

Preventive Measures to Reduce Post - spinal Anesthesia Hypotension for Elective Cesarean Delivery

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Abstract: Aim: To explore the effect of wrapping and/or raising of the legs as a Preventive Measures to Reduce Post - spinal Anesthesia Hypotension for Elective Cesarean Delivery. Setting: The study was conducted in the operating room (cesarean section) at Ain Shams maternity hospital. Study design: An experimental design. Type of Sample: - purposive sample. Methods: 120 parturients were undergoing elective Caesarean section randomly scheduled to four groups: Group (I) (n=30) parturients legs wrapped immediately before injection anaesthesia and elevated immediately after anesthesia administration. Group (II) (n=30) parturients legs wrapped , tightly wrapping was achieved after leg elevated to 45 degree for 2 minutes, with an elastic bandage applied from ankle to mid – thigh, immediately before anesthesia administration. Group (III) (n=30) parturients legs elevated to 20 degree immediately after anesthesia administration. Group (IV) (n=30) no intervention. Tools of data collection consisted of 1) Demographic data, 2) Automated monitors for measurement of blood pressure, 3) Graphic flow sheet to record blood pressure, and 4) neonate assessment sheet to record Apgar score at 1 and 5 minutes. Results : The findings revealed that, This study showed that, there is no inter group's differences regarding their age, body mass index & baseline. Mean systolic arterial pressure MSAP. Meanwhile, a significant difference was noticed among the groups, whereas GI (wrapping & elevation) had a higher MSAP, lower percent of hypotension women late onset time of hypotension and a lower percent of babies with bad outcome the Neonatal outcome was excellent and similar in both groups. Conclusion: wrapping and elevation of the legs for parturients at spinal block for Cs had more effective measures to prevent hypotension. Recommendations: wrapping and elevation of the legs should be used in addition to traditional measures to prevent post-spinal hypotension as a non-pharmacological technique.

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1. Introduction

Pamela.J.et al., (2011). Stated in their results that, the common clinical practice of volume expansion with crystalloid is not uniformly effective in reducing the incidence of maternal hypotension after spinal anesthesia for cesarean delivery. Colloid administration is more consistent but is associated with additional risks and costs. Mechanical means of central blood volume expansions also appear to be effective but have not come into widespread use. Greater emphasis is being placed on increased utilization of regional rather than general anesthesia, whenever possible Spinal anesthesia is easy, has a rapid onset, is reliable and provides good surgical conductions (Lewis et al., 2000 & Smeltzer, Bare.2000).

In women's with spinal Hypotension occurred frequently during spinal anesthesia (80%) and with an incidence similar to that in other reports. It result from the decrease of arterial blood pressure after spinal anesthesia is thought to be the result of sympathetic block, which could cause pooling and redistribution of blood into the lower extremities. Hypotension after induction of spinal anesthesia for cesarean section is remains a common clinical problem and a potentially serious complication

despite acute expansion of intravascular volume (Sun .HL, et al. 2004). It is often associated with bradycardia, nausea, vomiting and if sever: unconsciousness & pulmonary aspiration (Emmet et al.,2002 and Hartmann et al.,2002). Hypotension can threaten the wellbeing of the unborn child and compromise Fetal circulation, causing hypoxia, neurological injury and fetal acidosis in the unborn baby (A. Herdan , R. Roth, D. Grass & M. Hessen 2010).

In a recent study, carried by Ngan. K & Warwick. D(2010), they found that risk factors for hypotension include increased sympathetic tone, increasing age, obesity, higher blocks and higher birth weight. Prevention of hypotension is more desirable than correction after it has been occurred, as uterine blood flow has been shown to remain impaired for some minutes even after blood pressure has been restored (burns et al., 2003). Post - spinal appear to be difficult to avoid by traditional preventive measures (fluid preload, positioning & vasoconstrictors drugs) (Klasen et al.,2003).

In another study conducted by (Singh .J et al.(2010) they performed study to explore the Efforts to prevent hypotension have been attempted like preloading with crystalloids, colloids or use of

vasopressor. During spinal anesthesia, 16 – 20R% of the total blood volume is in the legs. Bagaert (1998) & (Iwama et al.(2002) stated in their study that preventive methods (wrapping and /or elevation) of legs would decrease incidence of post – spinal hypotension by venous pooling in the legs it appears as a theoretically attractive technique counteracting undesirable physiological changes of spinal anesthesia hypotension .

On the other hand (van .B, 1998 & B. S, et al. (1990)in their study to prevent these complications they have been attempted like wrapping, and elevation of legs they founded that, Wrapping of the legs was a nonpharmacological, prophylactic method to reduce hypotension during regional anesthesia for caesarean sections.

Considering prophylactic methods for compressing the lower limbs to suppress redistribution and augment venous return have been used, with varying degrees of success in preventing hypotension after spinal anesthesia.(Bjornestad.E.,Iversen.O.,Raeder.J.2009) they suggested that ,Wrapping of the legs significantly reduces hypotension during regional anaesthesia for caesarean sections, However, most obstetric anesthetists prefer to use vasoconstrictors for reducing hypotension.

Justification of the problem:-

Spinal anesthesia is commonly used for elective cesarean delivery. Associated hypotension is caused by an increase in venous capacitance and a reduction in systemic vascular resistance. Because uterine blood flow is dependent on perfusion pressure, hypotension results in reduced uterine blood flow, with a potential compromise in fetal oxygenation. Maternal nausea and vomiting may also occur.

Most previous study showed that, these prophylactic measures were clinically useful to reduce Hypotension after conduction of spinal anesthesia for caesarean sections but have not come into widespread use in operating room for cesarean section most obstetric anesthetists prefer to use vasoconstrictors for reducing hypotension. so this study was designed to apply prophylactic measures such as” wrapping and elevation of legs versus pharmacological methods in parturient during cesarean section to prevent hypotension associated with spinal anesthesia .

Aim of the study:

To explore the effect of wrapping and/or raising of the legs as a Preventive Measures to Reduce Post - spinal Anesthesia Hypotension for Elective Cesarean Delivery.

Hypotheses:

Based on other research studies , it was hypothesized that: 1)Wrapping and elevation of legs as a non – pharmacological technique in addition to traditional measures have a positive effect on preventing or reducing post – spinal hypotension . 2) Nurses have unsatisfactory level of knowledge regarding post – spinal hypotension.

2. Subjects and Methods:

Hypotension was defined as a decrease in any mean arterial pressure (MAP) measurement by more than 20% of the baseline MAP. Systolic (SAP), MAP and diastolic (DAP) arterial pressure, pulse pressure (PP), and heart rate (HR) were noted at baseline and every minute after the spinal block until delivery.

Design: an experimental design was used in the conduction of this study.

Setting: This study was conducted in the operating room at Ain Shams maternity hospital (cesarean section).

Subjects: 120 and twenty parturients undergoing for elective cesarean section under spinal anaesthesia and one 120 babies were studied.

Criteria of selection: Inclusion criteria parturients under spinal anesthesia and with the same level of sensory block.

Exclusion criteria: Obesity ,diabetes, hypertension, heart disease, multiple gestation, pre-term parturient, age less than 18 or more than 40years and height less than 152cm.

Tools of the study: four tools were used for data collection:

- Demographic data (age, height, weight &body mass index).
- Automated monitors for measurement of blood pressure.
- Graphic flow sheet to record blood pressure.
- Neonate assessment sheet to record Apgar score at 1 and 5 minutes.

Pilot study:

It was conducted on 10% of the total study sample to measure the feasibility of the study settings, clarity, reliability of tools and time required for completion of each study tools.

Procedure

Immediately after the approval for the conducting the study, sampling started and completed within 6months.

The cases were allocated randomly to the following:

Group I (n=30): parturients legs wrapped immediately before injection anaesthesia and elevated immediately after anesthesia administration.

Group II (n=30): parturients legs wrapped. Tightly wrapping was achieved after leg elevated to 45 degree for 2 minutes, with an elastic bandage applied from ankle to mid – thigh, immediately before anesthesia administration.

Group III (n=30): parturients legs raised to 20 degree by tilting foot – end of operating table, immediately after anesthesia administration.

Group IV (n=30): As control group no intervention. Baseline SAP determined by calculating the mean of 3 blood pressure measurements at 3 minutes interval in preoperative holding area by using auscultatory method. The SAP was recorded 30 minutes before anesthesia administration.

The SAP was monitored every 5minutes during first 30 minutes of anesthesia administration then every 10 minutes for later 30 minutes by automatic blood pressure monitor. Among the four groups when hypotension occurred, it was treated with vasoconstrictor drugs. Assessment of baby Apgar score at 1 and 5minutes post delivery was recorded, normal score ranged from 7-10.

3. Results

Table (1) reveals that demographic characteristic among parturients, there is no significant differences regarding their age and body mass index.

Table (1): demographic characteristics of parturient included in the study.

Variables	G 1(n=30) X ± SD	G 2(n=30) X ± SD	G 3(n=30) X ± SD	G 4(n=30) X ± SD
Age (years)	27.5±6.1	28±7.1	25.3±6.7	26.7±5.8
Body mass index (kg/cm ²)	27.4±3.4	29.17±3.8	28.5±5.7	28.7±3.8

Table (2): Pre & Post Spinal anesthesia for Mean Systolic Arterial Pressure among the Parturient.

Groups		Time of MSAP observation				
		Base line X ± SD	15 min. X ± SD	30 min. X ± SD	45 min. X ± SD	60 min. X ± SD
Prophylactic Measures	G 1: Legs wrapped immediately before anesthesia & Elevated Immediately after anesthesia	92.5±4.1	91.6±3.5	84.7±5.8	86.4±5.4	88.7±7.3
	G 2: Legs Elevated for 2min.& wrapped with elastic bandage immediately before anesthesia	92.2±4.0	90.8±3.6	83.6±5.9	86.0±5.5	88.4±7.2
	G 3: Legs elevated immediately after anesthesia	91.5±3.5	89.5±3.7	81.5±6.1	84.9±85.0	86.8±7.4
Control	G 4: No intervention	91.8±3.7	82.9±6.0	75.0±5.1	78.0±6.5	80.2±6.3

Table (2) Demonstrates that, there is no significant differences pre anesthesia (baseline). Meanwhile, post anesthesia a significant difference was noticed, whereas GI (wrapping & elevation) had a higher mean. As obviously, there is a gradual decrease in MSAP over 30 minutes of observation.

Table (3) Exposes that women apply leg wrapped were reduce Incidence of Hypotension about the no intervention group.

Table (4) Displays that incidence of hypotension was significant among studies and control groups

Table (5) Shows that, Leg wrapping resulted in a significant reduction in the incidence of post spinal hypotension in comparison to the control group.

Table (6) Exhibits MSAP and time onset of hypotension among parturients. As observed, G1 (Wrapping & elevation) Followed by G2 (Wrapping) had a higher percent SAP and late onset time of hypotension. The above table shows that there was significant difference in the time of onset of hypotension between the groups.

Table (7) Exposes Neonatal Outcome, Occurrence rate of Apgar score <7 at 5 minutes was lower in G1. (Wrapping & elevation) than G4 (control), 6.7% and 20.0% respectively.

Table (3): Incidence of Hypotension among Parturients

Groups		(n=120)	
		No.	%
Prophylactic Measures	G 1:Legs wrapped immediately before anesthesia & Elevated Immediately after anesthesia	8.0	26.7
	G 2: Legs Elevated for 2min& wrapped with elastic bandage immediately before anesthesia	8.0	26.7
	G 3:Legs elevated immediately after anesthesia	9.0	30.0
Control	G 4: No. Intervention	14.0	46.7

Table (4): Number and Percent Distribution of Parturients who had not suffered from Hypotension Among Studied and Control Groups

Groups		(n=120)	
		No.	%
Prophylactic Measures	G 1:Legs wrapped immediately before anesthesia & Elevated Immediately after anesthesia	22.0	73.3
	G 2: Legs Elevated for 2min& wrapped with elastic bandage immediately before anesthesia	22.0	73.3
	G 3:Legs elevated immediately after anesthesia	21.0	70.0
Control	G 4: NO Intervention	16.0	53.3

Table (5): Number and Percent Distribution of Present or Absent Hypotension among Parturients.

Groups		(n=120)			
		Present		Absent	
		No.	%	No.	%
Prophylactic Measures	G 1:Legs wrapped immediately before anesthesia & Elevated Immediately after anesthesia	8.0	26.7	22.0	73.3
	G 2: Legs Elevated for 2min& wrapped with elastic bandage immediately before anesthesia	8.0	26.7	22.0	73.3
	G 3:Legs elevated immediately after anesthesia	9.0	30.0	21.0	70.0
Control	G 4: NO Intervention	14.0	46.7	16.0	53.3

Table (6): Presentation of MSAP and Onset Time of Hypotension among Groups.

Items	Studied Groups						Control Group	
	Intervention (Preventive Measures)						No Intervention	
	G 1(n=30)		G 2(n=30)		G 3(n=30)		G 4(n=30)	
	No.	X ± SD	No.	X ± SD	No.	X ± SD	No.	X ± SD
MSAP of Hypotension	8.0	77.8±1.8	8.0	77.1±2.3	9.0	76.6±2.5	14.0	75.8±3.8
Time Onset of Hypotension	8.0	28.7±0.9	8.0	28.2±1.0	9.0	21.1±0.8	14.0	20.5±0.7

Table (7): Number and Percent Distribution of Neonatal Outcome Among Studies and Control Group

Item	Studied Groups						Control group	
	Intervention (Preventive Measures)						No Intervention	
	G 1(n=30)		G 2(n=30)		G 3(n=30)		G 4(n=30)	
	No.	%	No.	%	No.	%	No.	%
Apgar Score <7 at 5 min.	2	6.7	3	10.0	4	13.3	6	20.0

4. Discussions

Klohr.S.et al. (2010) reported that Spinal anaesthesia for caesarean section may cause hypotension, jeopardizing the fetus and its mother .Spinal anaesthesia is often selected for elective or emergency Caesarean section. The advantages are simplicity, rapid onset, reliability, dense motor block, and avoidance of the potential airway complications associated with general anaesthesia. However, hypotension occurs frequently following spinal block. The incidence of hypotension during spinal anaesthesia for Caesarean section is reported to be as high as 80 % (Farruk.M.A, Aneela.P&Vigar.A.2008).

Klohr.s. et al. (2010) agree with the result of this study they reported that , a decrease below 80% baseline and the combined definition of a blood pressure below 100 mmHg or a decrease below 80% baseline were the two most frequent definitions, found in 25.4% and 20.6% of the papers, respectively. When applying the spectrum of definitions to a prospective cohort. In addition (Klohr . S. et al. 2010) they reported that the incidences of hypotension varied between 7.4% and 74.1%. The incidence increased from 26.7% to 38.5% when using a value below 75% of baseline instead of below 70% of baseline .The lower extremities during central neural block results in peripheral vasodilatation, decreased venous return and hypotension (bagaert, 1998).

Concerning the preventive methods were provide a rich ground for developed holistic care, it is easy and inexpensive (Al-Sharkawi et al.,2002 and Ahmed et al.,2003). There has been a marked interest in complementary interventions as a non – pharmacological measure (Salama, 2001). Currently, several strategies are used to prevent or minimize hypotension but there is no established ideal technique (Emmett et al.,2001). Regarding parturient characteristics, no significant differences were noticed regarding their age and body mass index. This finding may be attributed to the criteria of sample selection.

Emett et al., (2002) supported the finding of the current study and they reported that in their study, the highest risk factors for hypotension were age greater than or equal to 50 years and body mass index greater than or equal to 30. Hartman et al. (2002) they added that, aging increases risk of hypotension because of the decrease in cardiac reserve or changes in autonomic functions which may play a role. Concerning MSAP, there is no intergroup significant difference pre- anaesthesia regarding baseline MSAP. This result was helpful for the researchers on assessment of MSAP post – anaesthesia. Buggy et al (1998) was consistent with the previous interpretation

and added that, higher baseline blood pressure provides a margin of safety in that systolic pressure can decrease 30 – 40 % post- anaesthesia and still remain greater than 90 mmHg.

Post- anaesthesia, all groups had a gradual decrease in MSAP over the first 30 minutes. This result was supported by Knoerl et al. (2001), who concluded that, there is no intervention that reliable prevents hypotension during spinal anaesthesia. The result of this present study showed that incidence of hypotension was in the leg-wrapped group (26.7%) compared with the control group (46.7%) in table 5.

Van. Bogaert.L.J(1997) supported the result of this study ,he mentioned that , The SAP remained significantly higher with wrapping; elevation did not add any benefit. The number of episodes of severe hypotension (defined as a SAP decrease 20% of baseline and <100 mmHg) was significantly reduced by wrapping (15.8% of cases) as compared to controls (45.5%) ($\chi^2=11.02$; $P=0.012$). Elevation alone did not prevent hypotension ($\chi^2=0.76$; $P=0.38$).

Conclusion: Wrapping of the legs at spinal block for Cs is recommended to reduce hypotension. In the same context, a significant difference was shown among the four groups regarding incidence of reduction in MSAP, whereas G1 (wrapping & elevation) followed by G2 (wrapping only) had a lower incidence. This finding could be interpreted as wrapping and elevation of the legs would somehow decrease the magnitude and prevalence of hypotension by venous pooling in the legs.

Ghabash et al.(1997),wrapping and elevation of the legs might prevent the sudden decrease in arterial blood pressure during spinal anaesthesia . Van Bogaert (1997) mentioned that, tightly wrapping the legs is safe and efficient in preventing hypotension. Also Iwama (2002) stressed that, wrapping reduced usage of vasopressor agents. In addition. Rout.C, Rocke.D, Gouws.E (1993) reported that, the use of leg compression post spinal provides a simple means of reducing the accompanying hypotension and should be used more widely. Also Pamela.J.et al., (2011), they reported that, several factors accounting for the success of leg wrapping in increasing central blood volume at cesarean delivery. First, there is approximately 150 mL of blood in the legs of nonpregnant subjects without spinal anaesthesia. During pregnancy, venous blood volume increases in the lower extremities, particularly after the 30th week of gestation, with spinal anaesthesia further increasing the volume of blood in the legs by induction of a sympathectomy. The effect of leg wrapping on the central volume has not yet been measured in parturients. In addition they showed in their study that Leg wrapping, was the most effective means of

reducing the incidence of hypotension compared with the control groups (no intervention or leg elevation alone). In each case, the incidence of this complication, as defined by the authors was reduced to less than 20%.

In relation to onset time of hypotension among parturients. It was noticed that at first 30 minutes post anesthesia G1 (wrapping & elevation) followed by G2 (wrapping) had a late onset time. Meanwhile, G4 (control) had a rapid onset. The previous finding was supported by Kohler et al. (2002). Also, Mendonca et al. (2003) claimed that the greatest magnitude of decrease in blood pressure was noted to occur 15-30 minutes after initiating spinal anesthesia. In the study conducted by Hartman et al (2002), he found that mean time of hypotension occurrence was 28+34 minutes after anesthesia. He also added that these mean times should not mislead, however hypotension occurred at all times during spinal anesthesia in patients who had been stable for hour or longer, thus observation may be required during spinal anesthesia.

As clear from this study, percent of babies with bad outcome was lower in G1 (wrapping & elevation) followed by G2 (wrapping only). This result could be interpreted as wrapping & elevation of legs in addition to the vasoconstrictor drugs during spinal-anesthesia decrease the prevalence of hypotension, which affect negatively on the fetus. In the same line, percent of babies with bad outcome was higher in G4 (control). Jorgensen et al. (1996) was in agreement with the previous finding and stated that, hypotension carries potentially serious consequences for both mother and fetus. Nishikawa et al (2000) claimed that, prolonged or severe maternal hypotension can cause serious adverse fetal and neonatal effects. Ngan Kee et al. (2001) clarified that transient decreases in blood pressure, rapidly treated with drugs, do not usually affect fetal acid – base status. Apgar score <7 at 5 min were recorded among groups.

5. Conclusion:

Wrapping and elevation of the legs for parturients at spinal block for Cs had more effective measures to prevent hypotension.

Recommendations:

Wrapping and elevation of the legs should be used in addition to traditional measures to prevent post-spinal hypotension as a non-pharmacological technique.

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