patients belonged to American Society of Anaesthetists (ASA)-1 and 23 patients belonged to ASA-II. In group I the average age of the patients was 28.12 ± 7.5 while in group II it was 25.32 ± 4.2 . 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 II as compared to group I.

Conclusion: Administration of single prophylactic dose (10mg) of ephedrine prevents hypotension in patients during spinal anaesthesia

Key Words: Spinal Anaesthesia, Ephedrine, Heart Rate, Blood Pressure, Ringers lactate

Introduction

In anaesthesia practice the role of neuraxial anaesthesia is gaining more and more importance with passage of time. There is a big list of surgeries which can be performed under this form of anaesthesia. With the advancement in drugs and equipment, the use of local anaesthetic technique is increasing day by day.

According to studies, neuraxial block is efficient in reducing the postoperative morbidity and mortality. 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 upper abdominal surgeries¹. It has also been involved in sympa-

Sindh Govt Lyari General Hospital, Karachi.
FA Khan

Department of Obstetrics & Gynaecology, Dow International Medical College, Dow University of Health Sciences, Karachi.
R Tabassum

Department of Anaesthesia and ICU, Dow International Medical College, Dow University of Health Sciences, Karachi.
S Sabbar

Correspondence:
Dr. Rumina Tabassum
Address: B-103, Block 14, Gulistan -e- Johar, Karachi.
Cell: 0314-2201239

thetic 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 child². Therefore currently it is the technique of choice in obstetric practice all over the world³.

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 preload, anticholinergics, compression devices on the legs, and prophylactic vasopressors⁴. However, 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 β -adrenoreceptor activity, it maintains arterial pressure mainly by positive inotropic and chronotropic effects as a result of its predominant activity on β_1 -adrenoreceptors. Use of Intramuscular ephedrine has been described, but its efficacy has been inconsistent⁵, and its use may be associated with unacceptable hypertension, particularly if spinal anaesthesia is unsuccessful⁶. 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 (10mg) of ephedrine given prophylactically to prevent hypotension in patients during spinal anaesthesia.

Patients and methods

This Quasi experimental study was conducted in anaesthesia department of Sindh Govt Lyari General Hospital, Karachi after approval from ethical committee, over a period of 3 months from May 2008 to July 2008. Sixty patients belonging to ASA I and II, undergoing elective surgeries under spinal anaesthesia, 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 20 years of both sexes undergoing elective surgery were included in this study.

Exclusion criteria: All those patients who refused to enter in this study, 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 I and group II. Group I (n=30) received Ringers lactate solution 15 ml/kg as preload and group II (n=30) received Ringers lactate solution 15 ml/kg as preload along with single prophylactic dose of ephedrine 10 mg intravenously. Patients were reassured, upon arrival in Operation Theater, to reduce their anxiety.

Intravenous line was secured routinely in all patients after arrival in operation theatre; monitors were applied; base line readings of heart rate and blood pressure were taken. Ringers lactate was used to preload the patients which were given according to body weight of the patient (15ml/kg). 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. 25 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 ml of 0.75% hyperbaric bupivacaine was injected. After removing spinal needle, sterile dressing was applied and patient was put in supine position. 10 mg of ephedrine was then injected in group II intravenously. Heart rate, systolic and diastolic blood pressures and oxygen saturation were monitored at 5 minutes interval till the end of surgery.

Statistical Analyses:

The data was collected from the proforma and was analyzed by Statistical Package for Social Sciences (SPSS) version 10. 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. $P < 0.05$ was considered significant.

Results

In this study, sixty patients were divided into two groups: Group I and group II. Group I (n=30) received Ringers lactate solution 15 ml/kg as preload and group II (n=30) received Ringers lactate solution 15 ml/kg as preload along with single prophylactic dose of ephedrine 10 mg in-

travenously.

Out of 60 patients, 32 were males and 28 were females. 37 patients belonged to ASA-I and 23 patients belonged to ASA-II. In group I, the average age of the patients was 28.12 ± 7.5 while in group II it was 25.32 ± 4.2 (table 1). 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 till the end of surgery. The base line readings were not significantly different statistically (table 2). 22 patients in group I developed hypotension where as only 10 patients in group II developed hypotension. Only 8 patients in group I did not develop hypotension where as in group II 20 patients did not develop hypotension (table 3). The incidence of hypotension was significantly low in group II. So it can be concluded that incidence of hypotension was significantly reduced by single prophylactic dose of 10 mg ephedrine in addition to preload with Ringers lactate as compared to patients who received only Ringers lactate solution as preload.

Table 1: Demographic and clinical characteristics of the patients

Variables	Group I (n=30) Mean±SD	Group II (n=30) Mean±SD
Age (years)	28.12±7.5	25.32±4.2
Weight (kilograms)	65.40±4.2	63.12±4.8
Height (cm)	150.40±3.9	149.02±3.7
Gender Male	15	17
Female	15	13
Male: Female Ratio	1: 1	1.30 :1
ASA I	19	18
II	11	12

Table 2: Comparison of base line haemodynamic characteristics

Haemodynamic Characteristics	Group I (n=30) Mean±SD	Group II (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

Values were considered significant when $p < 0.05$.

Data presented in mean±standard deviation

Table 3: Comparison of frequency of hypotension between groups

Hypotension	Group I (n=30) Mean±SD	Group II (n=30) Mean±SD	Total(n=60)
Yes	22 (73.33 %)	10 (33.33 %)	32 (53.33 %)
No	8 (26.66 %)	20 (66.66%)	28 (46.66%)

Values were considered significant when $p < 0.05$.

Data presented in mean±standard deviation

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 pretreatment, the contribution of small-dose intrathecal anaesthesia and prehydration play key roles.

In our study, ephedrine was used prophylactically as single 10 mg dose intravenously to observe its efficacy to prevent hypotension in patients during spinal anaesthesia along with preloading them with crystalloid solution i.e Ringers lactate in dose of 15 ml/kg immediately 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 hypotension⁹.

Kang et.al, 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 route¹⁰. Vercauteren et.al 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 anaesthesia¹¹.

Dsalu and Kushimo concluded that prophylactic ephedrine given by standard infusion set was more effective than crystalloid prehydration in prevention of hypotension during spinal anaesthesia¹².

Crystalloid pre-hydration is also important to prevent hypotension. Rout et al demonstrated that the incidence of hypotension decreased significantly from 71 % to 55 % for un pre loaded versus preloaded subjects, respectively. Increasing the crystalloid preload from 10 to 30ml/kg may further reduce the incidence of hypotension¹³.

In our study, all patients in group I and II were preloaded with Ringers lactate solution in dose of 15 ml/kg before giving injection of 0.75 % hyperbaric bupivacaine and patients in group II were given prophylactic 10mg dose of ephedrine intravenously. Hypotension developed in 22 patients in group I and in 10 patients in group

II which was treated with additional 200 ml boluses of Ringers lactate solution.

Conclusion

Our study suggests that the prophylactic single 10 mg intravenous dose of ephedrine is effective in preventing hypotension during spinal anaesthesia when given in addition to preload as compared to preload alone.

References

1. Kleinman W, Mikhael M. Regional anaesthesia and pain management: Spinal epidural and caudal blocks. In Morgan GE. Clinical anaesthesiology. 4th ed. New York: McGraw Hill Companies; 2006: 289-323
2. Casey WF. Spinal anaesthesia in practical guide. Spinal anaesthesia in obstetrics. 2000; 12 (8):7
3. Sultan ST. Anaesthesia and safe obstetrics. Spectrum 2000; 21:14-15
4. Gutsche BB. Prophylactic ephedrine preceding spinal analgesia for caesarean section. Anesthesiology 1976; 45: 462-5
5. Webb AA, Shipton EA. Re-evaluation of im ephedrine as prophylaxis against hypotension associated with spinal anaesthesia for Caesarean section. Can J Anaesth 1998;45: 367-9
6. Rout CC, Rocke DA, Brijball R, Koovarjee RV. Prophylactic intramuscular ephedrine prior to caesarean section. Anaesth Intensive Care 1992; 20: 448-52
7. Chan WS, Irwin MG, Tong WN, Lam YH. Prevention of hypotension during spinal anaesthesia for Caesarean section: ephedrine infusion versus fluid preload. Anaesthesia 1997; 52: 896-913
8. King SW, Rosen MA. Prophylactic ephedrine and hypotension associated with spinal anaesthesia for caesarean delivery. Int J Obstet Anesth 1998;7:18-22
9. Gutsche BB. Prophylactic ephedrine preceding spinal analgesia for caesarean section. Anesthesiology. 1976; 45(4): 462-5
10. Kang YG, Abouleish E, Caritis S. Prophylactic intravenous ephedrine infusion during spinal anaesthesia for caesarean section. Anesth Analg 1982; 61: 839-42
11. Vercauteren MP, Coppejans HC, Hoffmann VH, Mertens E, Adriaenssens H.A. Prevention of Hypotension by a Single 5-mg Dose of Ephedrine During Small-Dose Spinal Anaesthesia in Prehydrated Caesarean Delivery Patients. Anesth Analg 2000; 90: 324
12. Desalu I, Kushimo O.T. Is ephedrine infusion more effective at preventing hypotension than traditional prehydration during spinal anaesthesia for caesarean section in African parturients? International Journal of Obstetric Anaesthesia 2005; 14 (4): 294-299
13. Rout CC, Rocke DA, Levin J, et al. A re-evaluation of the role of crystalloid preload in the prevention of hypotension associated with spinal anaesthesia for elective caesarean section. Anesthesiology 1993; 79: 262-9