Original article

Prophylactic leg wrapping in elective cesarean section under bupivacain spinal anesthesia

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Background: Hypotension is the most frequent and serious complication associated with spinal anesthesia in obstetrics. Over the years many interventions have been tried to prevent the hypotension. Preloading with fluid, prophylactic vasopressors and leg wrapping have been seen as effective interventions. Leg wrapping, a noninvasive and a nonpharmacologic method, has consistently been seen as an easy and effective intervention. Various studies using Esmarch bandage, graduated compression bandage and inflatable boots are found in the literature. Till now no study has been done using Elastic leukocrepe bandage, which is cheap and widely available. This study was thus carried out with the aim of finding out if wrapping with elastic leukocrepe would have a similar effect.

Methods: In a randomized controlled study, 30 patients (15 in each group) had either their legs wrapped or no wrapping prior to spinal anesthesia before cesarean section. Systolic blood pressure and rescue mephentermine use were recorded.

Result: The mean systolic blood pressure, SBP, at different time intervals was compared. The leg wrapped group had consistently higher SBP.

Overall, 12 out of 15 patients in the leg wrapped group and all 15 patients in the control group experienced hypotensive episodes requiring rescue dose of mephentermine.

The number of patients who had more than one hypotensive episodes during the surgery was also analyzed. 5 out of 15 cases compared to 14 out of 15 controls had more than one hypotensive episodes requiring supplemental mephentermine.

Conclusion: The findings of my study suggest that the wrapping of lower limbs with Leukocrepe elastic bandage (like other methods of wrapping) decreases the incidence of hypotensive episodes to a significant degree however it does not eliminate the incidence of hypotension in spinal anesthesia given to elective cesarean section patients.

Key Words: prophylactic leg wrapping, elective CS, spinal anesthesia.

Introduction

Use of anesthesia in obstetrics dates back to 1847 when Dr. James Young Simpson first used diethyl ether in a woman with deformed pelvis for delivery. However, as the hazards of general anesthesia on labour and to the fetus became apparent, its use slowly weaned and was replaced in the twentieth century by regional anesthesia namely spinal and epidural anesthesia. [19]

Although spinal block provides excellent anesthesia for many operations it is frequently accompanied by hypotension. This hypotension in the pregnant woman is much worse than in her nonpregnant counterpart and it also compromises the fetus. [27]

Till now various prophylaxes have been in vogue. Out of these, following four have been accepted by the Cochrane as having significant effect in reducing hypotension in

pregnant women under cesarean section. [11]

1) Crystalloid preload vs. control
2) Colloid preload vs. control
3) Prophylactic ephedrine vs. control
4) Leg wrapping vs. control

Preloading with crystalloid 15-20 ml/kg is a standard practice before elective cesarean section in many countries. However its efficacy is doubtful as shown by many studies. [4, 6,8,11,12,14,22]

Colloid seem to be effective, however, relatively high cost combined with the possible hypersensitivity associated with it have limited its use. Besides this, routine preloading with either crystalloid or colloid have been shown to have doubtful efficacy in the young otherwise healthy pregnant women. [4]

Vasopressors, especially ephedrine, are now being used extensively worldwide as it has been shown to effectively prevent hypotension following spinal anesthesia without causing fetal compromise. However newer studies are challenging this concept. Phenylephrine has been shown to have better efficacy than ephedrine on the outcome of fetus. Whatever vasopressors we use ephedrine, mephentermine or phenylephrine, they are drugs belonging to FDA category C. Prophylactic use in all pregnant women, in order to prevent hypotension in a few, is neither ethical nor cost effective. [10, 24, 25, 26]

Leg wrapping on the other hand is a simple yet effective means of preventing spinal induced hypotension in a substantial number of cesarean sections done under spinal anesthesia [1, 2, 3, 5, 7, 9, 12, 13]. It is not only effective but also cheap, readily available and applicable everywhere. It is non invasive and non pharmacological. All studies done till now have spoken positively about leg wrapping however, this technique ironically despite its simplicity has seldom been used prophylactically. [15]

The basis for leg wrapping in cesarean section under spinal anesthesia lies in the fact that it effectively increases central blood volume. About 150 ml of blood is pooled in the lower extremities in normal adults. This is further increased in pregnant women due to compression by the gravid uterus on the inferior venacava and the aorta. Howard, Goodson and Mengert first described this as the "supine hypotensive syndrome." A compensatory mechanism exists that can offset the hypotension in the parturient. This occurs by a reflex increase in neurogenic vasoconstrictor tone that increases total peripheral resistance, forcing blood back to the right side of the heart and stabilizes cardiac output and blood pressure. With spinal anesthesia, due to obstruction of sympathetic outflow, this compensatory mechanism is impaired .A decrease in blood pressure to <100 mmHg systolic or by >30 mmHg from preanaesthetic values, is as high as 80 % [27]. Leg wrapping in any form be it elastic stockings or compression bandage prevents this.

Considering these facts this study was undertaken to find out if prophylactic leg wrapping with ordinary leukocrepe bandage easily available in all parts of our country reduces the frequency of hypotension associated with spinal anesthesia in cesarean section.

Material and Method

It is Randomized controlled trial in Obstetric OT in maternity ward TUTH, Katmandu, Nepal. Thirty women of ASA class one and two were randomly divided into two groups. Group A had elastic bandage wrapped around both their legs just before giving spinal while group B had no leg wrapping. The study was conducted February 2005 to April 2005. Materials used in studies are ECG and heart rate monitor, Life scope 6, Portable pt. monitor, Model OEC6102K, Serial no.23662 6A, NIHON CODHEN CORPORATION, BP cuff, Six inch ALPK2 1969, Adult size cuff, Six inch Leucocrepe elastic bandage.

Approval of protocol was obtained from The Department of General Practice, Department of Anesthesia and The Department of Gynecology and Obstetrics of TUTH. Informed consent was taken from all the patients. Routine pre-operative checkups were done in all the patients.

All patients were fasted at least eight hours before surgery. Premedications were given to all the patients. This comprised of Ranitidine 150 mg and Metoclopromide 10 mg at six am on the day of surgery.

Baseline values of heart rate and BP were taken as the average of three successive readings recorded in the maternity ward before the patient was taken to the OT. Intravenous preloading of 500ml of Ringer's lactate was done over 15 to 20 minutes just before spinal anesthesia.

Legs were elevated to 45 degrees and wrapped from ankle to mid thigh using six-inch elastic bandage in the study group after they were placed on the operating table. 2.5 ml of 0.5% hyperbaric Bupivacain was injected through a 25 gauge Yale spinal needle at L2-L3 or L3-L4 spinal interspace via midline approach in sitting position under aseptic conditions.

After spinal anesthesia, patients were immediately placed supine with a 15 degrees lateral tilt to left. Height of the spinal block was recorded.

The following parameters were recorded every two minutes for the first ten minutes and every five minutes thereafter

till the end of cesarean section. Systolic BP and Rescue Mephentermine use. SBP was measured manually.

Hypotension was defined as decrease in SBP to less than 90mmHg or by more than 25% from the baseline. Hypotension was treated immediately by increasing the rate of IV Ringer's administered and by bolus vasopressor, 6 mg Mephentermine, intravenously. Repeat SBP was taken after 1 minute and supplement of 6mg mefentermine was given till SBP was established at or above 90.

Parameter readings were recorded in a specially prepared format. Data was analyzed using following statistical test as appropriate: paired and unpaired t-test, Fisher's exact test and chi square test. Results were expressed as mean +/ _ SD. Any P value <0.05 were considered to be statistically significant.

Hypertensive patients (BP>150/90), patients with conventional contraindications for spinal anesthesia and patients who did not consent were excluded from the study. Besides these, patients who were given additional analgesia with pethidine or ketamine and operations requiring more than one hour were also excluded from the study.

Results

Total number of patients during the study period was 35. Out of this only 30 fulfilled the inclusion criteria (two had high baseline SBP, two received ketamine/pethidine for analgesia and one did not give consent for the study) and were enrolled in the study. They were randomly divided into two groups of 15 each - the leg wrapped group and the control, without legs wrapped.

All the patients in the study experienced satisfactory analgesia throughout the surgery. There were two patients, however, who complained of pain and received ketamine/ pethidine. These cases were excluded from the study. There was no significant difference in the level of spinal block in the two groups.

The intraoperative blood loss was not significant in the two groups and there was no difference regarding the amount of blood loss or the fluid replaced which was an average of 1000-1500ml

There was no significant difference between the two groups with regard to age distribution (p=0.773).There was no significant difference between the two groups with regard to weight distribution (p=0.922).Regarding the duration of surgery and the baseline blood pressure also the two groups were comparable (p>0.05).

When the mean SBP at different time intervals was compared, leg wrapped group had consistently higher SBP, however the difference was not significant statistically.

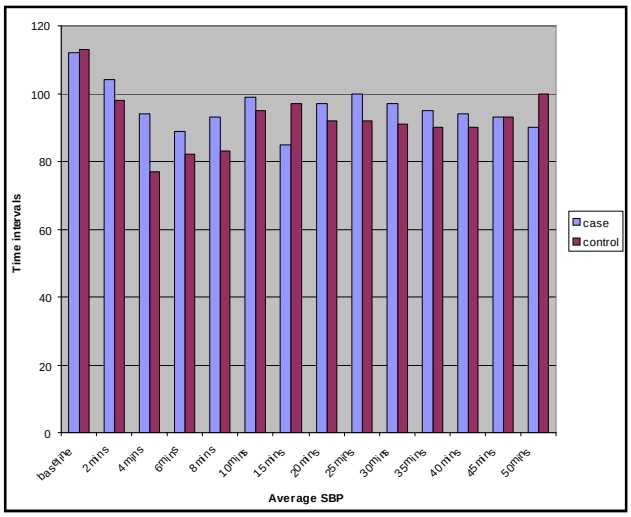

Fig. 1: Average systolic blood pressure at different times

Overall, 12(80%) patients in the leg wrapped group and 15(100%) patients in the control group experienced hypotensive episodes requiring rescue dose of mephentermine. This difference was not significant statistically as p value=0.06.

The number of patients requiring supplemental mefentermine was also analyzed. Although the supplements in cases were much lesser than in controls the difference was not significant statistically at all the time intervals p value >0.05 .

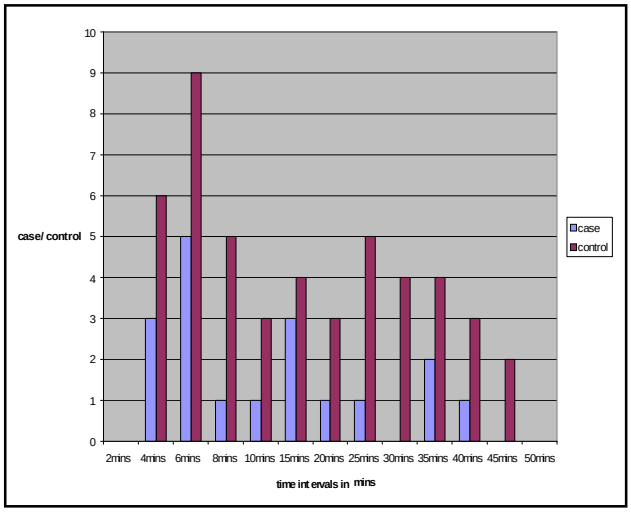

Fig. 2: Number of patients requiring supplement at different time intervals

The number of patients who had more than one hypotensive episodes during the surgery was also analyzed. 14(93%) controls and only 5(33%) cases had more than one

hypotensive episodes requiring supplemental mephentermine. This difference was statistically significant with p value =0.0006.

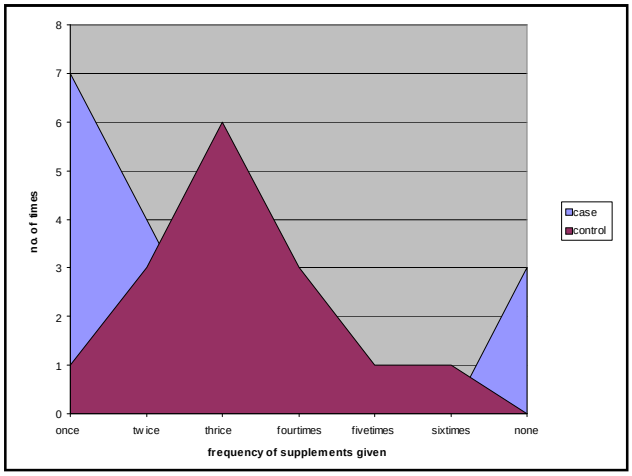

Fig. 3: Number of supplement required

Discussion

Maternal hypotension is the most frequent complication of spinal anesthesia for cesarean section approaching an incidence of 80 to 100% according to different studies. [11, 27] Untreated, severe hypotension can pose serious risk to both mother and the baby. A range of strategies is therefore being used to prevent or minimize hypotension but there is no established ideal technique. [11]

There are three major interventions that have gained popularity over the years and these include prophylactic volume (colloid or crystalloid) loading, use of vasopressors like ephedrine or phenylephrine and use of varying mechanical interventions to increase central blood volume like esmarch bandage or compressive leg stockings.

Volume preloading has been advocated, however its role has been challenged by various studies [14, 8, 6, 4].

Intramuscular prophylactic vasopressors have also been advocated. But concern about reactive hypertension has been the basis for opposition to their use [22, 23]. Hirabayashi et al reported coronary artery spasm after ephedrine in a patient with high spinal anesthesia [24]. Lustik et al, in 1997, reported ephedrine induced coronary vasospasm in a patient with prior cocaine use [13]. Despite all this, prophylactic ephedrine has not been seen to improve neonatal outcome although it prevents hypotension [26]. This may be because various studies [23, 29] have shown that prophylactic ephedrine in minimal effective dose prevents late onset hypotension only. In elective cesarean section it is the early hypotension that we have to target if we want to minimize fetal complications as the baby is usually out within the first fifteen minutes.

Bhagwanjee et al in 1990 showed that hypotension following spinal anesthesia in elective cesarean section could be prevented by wrapping of legs [2]. The study population however, was small; only 24 patients were included in the study. Three years later Rout et al from the same department studied the effect of leg wrapping in 97 parturients undergoing elective cesarean section and showed that there was a significant reduction in post spinal hypotension in these patients [3]. They also showed that leg elevation alone did not reduce hypotension significantly. Prevention of post spinal hypotension at elective cesarean section by wrapping of lower limbs published in Int J Gynecol Obstet 1998 June by van Bogaert LJ has also shown to decrease hypotensive episodes in patients significantly [1].

In above three studies [1, 2, 3] Esmarch elastic bandage has been used, in other studies [5, 7,10,17,28] graduated elastic compression stockings have been used, however, in my study I have only used ordinary Leukocrepe elastic bandage in wrapping the lower limbs. Unlike Esmarch bandage and graduated compression stockings, elastic Leucocrepe bandage does not provide sustained and uniform pressure on the lower limbs. This may be the reason for increased number of hypotensive episodes in both the case and control in my study compared to the small percentage in these studies. Preloading was also greater 20 ml/kg in these studies compared to <10ml/kg in my study. Fixed amount of 500ml preloading was done in the study to review the effectiveness of our prevailing practice. Also the amount of bupivacaine used in my study was higher than in other studies.

Decrease in SBP was consistently lesser in leg wrapped group than in controls, however due to small number of sample these differences could not reach a significant level. Small sample size is a major limitation of my study. Despite all this, the relative risk of hypotension in my study was 0.8 that is comparable with RR 0.75 given by Cochrane Database Syst Rev 2001.

The number of hypotensive episodes is also considerably lesser in the leg wrapped group compared to the controls. 14 (93%) of cases required one or less rescue mephentermine compared to a mere 5 (33%) of controls which is highly significant (p=0.0006). This finding is in keeping with the previous studies done outside.

Conclusion

The findings of my study suggest that the wrapping of lower limbs with Leukocrepe elastic bandage (like other leg wrapping devices) decreases the incidence of hypotensive episodes to a significant degree. However, it does not

eliminate the incidence of hypotension in spinal anesthesia given to elective cesarean section patients.

The systolic blood pressure in the leg wrapped group was consistently higher compared to the controls, however due to very small number of study population it was not seen to be significant.

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