Section A-Research paper
ISSN 2063-5346

Comparison of Preloading and Wrapping of Legs for Prevention of Hypotension Following Spinal Anaesthesia in Elective Caesarean Section

Nivash Ram.K [1], Selvakumaran P[2*], Thirumaaran U G[3]

1. Registrar, Apollo Hospital, Vanagaram, Chennai
2. Associate Professor, Department of Anesthesiaology, Indira Medical College and Hospitals, Thiruvallur, Tamil Nadu, India.
3. Professor, Department of Anesthesiaology, Meenakshi Medical College Hospital and Research Institute, Meenakshi Academy of Higher Education and Research, kanchipuram, Tamil Nadu, India.

***Corresponding Author**

Dr.Selvakumaran. P
Associate Professor,
Department of Anesthesiaology
Indira Medical College & Hospitals, Thiruvallur
Tamil Nadu, India
Email.Id: selvakumaran1987@yahoo.com

Abstract

Spinal anaesthesia can leads to hypotension for the reason of sympathetic blockade producing in more deleterious effects such as vasodilatation and decreased cardiac output. Prevention of spinal hypotension is a one of themost important especially in pregnant women as the life of mother and fetus is at risk. The preloading of intravenous fluids to optimize the blood volume before spinal anaesthesia has been used first line of therapy. In the present study comparison between two simple techniques between Preloading and wrapping of legs in prevention of hypotension following spinal anesthesia in elective caesarean section.60 Patients who were posted for caesarean section were selected and were divided into two groups (30 in each group) A and B. Group A patients received preloading with 15ml/kg intravenous crystalloids. Group B patients had wrapping of the legs using elasticated crepe bandages from ankle to mid-thigh.About 10% of the patients had developed hypotension in Group A while 33% of Group B patients B developed hypotension. The incidence was significantly ($p<0.05$) higher in Group B when compared to Group A hypotension patients.The incidence of hypotension and use of ephedrine was significantly ($p<0.05$) higher in leg wrapping group when compared to preloading group. In the present study we conclude that volume preloading with 15ml/kg intravenous crystalloids significantly reduces the incidence of spinal hypotension and results in a significantly decrease the use of vasopressor agents when compared with wrapping the legs from ankle to mid-thigh with elasticated crepe bandages.

Keywords: Hypotension, Preloading, Wrapping of legs

1. Introduction

Spinal anaesthesia is commonly administered during caesarean section for its quick onset, dense neural blockade, reduced risks of anaesthetic toxicity and minimal likelihood of drug transfer to the foetus. Sympathetic blockade occurs as a result of spinal anaesthesia. As a result of sympathetic inhibition, hypotension occurs in response to arteriolar vasodilation (reduction in systemic vascular resistance, i.e.,

afterload) and venous pooling in the peripheries (decrease in venous return i.e., preload). Hypotension results in uterine and placental hypoperfusion. The amount of sympathetic block is determined by the degree of cephalad distribution of the local anaesthetic medication in the subarachnoid space. Due to parturients increased sensitivity to local anaesthetics and the effects of aortocaval compression, the amount of blockage is increased, and hypotension occurs more often and severely [1]. Due to the increased degree of peripheral vasodilation in parturients, more venous pooling develops in the lower extremities. This vasodilation results in the pooling of around 500–600 ml of blood in the peripheral compartment, lowering venous return and thus lowering cardiac output. Pregnant women have a more sensitive baroreceptor response than non-pregnant women. As a result of baroreceptor activation, the heart rate increases in reaction to hypotension. Bradycardia may also occur with spinal anaesthesia at a high level [2].

In obstetric anaesthesia, the management of spinal hypotension is always a challenging because of the simultaneous concern for both mother and foetus in this situation. Both the severity and duration of hypotension after spinal anaesthesia are key variables in determining the prognosis of both the mother and the foetus following spinal anaesthesia. Numerous approaches for preventing spinal hypotension have been investigated.

Preloading of fluids has traditionally been advocated for the avoidance of hypotension after spinal anesthesia. Utilizing lower limb compression systems such as elastic compressive stockings, pneumatic stockings, Esmarch bandages, or leg wrappings with crepe bandage, to name a few, can help to maintain blood pressure by increasing venous return to the heart, decreasing venous pooling of blood in the legs, or increasing resistance to the peripheral circulatory system. This increases venous return and has been shown to decrease the incidence of hypotension without impairing uteroplacental circulation. As a result, the mother's hemodynamic stability is improved, and the fetus has a greater chance of survival[2,3].

The current randomized control trial evaluated and compared the two simple techniques between Preloading and wrapping of legs in prevention of spinal hypotension in elective caesarean section.

2. Materials and Methods

Prospective randomized controlled study evaluating efficacy of preloading and wrapping of legs in reducing the incidence of hypotension during spinal anesthesia for caesarean section. In this study was conducted in the department of Anesthesiology with help of surgery in Meenakshi medical college hospital and Research institute. During the study between March 2020 to September 2021 for patients patients indergoing elective lower segment caesarean section under spinal anesthesia. All the patients were divided into two groups. Each group consists of 30 pateints based on the inclusion and exclusion criteria. A proper consent was obtained from all the patients for this study.

.Group A patients received preloading with 15ml/kg Ringer Lactate solution&Group B patients had wrapping of the legs using elasticated crepe bandages from ankle to mid-thigh, the presence of adequate capillary pulsation in toes used to ensure that arterial pressure had not be exceeded.

3. Results

Table 1, indicated that the age distribution of the patients in the two groups. The average age of the patients in Group A and Group B were 26.43 (±2.91) years and 25.43 (±3.01) years, respectively. There was no significant in age wise distribution of Group A and Group B patients.

Table 1: Age distribution of the patients among the two groups (n=60)

Patient's age (in years)		Group		p value
		A (n=30)	B (n=30)	
Age category, n (%)	≤ 25 years	9 (30%)	14 (46.7%)	0.184*
	> 25 years	21 (70%)	16 (53.3%)	
Range		19-31	21-31	0.195#
Mean (±SD)		26.43 (±2.91)	25.43 (±3.01)	

- p value by chi-square test; #- p value by independent t test

Table 2: Weight and Height distribution of the patients among the two groups (n=60)

	Group		p value*
	A (n=30)	B (n=30)	
Weight (kg)	72.2 (±11.33)	76.6 (±12.93)	0.162
Height (cm)	150.8 (±3.99)	151.2 (±4.33)	0.758

- p value by chi-square test

Table 2 shows the Comparison of height and weight among the patients in two groups. The weight of the participants among the two groups was 72.2 (±11.33) kgs and 76.6 (±12.93) kilograms, respectively. The Height of the participants among the two groups were 150.8 (±3.99) and 151.2 (±4.33) centimeter's, respectively. The height and weight distribution were similar in both drug groups and was statistically insignificant (p>0.05).

Table 3: Comparison of the heart rates at different timelines among the two groups (n=60)

Table 3 and figure 1 shows the comparison of heart rate among the patients pre-operatively and at Baseline, 2, 4, 6, 8, 10, 15, 20, 25, 30, 35, 40, 45, 60, 75 and 90 minutesin groups A and B. The heart rate in the group A was significantly (p<0.05) lower at 4, 20, 25, 30, 35, 40, 45, 60, 75 and 90 minutes on comparison with the group B.

Time (minutes)	Group, mean(±SD)		p value*
	A (n=30)	B (n=30)	
Pre-Operative	84.83±8.91	85±8.35	0.593
Baseline	87.60±12.87	92.00±14.3	0.214
2	94.17±12.9	101.23±15.54	0.062
4	96.93±13.23	105.37±15.73	**0.027**^
6	97.93±11.98	101.57±15.91	0.326
8	95.43±11.33	100.20±14.97	0.167
10	96.60±11.66	105.10±14.81	0.017
15	96.17±12.91	101.97±14.85	0.117
20	94.03±12.72	103.53±14.83	**0.010**^
25	92.47±12.89	106.37±15.46	<**0.001**^
30	90.90±12.93	101.93±15.19	**0.004**^
35	88.63±12.88	109.97±16.18	<**0.001**^
40	90.67±13.13	105.97±16.91	<**0.001**^
45	93.47±13.13	102.90±17.03	**0.019**^

60	88.90±13.91	105.40±17.28	**<0.001^**
75	86.43±14.32	106.93±17.32	**<0.001^**
90	85.40±13.79	108.47±17.4	**<0.001^**

- p value by independent t test; ^p<0.05

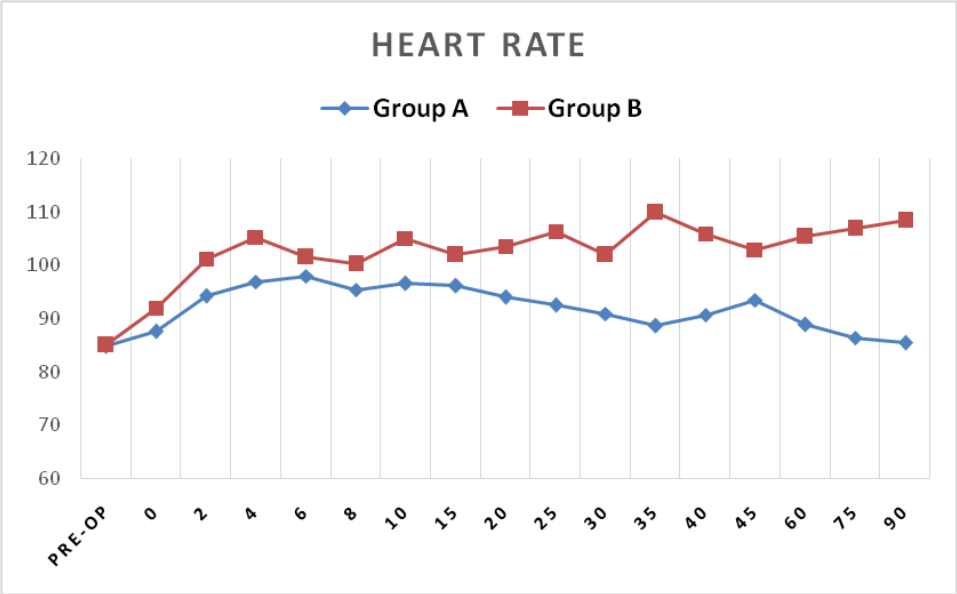

Figure 1: Heart rate comparison at different timelines among the two groups (n=60)

Table 4: Comparison of the mean arterial pressure at different timelines among the two groups (n=60)

Table 4 and figure 2 shows the comparison of average arterial blood pressure among the patients pre-operatively and at Baseline, 2, 4, 6, 8, 10, 15, 20, 25, 30, 35, 40, 45, 60, 75 and 90 minutes in groups A and B. The average arterial blood pressure in the group B was significantly ($p<0.05$) lower at 4 , 6 , 8, 15 minutes and 20 minutes on comparison with group A

Time (minutes)	Group, mean(±SD)		p value*
	A (n=30)	B (n=30)	
Pre-Operative	94.03±8.53	96.54±11.25	0.337
Baseline	88.57±9.96	90.07±9.53	0.552
2	85.20±8.68	83.70±9.41	0.527
4	85.37±10.63	78.40±9.14	**0.008^**
6	83.97±10.5	75.67±9.35	**0.002^**
8	84.23±9.57	78.97±6.91	**0.017^**
10	82.50±9.02	80.73±8.15	0.422
15	84.47±8.28	79.10±8.09	**0.013^**
20	87.50±9.4	81.93±9.79	**0.028^**
25	87.33±9.88	84.37±8.99	0.238
30	82.53±8.57	79.90±8.10	0.233
35	79.93±8.28	78.03±8.4	0.389

40	77.53±10.19	77.70±7.42	0.931
45	79.4±8.51	81.27±7.77	0.371
60	80.97±6.93	82.47±7.73	0.401
75	82.73±7.06	85.53±7.87	0.154
90	81.90±8.53	83.97±7.96	0.349

- p value by independent t test; ^-p<0.05

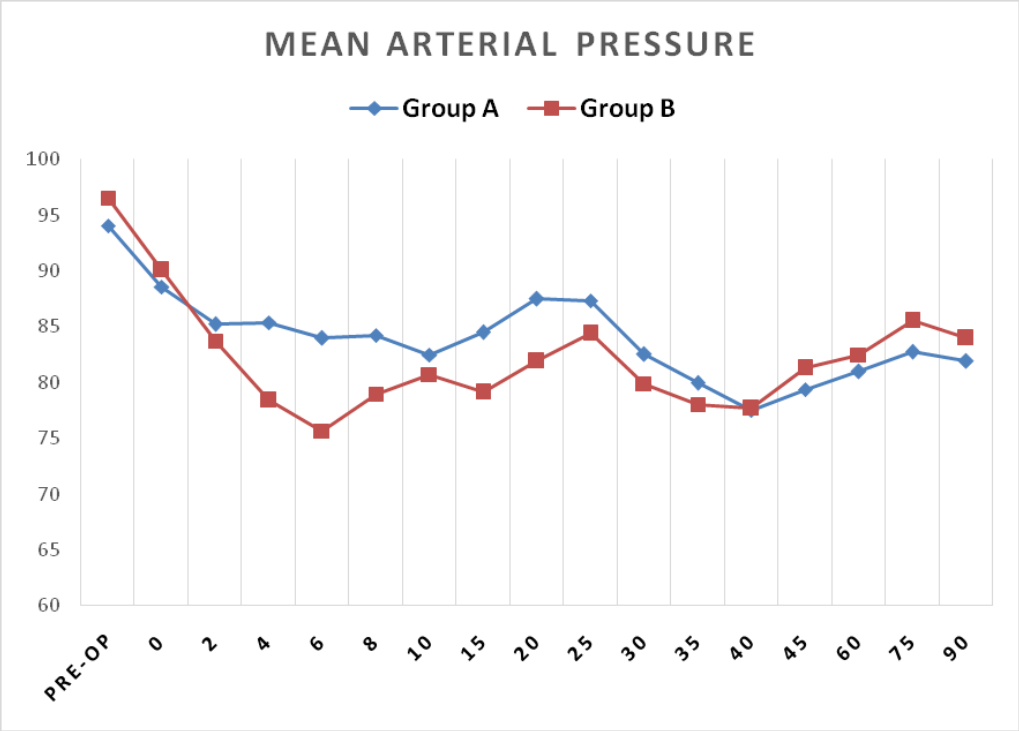

Figure 2: Mean arterial Blood Pressure comparison among the two groups (n=60)

Table 4 and figure2 shows the comparison of mean arterial blood pressure among the patients pre-operatively and at Baseline, 2, 4, 6, 8, 10, 15, 20, 25, 30, 35, 40, 45, 60, 75 and 90 minutesin groups A and B. The mean arterial blood pressure in the group B was significantly ($p<0.05$) lower at 4, 6, 8, 15 minutes and 20 minutes on comparison with the group A.

Table 5: Incidence of hypotension among the two groups (n=60)

Table 5 and Figure 3 shows the incidence of hypotension among the two groups. About 10% of the patients had developed hypotension in Group A while one-third of the patients in Group B developed hypotension. The incidence of hypotension was significantly ($p<0.05$) higher in Group B when compared to Group A.

Group	No. Of Patients Hypotension Present	Percentage	p value*
A	3/ 30	10%	**0.028**
B	10/ 30	33.33%	

- p value by chi-square test

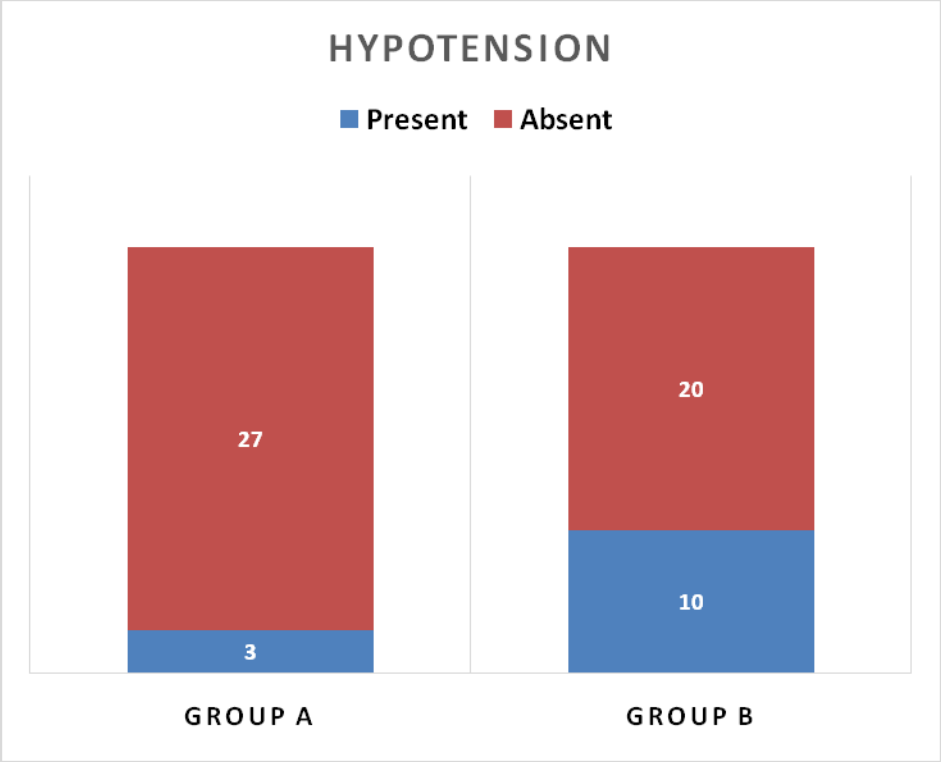

Figure 3: Incidence of hypotension among the two groups.

4. Discussion

In obstetric anaesthesia, the management of spinal hypotension is always a challenging because of the simultaneous concern for both mother and fetus in this situation. Both the severity and duration of hypotension after spinal anaesthesia are key variables in determining the prognosis of both the mother and the fetus following spinal anaesthesia. Numerous approaches for preventing spinal hypotension have been investigated. The current randomized control trial evaluated and compared the effectiveness of two simple techniques: Preloading and wrapping of legs in prevention of spinal hypotension in elective caesarean section. The patients enrolled in both the groups did not differ significantly in terms of the basic demographic and anthropometric characteristics such as age, gender, height, and weight. Additionally, the underlying obstetric parameters (gravida and parity) were almost similar in both the groups.

The heart rate in the preloading group was significantly ($p<0.05$) lower at different time intervals on comparison with the leg wrapping group .Similarly Saranya Devi et al. observed a statistically significant variation in heart rate across study groups. Heart rate was stable in the leg wrapping group (BLW) before

and after delivery but increased in the leg elevation group (BLE) and control group (BC).The heart rates in the leg elevation and control groups remained considerably higher than in the leg wrapping group [4].Our study findings too yielded similar results because the increase in heart rate might be a compensatory reaction to hypotension, which occurred considerably more often in leg wrapping group, or it could be attributable to the increased use of ephedrine in the group.

In the present study, about 10% of the patients had developed hypotension in preloading group while 33% of the patients in leg wrapping group developed hypotension. The three patients who developed hypotension in Group A were given 6 mg of ephedrine. Among the 10 patients who developed hypotension in Group B, 3 were given 6 mg of ephedrine while the other 7 were given 12 mg of ephedrine. The incidence of hypotension and use of ephedrine was significantly ($p<0.05$) higher in leg wrapping group when compared to preloading group. Similarly Saranya Devi et al. reported that the leg wrapping group (BLW) had a lower incidence of hypotension and a lower required for rescue vasopressor ephedrine when compared to the leg elevation (BLE) and control groups (BC). Hypotension occurred in three patients (10%) in the leg wrapped group (BLW), ten patients (33.3%) in the leg raised group (BLE), and fifteen patients (50 %) in the control group (BC).A. Ramakrishnarao et al [5], OhAY, Hwang JW et al. [6], and R.A. Dyer et al [7]. All noticed a substantial ($P< 0.05$) rise in central venous pressure during the preload phase. These studies revealed that rapidly administering crystalloid preload prior to spinal anaesthesia lowered the incidence or severity of hypotension

The systolic and diastolic blood pressure in the leg wrapping group was significantly ($p<0.05$) lower at different timelines on comparison with the preloading group. Similarly, the mean arterial pressure in the leg wrapping group was also significantly ($p<0.05$) lower at different timelines on comparison with the preloading group.The current study's findings also corroborate those of C.C. Rout et al, who demonstrated that in the leg wrapped group, the mean systolic blood pressure did not substantially decline to below the baseline range. At the 3rd, 4th, 6th, 7th, and 10th minutes post spinal injection, systolic blood pressure was considerably lower in the control group than in the leg wrapped group [8].

In a study done by A ABagle et al, they observed that leg wrapping along with preloading significantly reduced incidence of hypotension and vasopressor requirement when compared to preloading alone [9].In another study done by T Jamuna et al, they had compared leg wrapping and leg elevation and inferred that leg wrapping group maintained better hemodynamics when compared to leg elevation group, how ever preloading was done in both the groups

To summarize,in this studypreloading with IV crystalloids produced significantly better outcomes over leg wrapping in terms of reduced incidence of spinal hypotension, lesser need for the use of vasopressor agentsand minimized unfavorablehemodynamic parameters.

5. Conclusion

Volume preloading with 15ml/kg intravenous crystalloids significantly decreases the incidence of spinal hypotension when compared to wrapping of the legs using elasticated crepe bandages from ankle to mid-thigh.Preloading group had reduction in the use of vasopressor agents on comparison with leg wrapping. Preloading is the gold standard technique that should be definetly used in prevention of spinal hypotension, However additional techniques like leg wrapping and leg elevation along with preloading may provide better hemodynamic stability.

6. Reference

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