

Comparison of Hemodynamic Changes amongst Subjects Using Prophylactic Ephedrine v/s. Phenylephrine Intramuscularly for Prevention of Hypotension in Elective Caesarean Section Under Subarachnoid Block

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ABSTRACT

Background: Spinal anesthesia has evolved in recent years as a simple, effective, and acceptable technique for providing anesthesia in various surgical procedures. Various prophylactic and rescue regimens have been advocated for treatment and prevention of hypotension. The usual approach adopted is to treat the hypotension that has developed during caesarean section. With the aim to compare two commonly used vasopressors, ephedrine and phenylephrine, this study was performed with pre-emptive use of these vasopressors to prevent hypotension after spinal anesthesia for caesarean section.

Materials and Methods: The present study was conducted in a prospective observational manner at tertiary care teaching institute from central India. Subjects above 18 years scheduled elective caesarean section were included in the study. Subjects with any contraindications to spinal anesthesia were excluded from the study. After which monitoring was done every 3 minutes for the next 10 minutes and then every 10 minutes till the surgery lasted. All the data was arranged in a tabulated form and analyzed using SPSS software. Students t test was used for comparing mean of two samples. P value < 0.05 was considered significant at 95% confidence interval.

Results: The present study was conducted amongst 90 females with 30 subjects in each group. The mean age in group C, Group E and group P was 25.63 years, 26.10 years and 26.63 years respectively. The mean pulse rate in Group C, Group E and Group P at 0 minutes was 89.80±13.076, 86.07±12.443 and 88.93±11.744 respectively.

The mean arterial pressure in Group C, Group E and Group P at 0 minutes was 90.00±7.931, 88.87±7.705 and 90.37±7.600 respectively. The mean arterial pressure in Group C, Group E and Group P at 1 minutes was 86.77±7.846, 88.07±10.667 and 89.03±8.954 respectively. The mean arterial pressure in Group C, Group E and Group P at 3 minutes was 80.63±11.272, 82.97±11.763 and 83.93±9.425 respectively.

Conclusion: Hypotension is eminent in patients undergoing spinal anesthesia for caesarean section. Various approaches devised for prevention and treatment including use of vasopressors.

Keywords: Caesarean Section, Hypotension, Spinal Anesthesia.

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INTRODUCTION

Spinal anesthesia has evolved in recent years as a simple, effective, and acceptable technique for providing anesthesia in various surgical procedures. Rapidity of onset, symmetric sensory and motor block achievement makes it useful and a preferred choice of anesthesia in both elective and emergency caesarean section. Compared to general anesthesia, spinal anesthesia has lower incidence of complications in both the mother and foetus.¹⁻³ Though such advantages are offered by spinal anesthesia, hypotension is the most frequently occurring hemodynamic

complication in pregnant woman.⁴ Prevalence of this hypotension is reported to be as high as 70% to 80% without appropriate measures like pharmacological prophylaxis.⁵ This hypotension manifests as nausea-vomiting, dizziness, utero-placental hypo perfusion with fetal hypoxia and acidosis.⁶ Various prophylactic and rescue regimens have been advocated for treatment and prevention of hypotension. Also, physical measures like left lateral position, leg bindings and compression stockings are used.⁷ Amongst the vasopressor agents, ephedrine has been the choice

of vasopressor since last two to three decades. Ephedrine, a sympathomimetic agent has overall good safety and is readily available.⁴ Besides ephedrine, phenylephrine is the other vasopressor used commonly for treating hypotension caused by spinal anesthesia. It's alpha-2 agonist action increases both systolic and diastolic blood pressure.⁴ The usual approach adopted is to treat the hypotension that has developed during caesarean section. However, pre-emptive, or pro-active approach with the use of vasopressors before caesarean section to prevent hypotension may not be a routine practice at many centers. With the aim to compare two commonly used vasopressors, ephedrine and phenylephrine, this study was performed with pre-emptive use of these vasopressors to prevent hypotension after spinal anesthesia for caesarean section.

MATERIALS AND METHODS

The present study was conducted in a prospective observational manner at tertiary care teaching institute from central India. Department of anesthesia was the primary site for this study. The study was conducted for a period of 20 months. Ethical committee clearance was obtained from the Institute's ethical board and all the subjects were informed about the study and a written consent was obtained from all subjects in their vernacular

language. Subjects above 18 years scheduled elective caesarean section were included in the study. Subjects with any contraindications to spinal anesthesia were excluded from the study.

Patients were randomized in to three groups by computer generated randomization. Group P subject received phenylephrine (2 mg), Group E subjects received ephedrine (45 mg) and Group C were control receiving saline 0.9%. The required paranesthesia checkup of all the females was performed. 23 gauge Quincke's needle was inserted at L2-L3 or L3-L4 intervertebral space and once clear and free flow of cerebrospinal fluid was noted in all cases following which anesthetic agent (2.2 ml 0.5% hyperbaric bupivacaine) was injected. Patients were then placed supine with 150 tilt by placing a wedge under right buttock. Study medication was administered by intramuscular injections in left gluteal region. Maternal heart rate and blood pressures were measured every one minute for first 10 minutes counting since subarachnoid block. After which monitoring was done every 3 minutes for the next 10 minutes and then every 10 minutes till the surgery lasted. All the data was arranged in a tabulated form and analyzed using SPSS software. Students t test was used for comparing mean of two samples. P value < 0.05 was considered significant at 95% confidence interval.

Table 1: Pulse rate in study groups at different time periods

Pulse Monitoring (min)	Group C	Group E	Group P
0	89.80±13.076	86.07±12.443	88.93±11.744
1	91.60±15.999	88.13±12.950	90.00±12.382
2	89.77±19.932	86.47±14.347	90.10±14.490
3	88.57±16.788	86.47±15.003	88.87±14.457
4	87.20±17.071	83.17±13.943	89.43±16.998
5	87.17±16.257	83.20±16.050	85.73±16.528
6	84.90±15.738	82.27±16.499	80.80±14.167
7	82.17±16.922	79.63±13.140	82.03±14.124
8	84.40±18.301	80.90±16.074	80.93±15.218
9	83.73±17.528	83.20±17.119	80.93±15.292
10	84.23±14.864	85.13±16.984	80.63±15.707
13	84.40±12.450	86.43±18.364	81.37±15.725
16	87.27±12.889	86.17±18.688	80.53±12.995
19	88.97±14.143	88.07±18.629	81.00±15.414
30	92.43±10.295	91.20±23.140	83.43±13.014
40	88.40±8.332	86.53±20.875	82.57±13.871
50	85.14±11.948	85.80±17.674	79.00±11.061
60	86.94±9.365	85.63±20.484	78.86±14.873

RESULTS

The present study was conducted amongst 90 females with 30 subjects in each group. The mean age in group C, Group E and group P was 25.63 years, 26.10 years and 26.63 years respectively.

Table 1 shows the pulse rate at different time periods. The mean pulse rate in Group C, Group E and Group P at 0 minutes was 89.80±13.076, 86.07±12.443 and 88.93±11.744 respectively. The mean pulse rate in Group C, Group E and Group P at 1 minutes was 91.60±15.999, 88.13±12.950 and 90.00±12.382 respectively. The mean pulse rate in Group C, Group E and Group P at 3

minutes was 88.57±16.788, 86.47±15.003 and 88.87±14.457 respectively. The mean pulse rate in Group C, Group E and Group P at 6 minutes was 84.90±15.738, 82.27±16.499 and 80.80±14.167 respectively. The mean pulse rate in Group C, Group E and Group P at 9 minutes was 83.73±17.528, 83.20±17.119 and 80.93±15.292 respectively. The mean pulse rate in Group C, Group E and Group P at 30 minutes was 92.43±10.295, 91.20±23.140 and 83.43±13.014 respectively.

Table 2 shows the mean arterial pressure at different time periods. The mean arterial pressure in Group C, Group E and Group P at 0 minutes was 90.00±7.931, 88.87±7.705 and 90.37±7.600

respectively. The mean arterial pressure in Group C, Group E and Group P at 1 minutes was 86.77±7.846, 88.07±10.667 and 89.03±8.954 respectively. The mean arterial pressure in Group C, Group E and Group P at 3 minutes was 80.63±11.272, 82.97±11.763 and 83.93±9.425 respectively. The mean arterial pressure in Group C, Group E and Group P at 6 minutes was 76.33±9.495, 82.77±11.361 and 83.07±9.882 respectively. The mean pulse rate in Group C, Group E and Group P at 9 minutes

was 78.20±9.434, 83.97±11.622 and 82.90±8.821 respectively. The mean pulse rate in Group C, Group E and Group P at 30 minutes was 80.13±9.832, 86.87±10.702 and 81.43±8.881 respectively. Table 3 shows the percentage of subjects in each group that developed hypotension. There were 56.7% subjects in Group C, 23.3% subjects in Group E and 6.7% subjects in Group P that developed hypotension. There was a significant difference between the three groups as p value was less than 0.0001.

Table 2: Mean arterial pressure in study groups at different time periods

MAP (min)	Group C	Group E	Group P
0	90.00±7.931	88.87±7.705	90.37±7.600
1	86.77±7.846	88.07±10.667	89.03±8.954
2	81.03±9.539	85.20±10.733	86.87±10.190
3	80.63±11.272	82.97±11.763	83.93±9.425
4	76.03±12.770	81.50±11.419	83.70±10.942
5	75.73±12.443	81.73±10.885	83.23±10.301
6	76.33±9.495	82.77±11.361	83.07±9.882
7	77.67±10.420	82.03±10.053	81.30±10.086
8	78.43±9.171	83.63±8.189	82.70±9.581
9	78.20±9.434	83.97±11.622	82.90±8.821
10	78.80±7.867	83.37±12.748	83.07±8.582
13	78.07±8.944	82.93±11.718	83.53±8.916
16	78.00±11.867	85.20±10.931	83.43±8.537
19	79.63±8.814	84.87±11.069	81.87±8.721
30	80.13±9.832	86.87±10.702	81.43±8.881
40	79.70±9.436	88.73±8.870	82.50±7.964
50	84.34±9.424	89.07±10.716	81.67±9.56
60	86.17±9.237	92.94±13.148	84.00±8.293

Table 3: Hypotension development in patients from three study groups

Hypotension	Group C	Group E	Group P	P value
Yes	17 (56.7%)	7 (23.3%)	2 (6.7%)	<0.0001
No	13 (43.3%)	23 (76.7%)	28 (93.3%)	

DISCUSSION

Spinal anesthesia is one of the commonly used techniques for lower segment cesarean section. It is estimated that around 80% of patients who undergo LSCS under spinal anesthesia will develop hypotension during the procedures.⁸ Clinical symptoms due to hypotension like vomiting and dizziness often interferes with surgery. Methods for prevention of hypotension include preloading, left uterine displacement, use of vasopressors and the use of compression stockings. A survey of consultant obstetric anesthetists by Burns et al⁹ from United Kingdom reported that preloading (87.1%), left lateral position (39.6%) and ephedrine use (95.2%) were the measures taken by physicians. Use of combination strategies includes combination of preloading with the use of vasopressors. Warwick et al¹⁰ reported combination of a high-dose phenylephrine infusion and rapid crystalloid co hydration as effective measure for preventing hypotension during spinal anesthesia for caesarean delivery. However, there is no clear consensus on any effective approach. Ayorinde et al¹¹ reported similar finding. There was significantly lower incidence of hypotension in phenylephrine 4 mg group (33%) as compared to

control and phenylephrine 2 mg (70%). Another study comparing bolus ephedrine, phenylephrine and mephentermine from Ganeshanavar et al.¹² reported that phenylephrine group had quicker control of blood pressure compared to the other two groups. However, as the time elapsed all drugs achieved comparable control of blood pressure. Varathan et al.¹³ compared pre-emptive use of preloading and ephedrine (15 and 30 mg) at 10 and 20 minutes prior to spinal block. Along with crystalloid preloading 20-minute prior, Ephedrine 15 mg given at 10 minutes prior to spinal block was most effective in preventing hypotension. In our study, the mean pulse rate in Group C, Group E and Group P at 0 minutes was 89.80±13.076, 86.07±12.443 and 88.93±11.744 respectively. The mean pulse rate in Group C, Group E and Group P at 1 minutes was 91.60±15.999, 88.13±12.950 and 90.00±12.382 respectively. The mean pulse rate in Group C, Group E and Group P at 3 minutes was 88.57±16.788, 86.47±15.003 and 88.87±14.457 respectively. The mean pulse rate in Group C, Group E and Group P at 6 minutes was 84.90±15.738, 82.27±16.499 and 80.80±14.167 respectively. The mean pulse rate in Group C, Group E and Group P at 9

minutes was 83.73 ± 17.528 , 83.20 ± 17.119 and 80.93 ± 15.292 respectively. The mean pulse rate in Group C, Group E and Group P at 30 minutes was 92.43 ± 10.295 , 91.20 ± 23.140 and 83.43 ± 13.014 respectively. Another study from Ngan Kee et al.¹⁴ that compared phenylephrine infusion of 100mcg/min for 3 min against control. They reported that phenylephrine infusion decreased the incidence (6 [23%] of 26 versus 21 [88%] of 24; $P < 0.0001$), frequency, and magnitude (median minimum systolic arterial pressure, 106 mm Hg; interquartile range, 95-111 mm Hg; versus median, 80 mm Hg; range, 73-93 mm Hg; $P < 0.0001$) of hypotension compared with control. Another similar evaluation from Moslemi et al.¹⁵ compared phenylephrine and ephedrine infusion to placebo. They reported greater mean systolic blood pressure level with phenylephrine than placebo but not greater than ephedrine. This again corroborates our finding of prevention of hypotension effectively by these two vasopressors.

CONCLUSION

Hypotension is eminent in patients undergoing spinal anesthesia for caesarean section. Various approaches devised for prevention and treatment including use of vasopressors. In our study, ephedrine as well as phenylephrine was found to prevent development of hypotension when used pre-emptively before induction of spinal anesthesia. Requirement of rescue vasopressor was reduced significantly in phenylephrine & ephedrine group as compared to control group.

REFERENCES

1. Liu SS, McDonald SB. Current issues in spinal anaesthesia. *Anaesthesiology*. 2001;94(5):888–906.
2. Afolabi BB, Lesi FEA, Merah NA. Regional versus general anaesthesia for caesarean section. *The Cochrane Collaboration*. 2007;10(4): 1-44.
3. Páez JJ; Navarro J. Regional versus general anaesthesia for caesarean section delivery. *Colombian Journal of Anaesthesiology*. 2012;40(3):203–206.
4. Mitra JK, Roy J, Bhattacharyya P, Yunus M, Lyngdoh NM. Changing trends in the management of hypotension following spinal anaesthesia in caesarean section. *J Postgrad Med* 2013;59:121-126 .
5. Mercier FJ, Augè M, Hoffmann C, Fischer C, Le Gouez A. Maternal hypotension during spinal anaesthesia for caesarean delivery. *Minerva Anesthesiol*. 2013;79(1):62–73.
6. Gunda CP, Malinowski J, Tegginmath A, Suryanarayana VG, Chandra SBC, Venkatesh G. Vasopressor choice for hypotension in elective Caesarean section: Ephedrine or phenylephrine? *Arch Med Sci*. 2010;6(2):257–263.
7. Vaida S. Guidelines for managing hypotension during spinal anaesthesia for caesarean delivery. *Actualitati in Anaesthesia, Terapie Intensiva si Medicina de Urgenta, Editori Sandesc D, Bedreag O, Papurica M, Ed. Mirton*. 2008:368–74.

8. Räsänen J, Alahuhta S, T KS, Jouppila R, Jouppila P. The effects of ephedrine and etilefrine on uterine and foetal blood flow and on foetal myocardial function during spinal anaesthesia for caesarean section. *Int J Obstet Anesth*. 1991;1(1):3-8.
9. Burns SM, Cowan CM, Wilkes RG. Prevention and management of hypotension during spinal anaesthesia for elective caesarean section: A survey of practice. *Anaesthesia*. 2001;56(8):794–798.
10. Kee WDN, Khaw KS, Ng FF. Prevention of hypotension during spinal anaesthesia for caesarean delivery. An Effective Technique Using Combination Phenylephrine Infusion and Crystalloid Cohydration. *Anaesthesiology* 2005; 103:744–750.
11. Ayorinde BT, Buczkowski P et al. Evaluation of pre-emptive intramuscular phenylephrine and ephedrine for reduction of spinal anaesthesia - induced hypotension during Caesarean section. *Br J Anaesth*. 2001 Mar;86(3):372-6.
12. Ganeshanavar A, Ambi US et al. Comparison of bolus phenylephrine, ephedrine and mephentermine for maintenance of arterial pressure during spinal anaesthesia in caesarean section. *Journal of Clinical and Diagnostic Research*. 2011;5(5):948–952.
13. Varathan S, Ekanayake SU, Amarasinghe U. Comparison of prophylactic intramuscular ephedrine with preloading versus preloading alone in prevention of hypotension during elective caesarean section. *Sri Lankan Journal of Anaesthesiology*. 2009; 17(2):55–60.
14. Ngan Kee WD, Khaw KS, Ng FF, Lee BB. Prophylactic phenylephrine infusion for preventing hypotension during spinal anaesthesia for caesarean delivery. *Anesth Analg*. 2004;98(3):815–821.
15. Moslemi F, Rasooli S. Comparison of prophylactic infusion of phenylephrine with ephedrine for prevention of hypotension in elective caesarean section under spinal anaesthesia: A randomized clinical trial. *Iran J Med Sci*. 2015;40(1):19–26.

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