**ORIGINAL ARTICLE**

# Comparison of Ringer lactate Versus Hetastarch 6% to prevent hypotension in Spinal Anesthesia

NOMAN TARIQ, MAQSOOD ALI, TAHIR NAZEER, *RIAZ HUSSAIN, AMNA TAHIR, YUMNA JAVAID*

## ABSTRACT

**Background:** In spinal anesthesia we inject local anesthetic in subarachnoid space and it causes sensory and motor block producing analgesia below the level of injection. It also produces hypotension . To prevent it we use fluid and vasopressors drugs.
**Aim:** To compare the efficacy of ringer's lactate versus Hetastarch 6% regarding prevention of spinal induced hypotension.
**Study Design:** Randomized control trial.
**Methods:** 160 patients undergoing elective surgeries under spinal anesthesia were selected and allocated into group A (Hetastarch 6%) and B (Ringer lactate) by using random number table.Each group comprised of 80 patients. Group A patients received 500 ml Hetastarch 6%. 15 minutes prior to surgery and group B received 1000ml Ringer lactate 15 minutes prior tosurgery. Vital signs were noted every 3 minutes interval for 15 minutes and subsequently every 5 minutes up to 25 minutes of surgery.
**Results:** Hetastarch 6% prevented 75% and Ringer lactate prevented 60% spinal anesthesia induced hypotension.
**Conclusions:** Hetastarch 6% is better than Ringer lactate regarding prevention of hypotension due to spinal anesthesia.
**Keywords:** Hypotension, Spinal anesthesia, Hetastarch 6%, Ringer lactate.

## INTRODUCTION

In spinal anesthesia we inject local anesthetic in the subarachnoid space.[1] Spinal anesthesia reduces the incidence of pulmonary embolism, venous thrombosis, bleeding, pneumonia, respiratory depression and cardiac probems.[2,3] During spinal anesthesia there are chances of severe hypotension and Bradycardia.[4,5]Special treatments required to treat hypotension like vasopressors and fluids[6,7]. There are different types of fluids available like crystalloids and colloid. Colloid reduces the hypotension 66 to 85%[8-10]. It also reduces the incidence of vomiting and nausea[11]. In this study we compared the efficacy of Hetastarch 6% with Ringer lactate regarding prevention of hypotension in spinal anesthesia and rationale of study is to observe the haemodynamic changes and to find out the better preloading fluid.

## MATERIAL AND METHODS

After the approval of study from hospital ethics committee, 160 patients undergoing spinal anesthesia electively in department of anesthesiology Services Hospital Lahore were included and divided into equal groups A and B by using random number table. Patient's bio data and ASA status was noted. Informed consent was taken oneday before surgery. Two IV line with 18 G cannula were maintained in OT. Group A patient received 500 ml Hetastarch 6%. 15 minutes prior to spinal anesthesia.Group B patient received 1000ml Ringer lactate 15 minutes prior to spinal anesthesia. Baseline hemodynamic (blood pressure and heart rate) was noted. Lumber puncture was done in sitting position with midline approach at $L_3$ – $L_4$ level. Vital signs were noted every 3 minutes for 15 minutes and subsequently every 5 minutes upto 25 minutes of surgery. Data was entered in SPSS version 10 and analyzed. Chisquare test was used and P value of .05 or less was considered significant.

*[1]Assistant Professor, University College of Medicine & Dentistry, University of Lahore.*
*[2]Assistant Professor Anesthesiology, SIMS, Lahore*
*[3]Associate Professor, Azra Naheed Medical College, Lahore.*
*Correspondence to Dr. Noman Tariq, Email: drnomantariq@yahoo.com, Contact: 03002363812,*

## RESULTS

In my study mean age in group A was 41.8 ± 11.2 years and in group B it was 40.0 ± 10.4. The Distribution of male and female in group A was like that 66(82.5%) male patients and 14(17.5%) female patients and in group B there were 65 (81.25%) male and 15 (18.75) female patients. ASA status, in group A was 70 (87.5%) patients of ASA class I and 10 (12.5%) patients of ASA class II and in group B 69 (86.25%) patients of ASA Class I and 11 patients (13.75%) of ASA class II. Mean systolic blood pressure in group A was 127.2 mmHg and in group B it was 128.2mmHg preoperatively, similarly diastolic blood pressure in group A was 80.3 mm Hg and in group B it was 84.3 mmHg. Similarly mean systolic blood pressure after 3,6,9,12,15,20 and 25 minutes in group A was 120.4, 119.7 118.6, 117.5, 116.5, 115.7 and 115.9 mmHg respectively and in group B it was 119.4, 111.7, 110.6, 109.5, 108.5, 107.7 and 105.9 mm Hg.

Table 1: Distribution of patients by age

| Age (year) | Group A | | Group B | |
|---|---|---|---|---|
| | No. | % age | No. | % age |
| 20-30 | 7 | 8.75 | 9 | 11.25 |
| 31-40 | 23 | 28.75 | 30 | 37.5 |
| 41-50 | 50 | 62.5 | 41 | 51.25 |
| Mean±SD | 41.8 ± 11.2 | | 40.0 ± 10.4 | |

Key SD standard Deviation

Diastolic blood pressure in group A was 78.2, 77.4, 76.0, 75.2, 74.8, 73.6 and 73.8 mmHg respectively. Diastolic pressure in group B was 75.2, 70.4, 68.0,65.2,64.8, 62.6 and 60.0mmHg respectively.

Table 2: Distribution of patient by sex

| Gender | Group A | | Group B | |
|---|---|---|---|---|
| | No. | % age | No. | % age |
| Male | 66 | 82.5 | 65 | 81.25 |
| Female | 14 | 17.5 | 15 | 18.75 |
| Total | 80 | 100.0 | 80 | 100.0 |

Table 3: Distribution of patient by American Society of Anesthesiologist status.

| ASA status | Group A | | Group B | |
|---|---|---|---|---|
| | No. | % age | No. | % age |
| I | 70 | 87.5 | 69 | 86.25 |
| II | 10 | 12.5 | 11 | 13.75 |
| +Total | 80 | 100.0 | 80 | 100.0 |

Table 4: Mean blood pressure of Group A

| Time (minutes) | Mean systolic B.P. (mm Hg) | Mean diastolic B.P. (mm Hg) |
|---|---|---|
| Baseline | 127.2 | 80.3 |
| 3 | 120.4 | 78.2 |
| 6 | 119.7 | 77.4 |
| 9 | 118.6 | 76.0 |
| 12 | 117.5 | 75.2 |
| 15 | 116.5 | 74.8 |
| 20 | 115.7 | 73.6 |
| 25 | 115.9 | 73.8 |

Table 5: Mean blood pressure of Group B

| Time (minutes) | Mean systolic B.P. (mm Hg) | Mean diastolic B.P. (mm Hg) |
|---|---|---|
| Baseline | 128.2 | 84.3 |
| 3 | 119.4 | 75.2 |
| 6 | 111.7 | 70.4 |
| 9 | 110.6 | 68.0 |
| 12 | 109.5 | 65.2 |
| 15 | 108.5 | 64.8 |
| 20 | 107.7 | 62.6 |
| 25 | 105.9 | 60.0 |

## DISCUSSION

Bradycardia and hypotension are common physiological changes during spinal anesthesia[12]. The reason is blockade of sympathetic outflow from the spinal cord below the level of the spinal block. During spinal anesthesia lung volume, dead space, resting minute ventilation, arterial blood gas tension show little change[13] .When block is higher than T5 level, the incidence of nausea and vomiting is higher[14].Spinal anesthesia inhibits surgical stress response especially with lower abdominal and lower extremity procedure[15]. In the study of karinen et al they compared the one liter of crystalloid (Ringer lactate) preloading with 500ml of colloid (hydroxyethyl starch) in 26 patients undergoing elective caesarean section under spinal anesthesia. They observed hypotension in crystalloid group (62%) and in colloid group (38%)[16]. Their results favors our study. In the study of Riley ET et al they studied forty patients undergoing caesarean section. In one group they use 500ml 6% Hetastarch and 1 liter lactated Ringer solution and in other group they used 2 liter lactated Ringer's solution, prior to induction of spinal anesthesia.

Hypotension observed in 45% patients of Hetastarch group and in 85% patients in Ringer lactate group ($P<0.05$)[17]. Their results also support our study. In the study of Vercauteren MP et al they compared hydroxyethyl starch with modified gelatin as volume preload before spinal anesthesia for caesarean section in 90 patients and found better results in hydroxyethyl starch group.[18]In one study Sharma SK et al compared 6% Hetastarch with lactated Ringer's solution. The incidence of hyptension was 16% in Hetastarch group and 51% in Ringer's lactate solution group. Their results also favour my study[19]. In the studyof French GW et al they studied 160 patients undergoing elective caesarean section under spinal anesthesia. They compared pentastarch, 0.9% saline and hartmann's solution. In their study they concluded that starches are better for preloading[20]. In the study of Ueyama H et al they compared the three groups receiving 1.5 liters Ringer's lactate solution, 0.5 liter 6% hydroxyethyl starch and 1.0 liter hydroxyethyl starch solution respectively. The incidence of hypotension was only 17% in 1.0 liter 6% hydroxyethyl starch group, 50% in 0.5 liter 6% hydroxyethyl starch group and 75% in Ringer's lactate group[21]. Similarly in the study of Siddik SM et al they compared 500ml of 10% hydroxyethyl starch with 1000 ml Ringer's lactate solution during elective caesarean section under spinal anesthesia and they concluded that 10% hydroxyethyl starch is more effective than Ringer's lactate solution[22].

## CONCLUSION

Both intravenous preloading fluids are effective in prevention of spinal anesthesia induced hypotension but hetastarch 6% is better as compared to Ringer lactate solution.

## REFERENCES


1. Morgan GE, Mikhail MS, Murray MJ. Clinical anesthesiology 4th ed. Newyork: McGrawhill 2004; 16:290-1.
2. Mavermann WJ, Shilling AM. A comparison of neuraxial block versus general anesthesia for elective total hip replacement.AnesthAnalg 2006; 103: 1018-25.
3. Maermann WJ, Shilling AM, Zuo Z. A comparison of neuraxial block versus general anesthesia for elective hip replacement.AnesthAnalg 2007; 104: 458-9.
4. Haqm MA, Kazmi HE, Hussain Q. Analysis of outcome of general versus spinal anesthesia for cesarean delivery in severe preeclampsia with fetal compromise. Biomedical 2005; 21: 21-7.
5. Churpa OS, Chinachoti T, Visalyapvtra S, Himmunngant. Incidence and risk factors of hypotension during spinal anesthesia for cesarean section. J Med Assoc Thai 2006; 89: 1127-32.
6. Mercier FJ, Bonnet MP, Dorie DA, Moufouki M, Bnu F, Hanaf A, et al. Spinal anesthesia for cesarean section, fluid loading, vasopressors and hypotension. Ann FrAnesthreamin 2007; 26: 688-93.
7. Chohedri AH, Khojeste L, Shahbazi S, Alahyeri E. Ephedrine for prevention hypotension comparison between intravenous, intramuscular and oral administration during spinal anesthesia for elective cesarean section. Med J 2007; 14: 610-15.
8. Riaz A, Munzar Z. Preloading before spinal anaesthesiaforcesarean section. A comparison between

colloid and crystalloid preload.Anesth pain Intesn Care 2006; 10:9-12.
9. Dahlgren G, Granaanth F, Pregner K. Colloid versus crystalloid preloading to prevent maternal hypotension during spinal anaesthesia for elective cesarean section. ActaAnaesthesiolScend 2005; 49:1200-6.
10. Aitkenhead AR, Smith G, Rowbotham D J. Textbook of Anaesthesia. 5th ed. Churchill Livingstone; 2007; 416-17.
11. Ko JS, Km CS, Cho HS. A randomized trial of crystalloid versus colloid solution for prevention of hypotension during spinal or low-dose combined spinal-epidural anesthesia for cesarean delivery.IntJobstetAnesth 2007; 16: 8-12.
12. Allard R, Hatzakorzian R, Deschamps. Decreased heart rate and blood pressure in a recent cardiac transplant patient after spinal anesthesia. Can J Anesth 2004; 51:: 829-33.
13. Walsh KH, Murphy C, Iohom G. Comparison of the effects of two intrathecalanaesthetic techniques for transurethral prostatectomy on haemodynamic and pulmonary function. Euro J Anesth 2003;20:560-4.
14. Kyokong O, Charuluxananan S, Sriprajittichai P. The incidence and risk factors of hypotension and bradycardia associated with spinal anesthesia. J Med Assoc Thai 2006;89:58-64.
15. Desborough JP. The stress response to trauma and surgery.BJA 2000.85; 109-17.
16. Karinen J, Rasanen J, Alahuhta S, Joupilla P. Effect of crystalloid and colloid preloading on uteroplacental and maternal haemodynamic state during spinal anaesthesia for Caesarean section. Br J Anaesth.1995; 75: 531-5.
17. Riley ET, Cohen SE, Rubenstein AJ, Flanagan B. Prevention of hypotension after spinal anesthesia for Caesarean section: Six percent Hetastarch versus lactate Ringer's solution. AnaesthAnalg. 1995; 81: 838-42.
18. Vercauteren MP, Hoffmann V, Coppejans HC, Van Steenberge A L, Adriaensen HA. Hydroxyethyl starch compared with modified gelatin as volume preload before spinal anaesthesia for Caesarean section. Br J Anaesth.1996; 76: 731-3.
19. Sharma SK, Gajraj NM, Sidawi JE. Prevention of hypotension during spinalanaesthesia: A comparison of intravascular administration of hetastarch versus lactated Ringer's solution. AnaesthAnalg. 1997; 84: 111-4.
20. French GWG, White JB, Howell HJ, Popat M. Comparison of Pentastarch and Hartmann's soulution for volume preloading in spinal anaesthesia for elective Caesarean section. Br J Anaesth.1999; 83: 475-7.
21. Ueyama H, He YL, Tanigami H, Mashimo T, Yoshia I. Effects of crystalloid and colloid preload on blood volume in the parturient undergoing spinal anaesthesia for elective Caesarean section. Anesthesiology.1999; 91: 1571-6.
22. Siddik SM, Aouad MT, Kai GE, Sfeir MM, Baraka AS. Hydroxyethyl starch 10% is superior to Ringer's solution for preloading before spinal anaesthesia for Caesarean section. Can J Anaesth. 2000; 47:616-21.