



To Study the Hemodynamic Changes after Leg Wrapping In Elective Cesarean Section under Spinal Anesthesia

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Abstract

Background & Aim: Spinal anesthesia is commonly used for cesarean section, but it is usually associated with side effects like hypotension, which may be detrimental to mother and baby. Over past few years, many pharmacological interventions have been tried to prevent hypotension, but no single technique has proven to be ideal. This study was carried out with the aim to find whether wrapping the legs with elastic crepe bandage in addition to conventional approach was effective in preventing hypotension due to spinal anesthesia.

Method: A total of 60 full-term patients with an uncomplicated pregnancy belonging to American Society of Anesthesiologists I or II were allocated randomly (30 in each group) to have their legs wrapped with elastic crepe bandage (Group A) or no wrapping (Group B). All patients were administered intravenous (IV) crystalloid (20 ml/kg) 15-20 min prior to spinal anesthesia. Electrocardiography and oxygen saturation was monitored continuously and heart rate, blood pressure was measured every 2 min until delivery of baby and every 5 min thereafter until end of surgery. Hypotension was treated with IV phenylephrine 50 µg.

Results: The incidence of hypotension was significantly less ($P = 0.002$) in Group A (legs wrapped group) when compared with Group B (non leg wrapped). In Group A 3 (10%) patients and in Group B 15 (50%) patients required rescue dose with phenylephrine which was statistically significant ($P = 0.004$). Difference in the systolic, diastolic and mean arterial pressure between Group A and B was recorded and found significant between 4 to 15 min after spinal anesthesia.

Conclusion: There was less incidence of hypotension due to wrapping of legs with elastic crepe bandage with a subsequent reduction in the requirement of phenylephrine. Leg wrapping with crepe bandage is cheap, easy, readily available, noninvasive, and non pharmacological and most important it had least effect on baby. So leg wrapping can be recommended for preventing hypotension in spinal anesthesia.

Key words- Leg wrapping, hypotension, spinal anaesthesia.

Introduction

Anesthesia for elective or emergency caesarean section has always been a challenging proposition.

Spinal anesthesia in cesarean section is preferred anesthesia as it is easy, has a rapid onset of action, reliable and provides good surgical conditions, however there is risk of placental hypo perfusion

resulting from hypotension which is proportional to the degree of sympathetic block.¹

Maternal hypotension is the most frequent complication of spinal anesthesia which results from a decrease in arteriolar and venous tone secondary to sympathetic block, causing reduction in systemic vascular resistance and redistribution of central blood volume up to 500-600 ml to the peripheral compartment.² This may decrease uterine blood flow and utero placental perfusion, reducing the gas exchange across the placenta. This can cause fetal hypoxia, acidosis and neonatal depression which can be reflected by the umbilical artery pH.³ Various attempts have been made prophylactically to decrease the incidence and severity of hypotension. The commonest and standard practice is preloading with intravenous crystalloids or colloids.^{4,5} Pre block crystalloid or colloid administration may reduce the risk of hypotension but does not completely eliminate it and it may not decrease the requirement of vasopressors.^{6,7} Moreover role of preloading with crystalloid in prevention of hypotension has been questioned whereas colloid is expensive and is associated with hypersensitivity and impaired coagulation.⁸ Hence it is important to control post spinal hypotension by alternative means as an external measure like wrapping the lower limbs with compression stockings or elastic crepe bandage which is an effective and safe method to control post spinal hypotension in cesarean section patients.⁹ Few studies have opined that it is not only effective physiologically but also being nonpharmacological, it is devoid of any side effects. This study was designed to evaluate the efficacy and safety of wrapping the lower limbs just before giving spinal anesthesia in elective cesarean section and to compare with preloading and 15° left lateral tilt on incidence and severity of post spinal hypotension in elective caesarean section.

Method

After getting permission from ethical committee and obtaining informed consent from the patients this prospective randomized double blind study

was done in a study population of 60 patients posted for elective cesarean section under spinal anesthesia. Patients of ASA grade I & II with in age group of 19 to 40 yrs with full term, singleton pregnancies posted for elective caesarean section under spinal anesthesia were included in this study. Patients with postpartum hemorrhage, chronic hypertension, pregnancy-induced hypertension, diabetes mellitus, cardiovascular diseases, bronchial asthma, neurological diseases, body weight greater than 110 kg, patients with contraindications to local anesthetic, and patient who refused to take spinal anesthesia were excluded from this study.

Thorough pre anesthetic evaluation including case history, physical examination, spine examination, airway examination and required investigation were done day before surgery. All the patients were kept nil per oral for 6hrs before surgery. In all patients I.V line was secured using 18G cannula. All patients were premedicated with inj. Ranitidine 50mg iv and inj Metoclopramide 10 mg iv 1hr prior to surgery. I.V preloading with was done with 20ml/kg of ringer lactate solution over 15-20 min in all patients. In all patients base line blood pressure and heart rate were measured in the supine position with 15° left lateral tilt. 15° Left lateral tilt was attained by keeping a wedge under right hip. 60 patients were divided into two groups randomly.

In Group A (30) patients, lower limbs were wrapped and covered immediately before the administration of the subarachnoid block.

In Group B (30) patients, lower limbs were not wrapped, but they were covered to hide them from anesthesiologist recording hemodynamic.

Leg wrapping was done with crepe bandage (15 cm width, 4m stretched length) which was applied from the ankle to the mid-thigh in both legs. During wrapping lower extremity was raised at an angle of 45°. The crepe bandages were wrapped tightly enough that the women felt the tightness, but it was comfortable and not painful. After wrapping legs were kept in horizontal position. Care was taken to avoid compressing the legs to greater than systolic arterial pressure by checking

for capillary pulsation in the toes. All patients had their leg wrapped by the same person in around 3 min to eliminate bias introduced by the method or altered force of wrapping. After wrapping the crepe bandage was hidden to ensure blinding. Under all aseptic conditions spinal anesthesia was performed with injecting 12.5mg (volume- 2.5ml) of 0.5% hyperbaric bupivacaine using a 25G Quincke's needle in the L3-L4 interspace intrathecally through midline approach in the sitting position. Thereafter all the patients were placed in supine position with 15° left lateral tilt by placing a wedge under right hip. Pulse rate, electrocardiography, blood pressure, SPO₂ were monitored intraoperatively. Oxygen was supplemented by face mask. Fluid replacement was maintained with ringer's lactate solution. 20 units of oxytocin was put in the drip after delivery of baby and infused slowly. Any complication was noted and treated accordingly. Heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure was monitored every 2min till delivery of baby and thereafter every 5min till end of surgery. Time to reach maximum block height and other complications like nausea

and vomiting and shivering were noted. Hypotension was defined as fall in systolic blood pressure to ≤ 90 mm Hg or $>20\%$ decrease from baseline mean arterial pressure. Inj phenylephrine 50 μ g bolus was given IV for treatment of hypotension.

Statistical Analysis

The data generated were statistically analyzed. Parametric data were presented as mean \pm standard deviation for unpaired student t test and numbers (percentage) for chi-square test. The Unpaired Student's *t*-test was used for comparison of quantitative data between the two groups. Chi-square test was used for comparison of qualitative data between the two groups. The level of statistical significance was set at $P < 0.05$. All statistical tests were performed on a windows based computer using the program SPSS 20.0.

Result

Distribution of cases with respect to age, body weight and height, gestational age of patients in our study were found to be comparable.(Table-1)

Table no. 1: Demographic Data

	Group A N = 30	Group B N = 30	P value
	Mean \pm SD	Mean \pm SD	
Age (years)	27.17 \pm 3.87	27 \pm 4.25	0.1
Weight (kg)	65.7 \pm 6.04	68 \pm 5.93	0.85
Height (cms)	149.6 \pm 4.86	145.9 \pm 24.26	0.47
Gestational age (wks)	38.9 \pm 1.1	38.8 \pm 0.82	0.97

Comparison of baseline heart Rate and systolic blood pressure (SBP), diastolic blood pressure (DBP) and Mean Arterial Pressure (MAP) in

Table no. 2: Baseline HR,SBP,DBP,MAP

	Group A N = 30	Group B N = 30	P value
	Mean \pm SD	Mean \pm SD	
HR	86.8 \pm 5.67	84.3 \pm 4.9	0.28
SBP	125.7 \pm 5.83	124.6 \pm 4.43	0.96
MAP	87.7 \pm 5	88.3 \pm 3.9	0.97
DBP	64.1 \pm 4.9	65.37 \pm 3.9	0.28

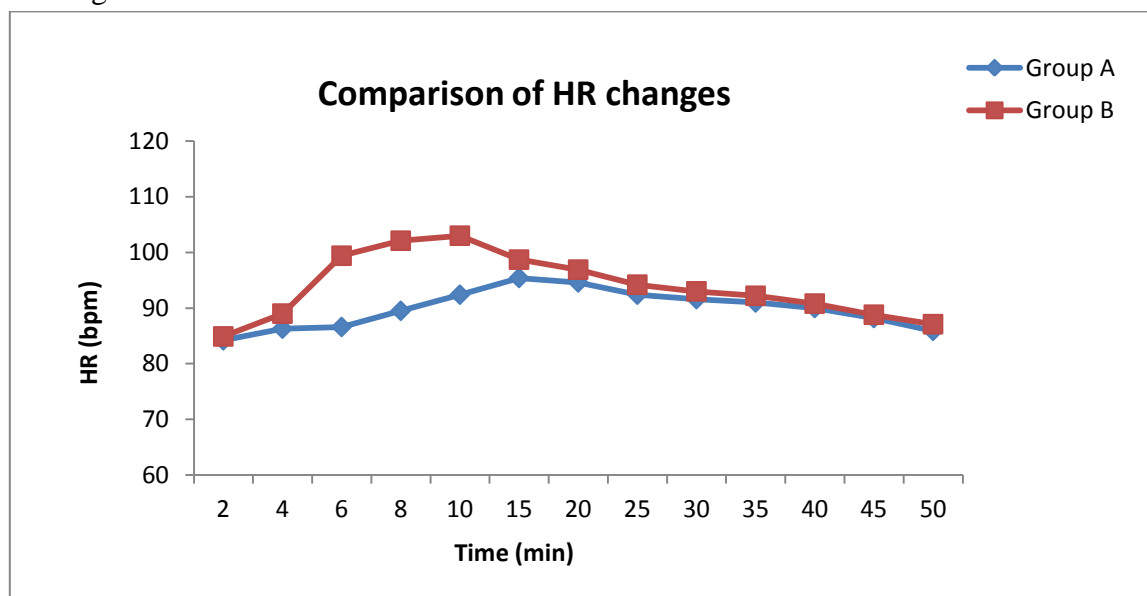
patients of both groups were found to be comparable. (Table-2)

Table no. 3: Maximum block height and total duration of surgery

	Group A N = 30	Group B N = 30	P value
	Mean \pm SD	Mean \pm SD	
Time of max Block height (min)	6.9 \pm 0.52	6.8 \pm 0.49	0.75
Total duration of surgery (min)	46.5 \pm 9.68	47.3 \pm 6.69	0.35

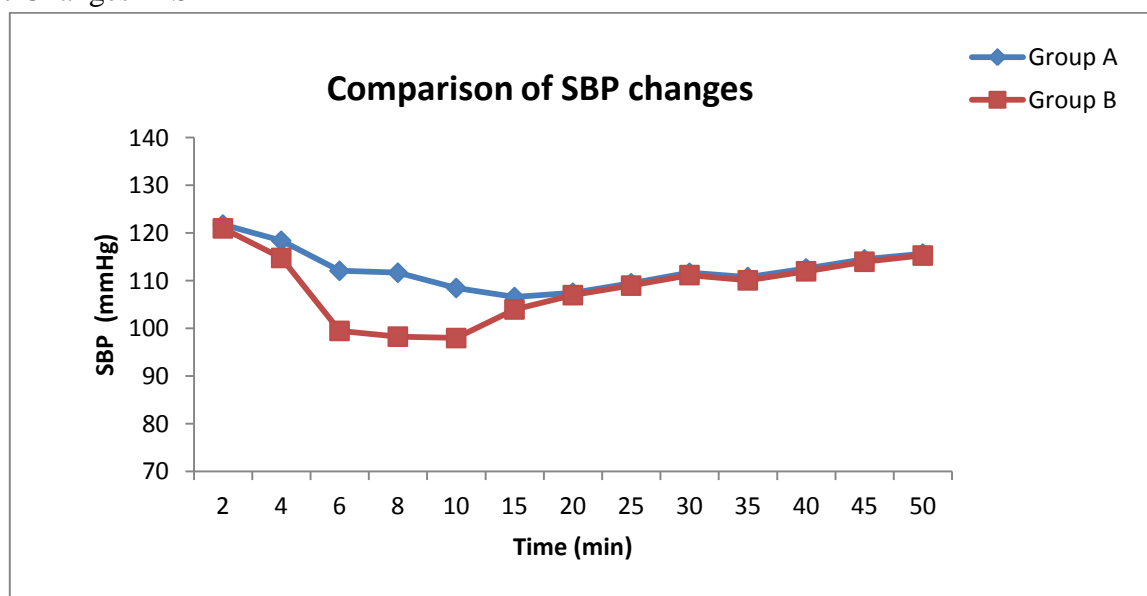
There was no statistically significant difference between the two groups regarding time to reach

maximum block height and total duration of surgery in both the groups. (Table-3)

Graph-1: Changes in heart rate

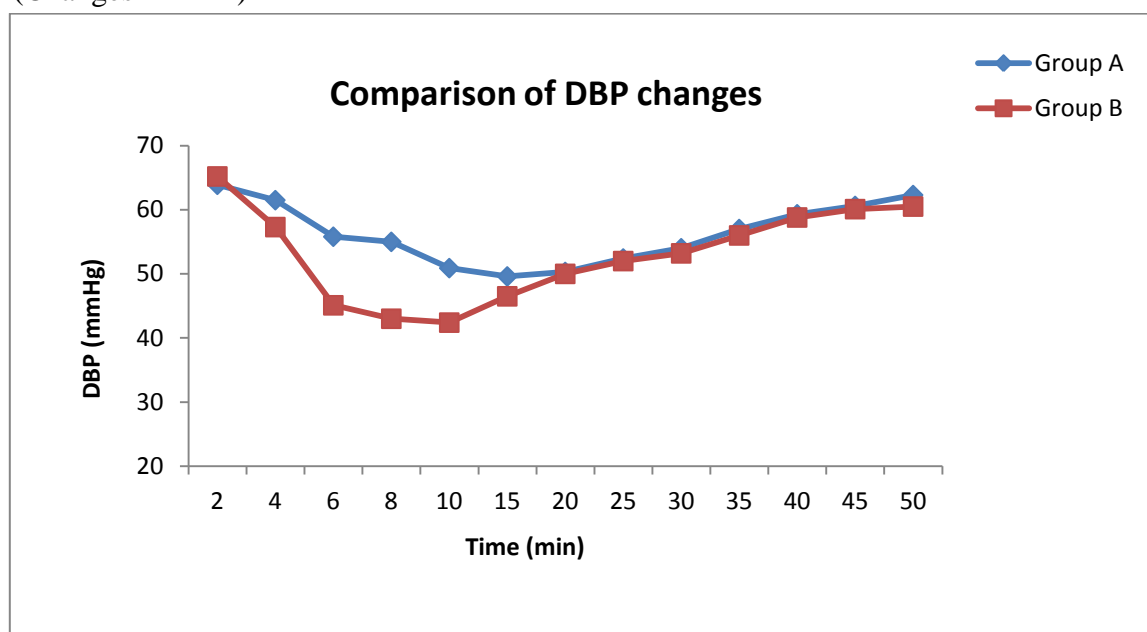
There is significant heart rate changes from 4 min to 15 min with highly significant from 6-10 min

after spinal anesthesia in Group B patients compared to Group A patients.(Graph-1)

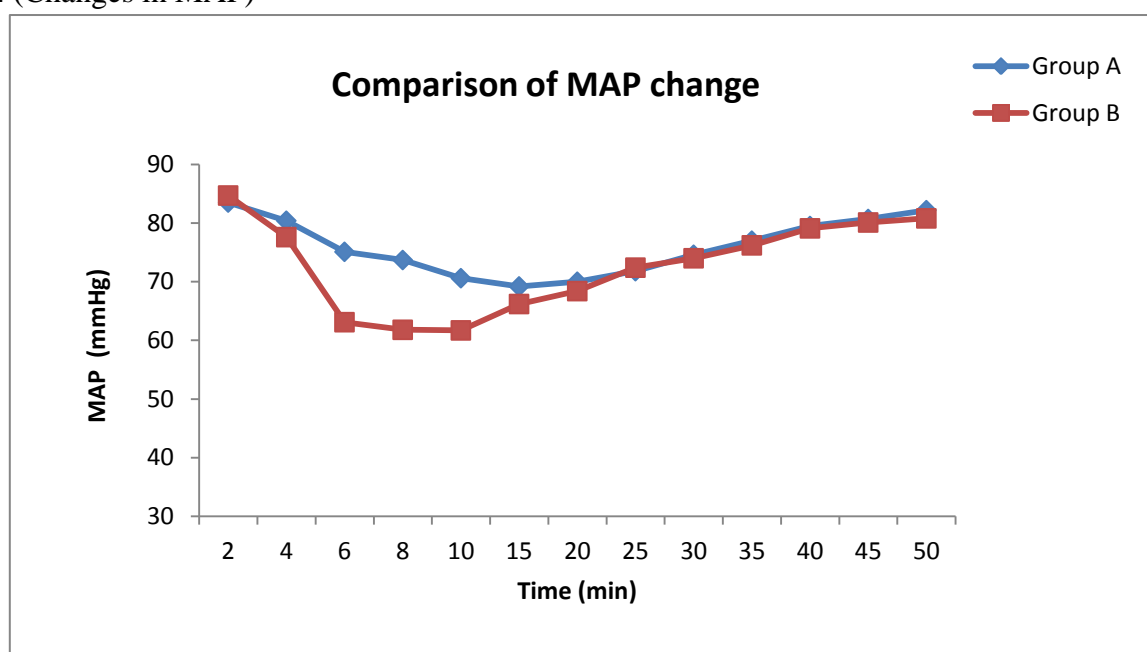
Graph 2: Changes in SBP

There is significant systolic blood pressure change from 4 min to 15 min with highly significant from 6-

10 min after spinal anesthesia in Group B patients compared to Group A patients.(Graph-2)

Graph-3 (Changes in DBP)

Changes in diastolic blood pressure (DBP) after spinal anesthesia in both groups were significant. (Graph-3)

Graph-4 (Changes in MAP)

There was change in mean arterial blood pressure in both groups which was statistically significant. (Graph-4)

Table-4:(Complications)

	Group A	Group B	P value
Hypotension	6(20%)	20(66.66%)	0.002
Nausea	2	9	0.03
Vomiting	2	9	
Shivering	5	17	0.01

Incidence of hypotension in Group A is 20 % where as in Group B is 66.66 % which was statistically significant. There was significant

difference in incidence of nausea, vomiting and shivering in both the groups.

Table-5: (No. of patients(%) required rescue phenylephrine)

	Group A	Group B	P value
No. of patients required rescue phenylephrine	3(10%)	15(50%)	0.004
Nil	27	15	
Total	30	30	

Significant no. of patients required rescue phenylephrine in Group B(50%) than Group A(10%) . (Table-5)

Discussion

Sympathectomy of the lower extremities during central neuraxial block result in peripheral vasodilatation, decreases venous return and leads to hypotension.¹⁰ 16-20% of the total blood volume is in the legs during spinal block.¹¹ During spinal anesthesia relaxation of calf muscles due to sympathetic blockade leads to loss of pumping action of calf muscles and the vascular distensibility of the calf vessels increases by 17%.¹² Although lower abdomen cannot be compressed in the pregnant patient, a significant effect might be anticipated when compressing the both legs alone. Parturients at term have more blood trapped in the lower extremities and spinal anesthesia induced vasodilatation will increase the pooling of blood even more.¹³ Vasodilatation induced by spinal anesthesia increases the proportion of blood that runs to periphery during systole. This also decrease the proportion of the blood volume in the arteries during diastolic phase resulting in decreased diastolic pressure.¹⁴

Kunal Singh et al found significant difference in change in heart rate at 6th and 8th min (before delivery) where as no significant difference was observed after delivery which correlates with the current study. In leg wrapped group, the systolic blood pressure, diastolic blood pressure and mean arterial pressure remained consistently above that of control and the difference in between the groups was significant at 4th, 6th, 8th, 10th and 15th min with highly significant between 6th to 10th minutes. In his study 3 patients (10%) in leg wrapped patients and 10 patients (33.33%) in non leg wrapped patients required rescue

phenylephrine, which was statistically significant and this correlates with the our study.¹⁵

Rout et al in his study showed that in leg wrapped group patients, systolic blood pressure did not significantly decreased to below baseline value. Systolic blood pressure was significantly lower in the control group than leg wrapped group at 3rd, 4th, 6th, 7th and 10th minutes following spinal injection which correlates with the current study. In his study 53% of non leg wrapped and 18% of leg wrapped patients developed hypotension. This correlates with the current study.¹⁶

Von Bogaert et al found that there was a decrease in systolic blood pressure in both the groups but the systolic blood pressure of leg wrapped patients remained significantly above the systolic blood pressure of control group which correlates with the current study. In his study 45.5% in non leg wrapped patients and 15.8% in leg wrapped patients developed hypotension which was statistically significant and this correlates with the current study.¹⁷

Goudie et al in concluded that hypotension was less common and less severe in splint treated patients and found that 48% of patients from leg wrapped group and 83% of patients from control group developed hypotension which correlates with the current study.¹⁸

S Bhagwanjee et al found that leg wrapped patients had significant lower incidence (16.7%) of hypotension than control (83.3%). Only 2 patients in leg wrapped group required ephedrine compared to 10 patients in control which correlates with the current study. In his study systolic arterial pressure was significantly less in

control subjects at 4min, 5min, 6 min following spinal injection which correlates with the current study.¹⁹

Jorgensen J et al in his study found that 5 patients out of 15 in non leg wrapped group and no patient out of 15 in leg wrapped group experienced nausea which was statistically significant and this correlates with the current study.²⁰ All above studies had shown decreased incidence of nausea and vomiting related to spinal anesthesia induced hypotension in leg wrapped patients in elective caesarean section which correlates with the current study.

In the current study, in group A 3 patients out of 30 (10%) required phenylephrine as compared to 15 patients out of 30 (50%) in group B, the difference being statistically significant. In the current study there was no undesirable effect of lower limbs wrapping with crepe bandages encountered in any patient of leg wrapped group. Thus it can be concluded that wrapping of lower limbs may be an easier, safer and more effective method than preloading, leg raising and lateral tilt to prevent post spinal hypotension in parturients. There was also reduction in the use of potent vasopressor agents and their unnecessary pharmacological action. The incidence of nausea, vomiting and shivering were significantly lower in leg wrapping group.

Conclusion

From the current study it can be concluded that wrapping of lower limb just before spinal anesthesia is an effective method to prevent hypotension during spinal anesthesia for elective caesarean section without any unwanted side effect like hypotension, tachycardia, nausea, vomiting and any other maternal side effects.

Source of support-nil

Conflict of interest-non

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