Legs Wrapping to Decrease the Incidence of Hypotension Induced by Spinal Anesthesia in Cesarean Section

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ABSTRACT:

BACKGROUND:

Leg wrapping is an effective technique and comparable to vasopressors to prevent post- spinal anesthesia hypotension during cesarean patients

OBJECTIVE:

To evaluate the effectiveness of leg wrapping in decreasing the incidence of hypotension induced by spinal anesthesia in cesarean section.

PATIENTS AND METHODS:

A prospective randomized clinical trial study conducted in the obstetric operating room at Baghdad Teaching Hospital May 2018 to February 2019. It involved 60 full-term singleton pregnant randomly allocated to one of two groups: Group A: Leg wrapped immediately before subarachnoid block until the end of surgery and group B: Nonleg wrapped. Blood pressure and heart rate were monitored before and at three-minute intervals for 20 minutes and then every five minutes until the end of the the operation. Any decrease in systolic blood pressure ≥ 20-30% mmHg of the baseline was considered hypotension, which was immediately treated by increasing the I.V fluid infusion rate (Ringer solution) and by a bolus dose of epidrine 5mgIV.

RESULTS:

The Mean of MAP after three, six, nine, 12 and 15 minutes after induction of spinal anesthesia was significantly higher among group A than that in group B). After six, nine, 12, 15, and 18 minutes, five patients (16.7%) in group A needed ephedrine dose while in group B, 23 patients (76.7%) and the mean of ephedrine dose needed was 0 versus 3.0, 0.48 versus 4.0, 1.0 versus 3.6, 0 versus 3.0 and 0 versus 2.0 mg respectively and these differences were statistically significant.

CONCLUSION:

Legs wrapping decrease vasopressors need in spinal anesthesia-induced hypotension

KEYWORDS: Leg wrapping, post-spinal hypotension

INTRODUCTION:

Post spinal anesthesia hypotension is the most common complication during SA with the adverse outcomes on both the mother and the fetus. Even though there is variability in defining hypotension for expectant mothers involving SA, most authors define it as being a 20% to 30% reduction in systolic blood pressure, comparing it to initial values (prior to drugs being placed in the neuraxis) or absolute systolic blood pressure values between 100 mmHg and 90 mmHg [(1)]. There is a 33% incidence of hypotension caused by SA in the general population (non-expectant mothers). It affects more than 91% of pregnant females. Multiple pregnancies are not considered to be a risk factor for hypotension caused by SA for C/S compared to single pregnancies [(2)].

PATIENTS AND METHODS:

A prospective randomized clinical trial study conducted in the obstetric operating room at Baghdad Teaching Hospital for a period of 10 months from May 2018 to February 2019. The study included 60 full-term pregnant, all are singleton, vitally stable and presented for elective lower segment cesarean section under spinal anesthesia. Patients were randomly divided into two groups: Group A: Leg wrapped immediately before subarachnoid block until the end of surgery and group B: Nonleg wrapped. Blood pressure and heart rate were monitored before and at three-minute intervals for 20 minutes and then every five minutes until the end of the operation.

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Any decrease in systolic blood pressure ≥ 20-30% mmHg of the baseline was considered hypotension which was immediately treated by increasing the I.V fluid infusion rate (Ringer solution) and by a bolus dose of ephedrine 5 mg I.V.

All patients were verbally informed about the study and they were asked permission to be part of the study. All personal information was kept anonymous. Data were exclusively used for the sake of this study. Approvals were granted from the Scientific Council of Anesthesia and Intensive Care.

Statistical Package for Social Sciences (SPSS) version 25 was used for analysis. Independent t-test (two-tailed) was used to compare the continuous variables among study groups accordingly. A P value level of 0.05 or less was considered significant.

RESULTS:

Study patient's age was ranging from 19 to 39 years with a mean of 28.51 years and a standard deviation (SD) of ± 4.84 years. The highest proportion of study patients was aged < 30 years (71.7%). According to the BMI level, the highest proportion of study patients was overweighed (93.3%). Figure (1) Table (1)

In comparison between study group by age, BMI, and gestational age, we noticed that there were no significant differences (P ≥ 0.05) in age, BMI and GA between study groups as shown in table (2).

Table 1: Distribution of study patients by BMI level

BMI level	No. (n=60)	Percentage (%)
Normal	4	6.7
Overweight	56	93.3

In comparison between study group by age, BMI, and gestational age, we noticed that there were no significant differences (P ≥ 0.05) in age, BMI and GA between study groups as shown in table (2).

Table 2 : comparison between study groups by age, BMI , and GA

Variable	Study group		P- Value
	A mean ± SD	B mean ± SD	
Age (years)	28.9 ± 4.96	28.1 ± 4.76	0.51
BMI Level (kg/m^2)	27.23 ± 2.58	28.5 ± 3.11	0.133
Gestational age (weeks)	38.4 ± 1.4	38.8 ± 0.92	0.195

The comparison between study groups by mean of MAP is shown in table (3). In this study, mean of MAP after three, six, nine, 12 and 15 minutes after induction of spinal anesthesia was significantly higher among group A than that in group B (88.6 versus 80.8 mmHg, P= 0.001; 78.16 versus 59.06 mmHg, P= 0.001, 72.8 versus 57.4 mmHg, P= 0.001; 68.6 versus 61.96 mmHg, P= 0.001; and 70.4 versus 64.2 mmHg, P= 0.004 respectively).

There were no significant differences (P ≥ 0.05) between study groups in means of MAP in all other times of the operation. We noticed that five patients (16.7%) in group A developed hypotension compared to 23 patients (76.7%) in group B.

Table 3: Comparison between study groups by mean of MAP

Time	MAP (mmHg) in study group		P-Value
	Group A mean ± SD	Group B mean ± SD	
Baseline	95.2 ± 3.93	96.4 ± 2.84	0.182
After 3 mints	88.6 ± 4.14	80.8 ± 4.23	0.001
After 6 mints	78.16 ± 5.5	59.06 ± 3.62	0.001
After 9 mints	72.8 ± 4.25	57.4 ± 7.84	0.001
After 12 mints	68.6 ± 4.36	61.96 ± 3.97	0.001
After 15 mints	70.4 ± 2.45	64.2 ± 3.17	0.001
After 18 mints	71.5 ± 2.6	70.5 ± 3.4	0.181
After 20 mints	72.9 ± 3.71	72.2 ± 2.6	0.402
After 25 mints	74.4 ± 3.16	73.6 ± 2.53	0.285
After 30 mints	78.5 ± 3.38	76.8 ± 3.57	0.074
After 35 mints	78.8 ± 2.49	78.4 ± 4.14	0.626
After 40 mints	85.2 ± 3.21	86.7 ± 4.45	0.168
After 45 mints	88.7 ± 3.91	86.6 ± 5.05	0.115

The comparison between study groups by mean of heart rate is shown in table (4). The mean of heart rate after nine minutes from induction of spinal anesthesia was significantly higher among group A than that in group B (81.2 versus 75.6 beats/minutes, P= 0.001).

After 18, 20, and 25 minutes after induction of spinal anesthesia, the mean of heart rate was significantly higher among group B than that in group A (87.6 versus 77.2 beats/minutes, P= 0.001; 88.0 versus 83.8 beats/minutes, P= 0.004; and 87.8 versus 82.8 beats/minutes, P= 0.001 respectively).

Table 4: Comparison between study groups by mean of heart rate

Time	Heart Rate (Beats/mint) in study group		P-Value
	Group A mean ± SD	Group B mean ± SD	
Baseline	88.3 ± 8.2	86.8 ± 8.1	0.5
After 3 mints	88.0 ± 7.7	86.2 ± 8.7	0.388
After 6 mints	79.8 ± 5.2	78.3 ± 4.8	0.261
After 9 mints	81.2 ± 3.8	75.6 ± 6.1	0.001
After 12 mints	78.4 ± 5.0	81.6 ± 7.7	0.064
After 15 mints	79.0 ± 3.5	80.7 ± 4.6	0.113
After 18 mints	77.2 ± 4.2	87.6 ± 8.1	0.001
After 20 mints	83.8 ± 4.2	88.0 ± 6.3	0.004
After 25 mints	82.8 ± 5.6	87.8 ± 3.7	0.001
After 30 mints	86.2 ± 6.7	87.8 ± 5.4	0.31
After 35 mints	87.4 ± 4.7	85.6 ± 5.2	0.164
After 40 mints	84.8 ± 3.4	83.6 ± 3.0	0.051
After 45 mints	83.0 ± 3.0	83.4 ± 2.4	0.635

Table (5) shows the comparison between study groups by ephedrine dose needed to correct hypotension. It was obvious that after six, nine, 12, 15, and 18 minutes from induction of spinal anesthesia, five patients (16.7%) in group A needed ephedrine dose while in group B, 23 patients (76.7%) and the mean of ephedrine dose needed was 0 versus 3.0, 0.48 versus 4.0, 1.0 versus 3.6, 0 versus 3.0 and 0 versus 2.0 mg after six, nine, 12, 15, and 18 minutes respectively and these differences were statistically significant ($P < 0.05$).

Table 5: Comparison between study groups by ephedrine dose needed

Time	Ephedrine dose (mg) in Study Group		P-Value
	Group A mean ± SD	Group B mean ± SD	
After 6 mints	0	3.0 ± 1.8	0.001
After 9 mints	0.48 ± 0.12	4.0 ± 2.03	0.001
After 12 mints	1.0 ± 2.0	3.6 ± 2.2	0.001
After 15 mints	0	3.0 ± 2.5	0.001
After 18 mints	0	2.0 ± 2.5	0.001

DISCUSSION:

Cesarean section has become the most common operative procedure. The central neuraxial blockade has become the preferred anesthesia technique for cesarean sections (CS), and the use of general anesthesia has drastically decreased [3]. Spinal anesthesia provides excellent anesthesia, however hypotension is a common associated adverse effects. The hypotension depends on block level achieved [4]. Preloading with crystalloids, colloids, vasopressors and mechanical compression devices (leg wrapping) are used to prevent post-spinal anesthesia hypotension [5].

In the current study, five patients (16.7%) developed hypotension in group A while 23 patients (76.7%) developed hypotension in group B. The mean of Mean Arterial Pressure (MAP) in three, six, nine, 12 and 15 minutes after induction of SA was significantly higher among group A than in group B ($P < 0.05$), while ($P \geq 0.05$) in the remaining readings.

Agreement observed in other studies, when sixty parturients were randomly allocated in Sun et al study in 2004 to receive either leg wrapping with tight elastic bandages (leg-wrapped group) or not (control group) before anesthesia. Th results obtained showed that incidence of hypotension was significantly less frequent in the legwrapped group (23%) compared with the control group (50%) ($P = 0.03$) [6] . Results observed in Singh et al study in 2014 were agreed to the current results, in which 60 full-term parturients were allocated randomly (30 in each group) to have their legs wrapped with elastic crepe bandage or no wrapping was done, they noticed that the incidence of hypotension was 10% in leg wrapped group while 43.33% in the group where the leg was not wrapped.

They noticed also that leg wrapped group had higher MAP throughout the measured interval and there was a highly significant difference at 4 th, 6 th, and 8 th min ($P < 0.05$), also heart rate changes before delivery at two minutes' interval were compared between the two groups, a significant difference was found at 6 th and 8 th min ($P < 0.05$), whereas no significant difference was observed after delivery[7]. .

By comparison to other studies, another agreement observed in Bagle et al study in 2017, when 60 full-term pregnant patients who were posted for cesarean section were divided into group W with legs wrapped with elastic bandage and group N with no leg wrapping. The results obtained showed a significant decrease in the mean arterial blood pressure at the 3, 6, 9, and 12 min in Group N as compared to Group W ($P<0.05$). Leg wrapping in group A obtained a higher MAP during the different measured intervals. Furthermore, difference in heart rate was nonsignificant between the two groups in perioperative period, as heart rate changes were inconsistent. Some patients had an increase in heart rate with the onset of hypotension[8].

Differences observed In the above-mentioned studies might attributed to the sample size enrolled in each study, in addition to preloading with crystalloids, use of vasopressor drugs, the position of the patients during the operation, the effect of gravid uterus in CS, level of spinal block as it associated with increased in sympathetic block, which could cause more vasodilation and subsequent pooling of blood into the lower extremities, also vagal reflexes due to surgical stimulus and different levels of autonomic blockade had a significant of on heart rate during the operation.

In the current study, after six, nine, 12, 15, and 18 minutes from induction of SA, 16.7% of patients in group A needed ephedrine dose while in group B, 76.7% of them needed and these differences were statistically significant (P < 0.05). Different results were observed in Singh et al study in 2014, in which sixty pregnant women enrolled, divided into Group B (legs wrapped group) and Group A (nonleg wrapped). The results showed that one third of patient in Group A (33.33%) and 10% of the patients in Group B developed hypotension which required rescue dose of phenylephrine, the differences observed were statistically significant ($P< 0.05$) [7].

Different results also observed in Bjornestad et al study in 2009, in which forty nonlabouring women were randomized either to have their legs wrapped with tight elastic bandage prior to initiating SA plus placebo IV injections (group A), or using repeated 50 microg phenylephrine boluses at zero, five and 10 min after SA with a placebo leg elastic wrapping (group B). there were no statistically different readings between the leg wrapping group A and the vasopressor group B regarding post epidural anesthesia hypotension for cesarean section [9].

Finally, Bhagwanjee et al study results showed a higher incidence of hypotension requiring vasopressor therapy in the control group (83%) as compared to the leg wrapped group (16%) with significant clinically and statistically difference [10].

The discrepancies observed might due to sample size, the dosage used, Prophylactic fluid preloading and the presence of mechanical compressor.

In the current study, the mean and a standard deviation (SD) of age was 28.51 ± 4.84 years (ranging from 19 to 39 years), in which the highest proportion found in those aged < 30 years (71.7%). According to the BMI level, the highest proportion of study patients was overweighed (93.3%), there were no significant differences in age, BMI and GA between study groups (P ≥ 0.05). Differently, younger patients included in Singh et al study in 2014, in which the mean and SD of age in the women included in the study was 26.8 ± 3.69 years [7] .

In comparison to other studies, difference observed in Hasanin et al study in 2017, in which a slightly older patients included ibn their study, as the mean and SD of the age was 29 ± 4 years, in which no significant association with age observed (P=0.13)[11].

In another study, different results observed in Erango et al study in 2018, when older patients were included in their study, the mean of age was 34.5 years (ranging from 21 to 43 years), also the mean and SD of BMI of the participants was 28.5± 4.3 kg/m2 [12] .

CONCLUSION:

Legs wrapping decrease vasopressors need in spinal anesthesia-induced hypotension

RECOMMENDATIONS:

We recommend wrapping both legs to decrease the incidence of hypotension in spinal anesthesia in addition to other methods of preventing hypotension induced by spinal anesthesia .

We recommend the future studies to assess the effect of pneumatic compression to decrease the incidence of hypotension induced by spinal anesthesia.

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