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Comparison of Haemodynamic Changes with or without Leg Elevation in Elective LSCS under Spinal Anaesthesia

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Abstract

Background: Spinal blockade provides excellent anaesthesia for patients undergoing lower segment cesarean section (LSCS). However hypotension after spinal anaesthesia is a common adverse effect that is commonly experienced in patients undergoing cesarean section. So our aim is to analyze a simple technique like leg elevation for decreasing the incidence of post spinal hypotension and vasopressor requirement in parturients undergoing cesarean section under spinal anesthesia. *Materials and Methods*: Sixty full term patients posted for elective cesarean section belonging to ASAI and II were divided into two groups. Patients preloaded with Ringer lactate at 10 ml/ kg prior to the spinal anesthesia. Spinal anesthesia was given with 0.5% Bupivacaine heavy 2ml. Patients in Group C lower limbs will not be raised and in Group LE will have their legs elevated at 30° with two pillows underneath the calf muscles after spinal anesthesia. The hemodynamic parameters were monitored every 3 minutes until the delivery of the baby and every 5 minutes till the end of surgery. If hypotension occurred, then along with crystalloid loading a bolus dose of inj Mephentermine 6 mg was given. *Result:* Incidence of hypotension in Group C (46.6 %) was significantly more compared to group LE (23.3%). Dose requirement of vasopressor was also significantly less in Group LE. *Conclusion:* Legs elevated with two pillows underneath the calf muscles was the simple ,easiest and effective method of controlling post spinal hypotension in caesarean patients and needs to be practiced routinely.

Keywords: Postspinal Hypotension; LSCS; Leg Elevation; Vasopressor.

Introduction

Spinal anaesthesia has increasingly became the technique of choice for LSCS and use of general anaesthesia has drastically decreased [1]. Risk of general anaesthesia includes failed endotracheal intubation, failed ventilation, aspiration pneumonitis, postoperative nausea, vomiting and neonatal depression [2,3]. Spinal anaesthesia has the advantage of simplicity of technique [4,5], rapid onset of action and provide excellent anaesthesia. It is associated with adverse effects like hypotension with incidence up to 60-70%. Hypotension depends on level of block achieved [6]. The common methods used to prevent hypotension are preloading with crystalloids or colloids, use of wedge below right hip, use of vasopressors and mechanical compression devices [7]. Current techniques used for prevention of hypotension are fluid and vasopressor administration like ephedrine, phenylephrine and mephentermine. Vasopressors have adverse effects such as anaphylaxis, hypertension, tachyphylaxis and cardiac dysrhythmias [8,9]. Uncontrolled use can even lead to impaired uteroplacental circulation caused by vasoconstriction [10,11].

Non pharmacological simple and cost effective technique of leg elevation with pillows found to be comparable with use of vasopressor in prevention of post spinal hypotension in cesarean patients. It is not only devoid of any side effect and can be used

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on a daily basis to prevent hypotension. So far limited evidence toward its likelihood of being effective, easy and safe [12,13]. In this study we evaluated the efficacy of leg elevation with two pillows under the calf in order to minimize hypotension in cesarean section under spinal anaesthesia.

Materials and Methods

A prospective, randomized study design with two parallel groups was used. After prior approval of institutional ethics committee study was conducted in 60 full term parturients of ASA I and II booked for elective LSCS. Informed consent was obtained from all the parturients. Exclusion criteria was ASA III and more, patients with known sensitivity to local anaesthestics, coagulopathies, patient not willing to be a part of study and any contraindication for spinal anaesthesia.

Randomization was done using computer generated random number table.

Group C (non leg elevation) (n=30)

Group LE (leg elevation) (n=30)

All patients were subjected to pre anaesthetic evaluation with relevant laboratory investigation, they were counseled with regards to spinal anaesthesia and leg elevation as well as operative procedure. Demographic profile like age, height, weight, gestational age was recorded. All patients were kept fasting for 8 hours prior to surgery, for all patients an IV line secured using 20G intracath in left forearm. All patients received inj. ranitidine 50 mg and inj. metaclopromide 10 mg IV 30 min prior to the cesarean section. Baseline blood pressure and heart rate were measured in supine with left wedge position. Baseline values were taken as the average of three successive readings, preloading was done with 10ml/kg of ringer lactate solution prior to spinal anaesthesia.

Under all aspetic precautions spinal anaesthesia was performed in sitting position using a 26 G quinckes needle in L3-L4 or L4-L5 inter space through midline approach . All patients received 2 ml of 0.5% hyperbaric bupivacaine intrathecally. Patients were monitored by anaesthesiologist who was unaware of the groups.

In Group C patients lower limbs were not raised, but they were simply covered to hide them from anaesthesiolgist recording hemodynamic parameters. In Group LE patient legs were elevated at 30 degree with two pillows underneath calf muscles immediately after spinal anaesthesia and covered with drapes.

Fluid replacement was maintained with ringer lactate solution. 20 units of oxytocin was given as iv infusion after delivery of baby. ECG and SPO2 were monitored continuously and heart rate and NIBP measured every 3 min for first 15 min and every 5 min thereafter till end of surgery. Duration of surgery, the level of block achieved and blood loss monitored.

Hypotension was defined as fall in systolic blood pressure to > 20% of base line and immediately treated by increased rate of IV ringer lactate and by bolus of 6mg of inj. mephentermine. Parameters were recorded in a specially prepared proforma.

All data collected was evaluated statistically using statistical software. All quantitative data such as age, weight, height, duration of surgery, vasopressor requirement was expressed as mean +/- standard deviation. Unpaired students t test was used for quantitative data analysis and chi square for qualitative data analysis. $P < 0.05$ was taken as significant.

Results

Sixty patients were entered in the study from which 2 patients had an inadequate block which had converted to general anaesthesia & were excluded from study. The remaining 29 patients in each group were matched for age, weight, height, gestational age & ASA grade (Table 1). No significant difference was found. There was no difference in the groups with respect to duration of surgery, level of sensory block achieved & intraoperative blood loss.

Table 1: Comparison of demographic data between group C and group LE

Parameter	Group C	Group LE	P value	Significance
Age (Years)	52.9 ± 8.35	48.96 ± 11.9	0.07151	Not Significant
Weight (Kg)	62.9 ± 6.5	63.9 ± 6.9	0.55	Not Significant
Gender (M:F)	17:13	16:14	-	-
ASA Grading	Grade I- 22 Grade II- 8	Grade I- 23 Grade II- 9	-	-
Gestational Age	39.22 ± 0.73	39.13 ± 0.61	0.623983	Not Significant

There was no significant difference in HR between the two groups after spinal anaesthesia (Figure 1).

There was a significant decrease in MAP at 3, 6, 9, 12, 15 and 25 min in control group. The leg elevation group had decrease in MAP at 3, 6 min after spinal anaesthesia & thereafter it remained higher throughout the measured interval (Figure 2).

Vasopressor requirement per patient was significantly high in group C as compared to group LE. In group C, 14 patients (46.6%) developed hypotension and in group LE only 7 patients (23.3%) developed hypotension. There is significant difference in incidence of hypotension between two groups (Table 2).

Table 2: Vasopressor requirement in two groups

	Group C (n=29)	Group LE n=29)	P value	Significance
Number of patients required vasopressor (%)	14(46.6%)	7(23.3%)	0.0495939	Significant
Mean vasopressor requirement per patient (mg)	3.766667	1.580645	0.037397	Significant

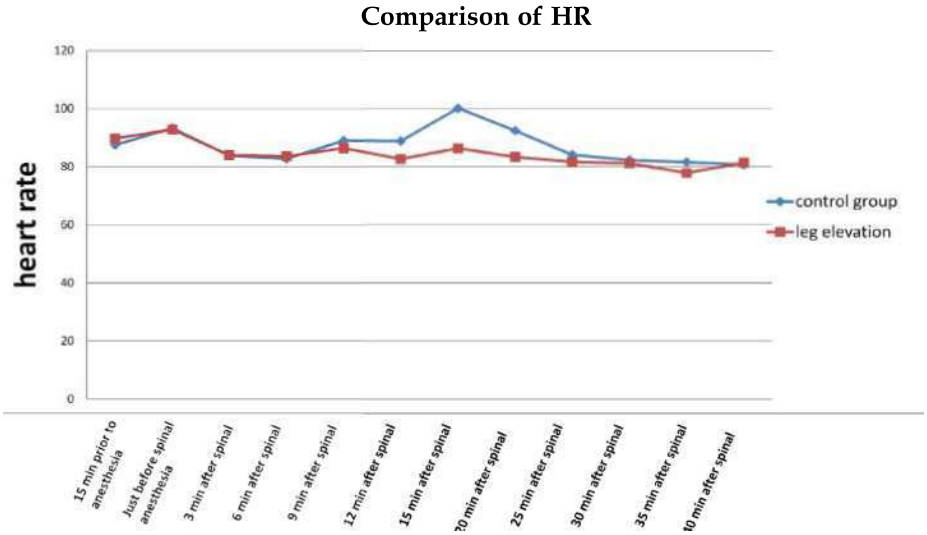

Fig. 1: Comparison of Heart rate between group C and group LE

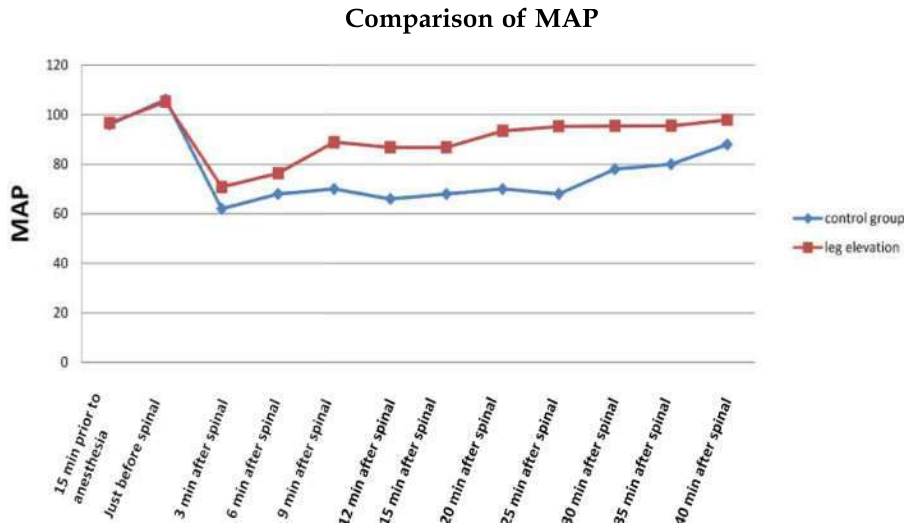

Fig. 2: Comparison of Mean arterial blood pressure (MAP) between group C and group LE

Discussion

Spinal anaesthesia is the safest regional anaesthesia technique for LSCS. Spinal anaesthesia is preferred as it allows the mother to be awake & interact immediately with her baby. But commonly associated adverse reaction with spinal anaesthesia is hypotension. Hypotension is caused by an increase in venous capacitance because of sympathectomy causing vasodilatation in the lower part of body. This decrease in arteriolar & venous tone secondary to sympathetic block causes a reduction in systemic vascular resistance & redistribution of central blood up to 500-600ml to peripheral compartment. The situation is further aggravated in pregnancy by aortocaval compression [14]. This aortocaval compression decreased by uterine displacement by placing wedge under the right buttock. Prolonged maternal hypotension leads to decrease in utero-placental blood flow which is detrimental to fetus & leads to decrease in Apgar Score [15].

Various techniques are in practice to prevent hypotension which include fluid preloading, lateral tilt, use of vasopressor like ephedrine, mephentermine or phenylephrine and use of mechanical interventions like esmarch bandages, compression leg stockings, crepe bandages which increase central blood flow but there is no ideal established method [16,17].

The ideal fluid for preloading is a matter of debate. Crystalloid fluid is cheaper but less effective when used alone. Colloid fluids are more reliable to prevent post spinal hypotension but they are costly, possibility of anaphylactic reactions & risk of excessive volume expansion causing pulmonary edema. Vasopressor has known adverse effects like tachycardia, arrhythmias. Though they increase mean arterial blood pressure, but their effect on neonatal outcome is debatable [16].

We therefore studied simple technique of leg elevation using two pillows underneath the calf muscle immediately after spinal anaesthesia to decrease the incidence & severity of hypotension. The advantage of raising legs immediately after spinal injection is that it increases venous return and cardiac output & hence decreasing the requirement of vasopressors .In group C 46.6% patients had hypotension as compared to group LE 23.3%. There was a significant decrease in MAP in group C as compared to group LE; results found in our study differed from pout et al findings who reported no advantage for patients leg elevation on the incidence of hypotension.

Although the incidence of hypotension was lower with leg elevated group (46.6% Vs 23.3%), also mephentermine consumption was significantly low in LE group. In leg elevated patients there was auto transfusion of blood from lower extremities to the central circulation; thus leg elevation increases the cardiac preload & consequently the cardiac output [4,5]. Which helps in decreasing the incidence of hypotension.

A previous study using radio-labeled erythrocytes reported a reduction of 34±4% in counts from the radiolabeled intravascular spacer from the calves following leg elevation that is corresponding to about 150 ml [18]. Although the volume transported during leg elevation is not large, we assume that it is quite effective in decreasing the incidence and severity of post spinal hypotension.

Our findings give a simple, rapid & cost effective method for prevention of spinal hypotension without affecting the level of spinal block. In our study leg elevation had a moderate effect that produced a significant but not huge reduction in incidence of post spinal hypotension.

Conclusion

We conclude that legs elevated with two pillows underneath the calf muscles is the simple, easiest and effective method of controlling post spinal hypotension in caesarean patients by preventing the pooling of central blood in to the lower limbs. It results in less reduction in blood pressure and needs to be practiced routinely.

Limitations

The sample size was small for more accuracy, study need to be conducted with larger sample size. We did not study changes in cardiac output due to leg elevation, as cardiac output is a better indicator of uteroplacental blood flow than upper arm blood pressure measurement. The incidence of Post Spinal Hypotension (PSH) is still high with most of the available prophylactic measures; thus combination of leg elevation with other pharmacological and non pharmacological approaches for more effective prevention of PSH during LSCS.

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References

1. Paez LJ, Naverro JR. Regional versus general anesthesia for caesarean delivery. Rev Colomb Anesthesiol. 2012;40:203–6.
2. Fassoulaki A, Staikou C, Melemeni A, Kottis G, Petropoulos G. Anaesthesia preference, neuraxial vs general, and outcome after caesarean section. J Obstet Gynaecol. 2010;30:818–21.
3. Hawkins JL, Chang J, Palmer SK, Gibbs CP, Callaghan WM. Anesthesia-related maternal mortality in the United States: 1979-2002. Obstet Gynecol. 2011;117: 69–74.
4. Caille V, Jabot J, Belliard G, Charron C, Jardin F, Vieillard-Baron A. Hemodynamic effects of passive leg raising: an echocardiographic study in patients with shock. Intensive Care Med. 2008;34:1239–45.
5. Monnet X, Teboul J-L. Passive leg raising. Intensive Care Med. 2008;34:659–63.
6. Ngan Kee WD, Khaw KS, Ng FF. Prevention of hypotension during spinal anesthesia for cesarean delivery: An effective technique using combination phenylephrine infusion and crystalloid cohydration. Anesthesiology. 2005;103:744–50.
7. Kluger MT. Ephedrine may predispose to arrhythmias in obstetric anaesthesia. Anaesth Intensive Care. 2000; 28:336.
8. Mohta M, Janani SS, Sethi AK, Agarwal D, Tyagi A. Comparison of phenylephrine hydrochloride and mephentermine sulphate for prevention of post spinal hypotension. Anaesthesia. 2010;65:1200–5.
9. Chan WS, Irwin MG, Tong WN, Lam YH. Prevention of hypotension during spinal anaesthesia for caesarean section: Ephedrine infusion versus fluid preload. Anaesthesia. 1997;52:908–13.
10. Ngan Kee WD, Khaw KS, Tan PE, Ng FF, Karmakar MK. Placental transfer and fetal metabolic effects of phenylephrine and ephedrine during spinal anesthesia for cesarean delivery. Anesthesiology. 2009;111:506–12.
11. Sujata N, Arora D, Panigrahi BP, Hanjoora VM. A sequential compression mechanical pump to prevent hypotension during elective cesarean section under spinal anesthesia. Int J Obstet Anesth. 2012;21:140–5.
12. Bjørnestad E, Iversen OE, Raeder J. Wrapping of the legs versus phenylephrine for reducing hypotension in parturients having epidural anaesthesia for caesarean section: A prospective, randomized and double-blind study. Eur J Anaesthesiol. 2009;26:842–6.
13. Singh K, Payal YS, Sharma JP, Nautiyal R. Evaluation of hemodynamic changes after leg wrapping in elective cesarean section under spinal anesthesia. J Obstet Anaesth Crit Care. 2014;4:23–8.
14. Rees SGO, Thurlow JA, Gardner IC, Scrutton MJL, Kinsella SM. Maternal cardiovascular consequences of positioning after spinal anaesthesia for Caesarean section: left 15 degree table tilt vs. left lateral. Anaesthesia 2002;57:15–20.
15. Zhang J, Klebanoff MA. Low blood pressure during pregnancy and poor perinatal outcomes: an obstetric paradox. Am J Epidemiol. 2001;153:642–646.
16. Lee A, Ngan Kee WD, Gin T. Prophylactic ephedrine prevents hypotension during spinal anesthesia for cesarean delivery but does not improve neonatal outcome: A quantitative systematic review. Can J Anaesth. 2002;49:588–99.
17. Rout CC, Rocke DA, Gouws E. Leg elevation and wrapping in the prevention of hypotension following spinal anaesthesia for elective caesarean section. Anaesthesia. 1993;48:304–8.
18. Rutlen DL, Wackers FJ, Zaret BL. Radionuclide assessment of peripheral intravascular capacity:a technique to measure intravascular volume changes in the capacitance circulation in man. Circulation 1981;64:146-52.