Asian Journal of Pharmaceutical and Health Sciences
www.ajphs.com

Trendelenberg positioning technique, An alternative to preloading for prevention of Hypotension during Spinal anaesthesia for Abdominal Hysterectomy

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ARTICLE HISTORY

Received: 11.04.2013

Accepted: 15.05.2013

Available online: 10.08.2013

Keywords:

Spinal Anaesthesia, Hypotension, Trendelenberg Position.

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ABSTRACT

Aims : The study was undertaken to search for an alternative technique to preloading with less or no side effects. **Settings and Design:** A total of 100 female patients of ASA class I and II undergoing abdominal hysterectomy were enrolled in the study. Two groups namely Group A and Group B were made. All the patients received 2.6ml of 0.5% Bupivacaine heavy intrathecally at L3-L4 level in lateral decubitus using 25 gauge Quincke's spinal needle. Patients of Group A were placed in Trendelenberg position after spinal anesthesia & patients of Group B received preloading with Lactated Ringer's solution before spinal anaesthesia. Assessment of hemodynamics (intraoperative and post operative) and side effects was done. **Statistics**: Data are expressed as mean + SD. Group comparisons were made using unpaired t-test. **Result :** Intraoperative blood loss and intraoperative requirement of Inj. Mephentermine was significantly less in Group A in comparison to Group B. **Conclusion :** Trendelenberg positioning after spinal anesthesia could be advantageous in terms of intraoperative vasopressor requirement and introperative blood loss.

INTRODUCTION

Subarachnoid block is the preferred anaesthetic technique for elective, below umbilical, gynaecological surgeries[1,2] due to its simplicity, rapid onset, reliability, dense motor block and avoidance of the potential airway complications commonly associated with general anaesthesia. Spinal anaesthesia causes hypotension in 35-49% cases after adequate block at the required level. Untreated hypotension can cause nausea, vomiting, unconsciousness, pulmonary aspiration, apnoea and even cardiac arrest. The usual methods to prevent hypotension include infusion of fluid to increase blood volume [1,3,4] or by administration of specific drugs to produce vasoconstriction of the peripheries and increasing the heart rate.

There is scarcity of literature mentioning physical interventions like wrapping the patient's legs with an Esmarch bandage [1-2] and leg elevation to minimize the pooling of blood in the legs and the lower abdomen to prevent hypotension.

Current study was undertaken to know the role of Trendelenberg position in the control of hypotension caused by Subarachnoid block.

METHODOLOGY

A comparative study was conducted after the approval of Institutional Ethical Committee with written and informed consent from the subjects. 100 women were enrolled for this study. Subjects were divided in two groups **Group A** and **Group B** by randomization using a sealed envelope technique.Subjects which were excluded from study were, body weight >90 kgs, height <150 cms, age <18 or >60 years, preoperative MAP <75 mm Hg, block reaching above the level of T6, pulse rate <60/min and who were on vasoconstrictors or vasodilator drugs.

Patients were kept nil oral after midnight and started 5% dextrose normal saline as maintenance fluid (50ml/hr) through 18 gauge cannula in both the groups. All the patients received 2.6ml of 0.5% Bupivacaine heavy in subarachnoid space at L3-L4 level in lateral decubitus using 25 gauge Quincke's needle. Thereafter women were placed in supine position for surgery.**Group A -** patients were placed in Trendelenberg position (the legs of the patient were elevated with 30° head down) for 5 minutes after spinal anaesthesia and no preloading was done.**Group B -** patients were preloaded with 10-20ml/kg body weight of intravenous crystalloid (Lactated Ringer's solution) and legs were placed in neutral position. Heart rate, mean arterial pressure

(MAP), oxygen saturation, room temperature and core body temperature were recorded every 10 minutes during surgery and 1 hourly in post operative period up to 4 hours. Blood loss was monitored directly from the collection into a calibrated bottle entrapped in line with the suction from the operative field.

Significant fall in MAP (≥ 20% fall in the base line) was treated with intravenous ringer's lactate infusion and inj. Mephentermine (6 mg IV bolus) to maintain MAP.

After surgery patients belonging to Group A were shifted in Trendelenberg's position and Group B patients were kept in neutral position.

RESULTS

In both the Groups, Demographic data, duration of surgery, room temperature, base line pulse rate, respiratory rate and mean arterial pressure (MAP) were similar. There was no significant change in Pulse Rate, Respiratory Rate in both the groups during surgery as well as postoperative period (Table 1, 2, 3).There were more episodes of hypotension (> 20 % fall in MAP) in Group B as compared to Group A which was treated with intravenous fluid and Inj. Mephentermine (60 % vs 32 %, p value - 0.009). Requirement of intravenous fluid and Inj. Mephentermine was significantly less in Group A than Group B (208.7 ± 53.25 and 992.2 ± 141.1, $p < 0.001$) & (2.64 ± 2.75 & 8.1 ± 3.44, $p < 0.001$) respectively.

Nausea and vomiting resulting from episodes of hypotension were more in control group, Group B, (38% vs. 24%, respectively, $p = 0.045$). Shivering and hypothermia was increased in control group (Group B) but there was no statistically significant difference.

DISCUSSION

Prevention and treatment of hypotension is most important aspect of spinal anaesthesia. This may be associated with a number of sequalae, including vomiting, nausea, and impaired consciousness, pulmonary aspiration, apnea or even cardiac arrest.

Studies evaluating spinal anesthesia in lower segment cesarean section (LSCS) have shown that leg wrapping with elastic bandages/limb elevation might reduce the incidence of hypotension by preventing pooling of the central blood into the lower limbs [1,2,3]. However, the effect of this maneuver in non obstetric patients receiving spinal anesthesia for below umbilical surgeries has not been evaluated. Moreover, the effect of this maneuver as regards to total fluid requirement & urinary retension, after spinal anesthesia, has not been examined.

Hypotension occurs frequently during spinal anesthesia for below umbilical surgeries. Redistribution of central blood, up to 500-600 ml [4], to the peripheral compartment secondary to vasodilation caused by spinal anesthesia may contribute to this

Table 1: Characteristics of the Patients and Baseline Variables (Values are Mean ± SD)

Variable	Group A (Trendelenberg's position) (n = 50)	Group B (Neutral position) (n = 50)	p value
Age (yr)	32 ± 4	30 ± 4	0.09
Weight (kg)	67 ± 7	68 ± 8	0.55
Height (cm)	158 ± 5	157 ± 5	0.12
Room temperature (°C)	23.5 ± 1.2	23.4 ± 1.1	0.79
Bupivacaine dose (mg)	12 ± 3	12 ± 3	0.09
Duration of surgery (min)	83.67 ± 12.43	81.67 ± 16.15	0.84
Baseline mean arterial blood pressure (mm Hg)	82.50 ± 3.72	82.05 ± 5.53	0.97
Baseline mean pulse rate(per min)	73.16 ± 8.39	74.56 ± 9.21	0.63
Baseline mean respiratory rate(per min)	14.2 ± 2.28	14.2 ± 3.01	0.87

Table 2: Effect on pulse rate, respiratory rate & mean arterial pressure in study groups

	Pulse rate		Respiratory rate		MAP	
	Group A(mean ± SD)	Group B(mean± SD)	Group A(mean ± SD)	Group B(mean ± SD)	Group A(mean ± SD)	Group B(mean± SD)
Baseline	73.16 ± 8.39	74.56 ± 9.21	14.2 ±2.28	14.2 ±3.01	82.50 ± 3.72	82.05 ± 5.53
10 min	78.40 ± 7.67	76.08 ± 9.97	13.4 ±2.30	13.1 ±3.20	77.25 ± 4.48	78.65 ± 5.41
20 min	78.76 ±12.07	78.56 ±7.03	13.8 ±3.02	14.6 ±2.28	73.80 ± 3.94	74.70± 5.22
30 min	77.36 ±11.59	76.40 ±6.52	13.8 ±2.90	14.1 ±2.56	73.00 ± 4.38	73.75 ±4.69
60 min	76.44 ± 9.74	72.40 ± 6.42	14.6 ±2.45	13.4 ±3.20	73.90 ± 4.12	72.63 ±3.58
90 min	74.96 ±11.01	69.28 ± 6.71	14.4 ±2.28	13.9 ±2.28	78.80 ± 7.40	77.13 ± 5.63
120 min	70.12 ±10.73	69.12 ± 5.94	13.6 ±1.82	13.2 ±1.15	79.83 ± 4.12	78.51 ± 5.53
150 min	70.60 ± 9.99	68.00 ± 5.67	13.9 ±2.20	13.9 ±2.27	78.00 ±7.24	78.25 ± 4.48

Postoperative

	Pulse rate		Respiratory rate		MAP	
	Group A(mean ± SD)	Group B(mean± SD)	Group A(mean ± SD)	Group A(mean ± SD)	Group B(mean± SD)	Group A(mean ± SD)
1 hour	72.40 ± 8.49	71.30 ± 5.55	14.9 ±2.34	14.9 ±2.27	76.40 ±5.84	77.25 ± 5.42
2 hour	71.90 ± 8.99	72.20 ± 4.42	13.7 ±2.20	14.1 ±2.24	77.00 ±7.54	77.54 ± 6.68
3 hour	70.50 ± 10.43	71.10 ± 4.77	13.5 ±2.23	13.7 ±2.41	79.50 ±8.26	82.25 ± 4.48
4 hour	71.60 ± 11.23	70.54 ± 5.74	12.8 ±2.54	13.5 ±2.32	77.83 ±8.78	80.15 ± 4.72

Table 3: Distribution of complications and mephentermine Requirement

Variable	Group A (n = 50)	Group B (n = 50)	P value
Hypotension	16 (32%)	30 (60%)	0.009
Bladder distension	8 (16%)	19 (38%)	0.024
Hypothermia	12 (24%)	20 (40%)	0.133
Shivering	19 (38%)	28 (56%)	0.109
Nausea & vomiting	9 (24%)	19 (38%)	0.045
Mephentermine requirement(total)mg	2.64±2.75	8.1± 3.44	<0.001
Total fluid requirement (ml)	208.7 ± 53.25	992.2 ± 141.1	<0.001
Blood loss (ml)	251.2+20.3	180.4+24.7	<0.001

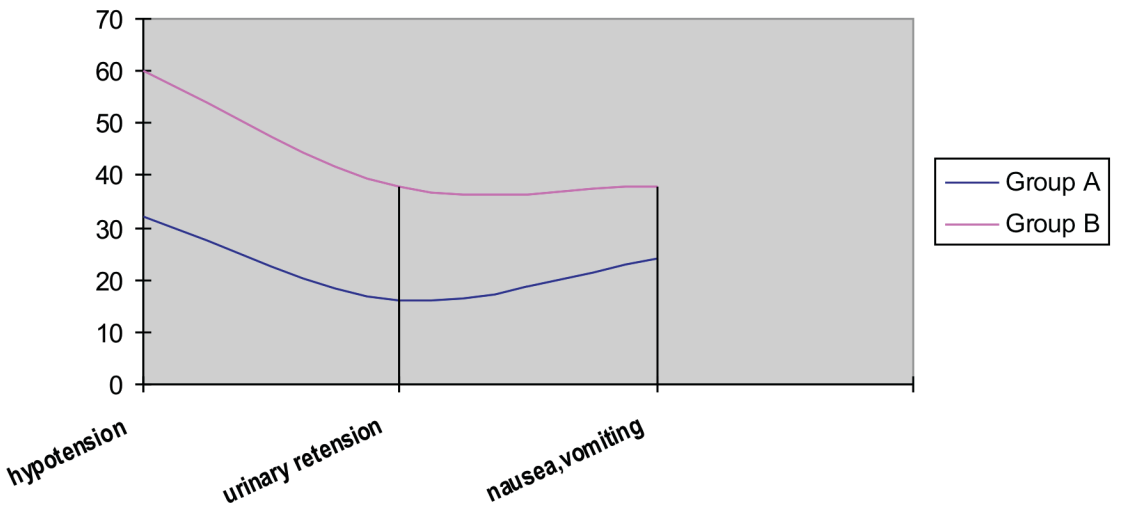

Figure 1: Graph showing percentage of hypotension, urinary retension & nausea, vomiting in study groups

observation [5]. Therefore, several mechanical methods to suppress redistribution and augment venous return have been used, with varying degrees of success in preventing hypotension after spinal anaesthesia[1,2,3] . By wrapping the legs, van Bogaert [1] reported a significant reduction in hypotension episodes (15.8%) as compared with control (45.5%) in patients receiving spinal anesthesia for cesarean delivery. Rout et al.[2] observed a significant reduction in the incidence of hypotension between rubber Esmarch bandage leg-wrapped (18%) and control (53%) groups after spinal anesthesia. Similarly, Bhagwanjee et al.[3] also showed a significantly less frequent incidence of hypotension in leg-wrapped patients (16.7%) compared with controls (83.3%) after spinal anesthesia. Although it is clear that wrapping attenuates hypotension after the initiation of spinal anesthesia for cesarean delivery, its effect has not been adequately tested in non obstetric patients receiving spinal anesthesia for below umbilical surgeries.

In present study the incidence of hypotension was 32% in limb elevation group compared with 60% in control group. Lower limb elevation causes less fall in blood pressure by shifting pooled intravenous blood to central circulation. Limb elevation also causes less intravenous fluid requirement (208.7 ± 53.25 ml vs. 992.2 ± 141.1 ml) resulting in significant reduction in post operative bladder distension which was 16 % as compared to 38 % in control group.

There were fewer fluctuations in blood pressure in limb elevated group as compared to control group, where

Mephenteramine was given to maintain blood pressure resulting in episodes of hypertension causing more bleeding and tachycardia. In our study we have also assessed the blood loss by observing blood in mops, sponges & suction apparatus, where we found significant less blood loss in limb elevated group. Probably keeping blood pressure lower without fluctuations & less intravascular volume resulted in lesser blood loss.

We conclude that, under the conditions of this study, leg elevation decreases the pooling of blood into the lower limbs and, hence, decrease incidence of hypotension after spinal anesthesia, also decreases bleeding, fluid requirement & post-operative bladder distension.

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