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PHENYLEPHRINE ADMINISTRATION : A COMPARATIVE STUDY BETWEEN PROPHYLACTIC INFUSION AND BOLUS USAGE FOR THE PREVENTION AND TREATMENT OF HYPOTENSION IN CESAREAN SECTION DURING SPINAL ANAESTHESIA

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ABSTRACT

BACKGROUND: We compared two methods of administration of phenylephrine,infusion vs Bolus dose(control group) in the prevention and treatment of hypotension in cesarean section under spinal anesthesia.

METHODS: 100 parturients with ASA I who were scheduled for emergency caesarean section were chosen. Spinal anesthesia was performed using 10 mg hyperbaric bupivacaine. In the infusion group ,Phenylephrine 100µg /min was infused for the initial 3 minutes after the subarachnoid block and were supplemented with 100µg infusion,whenever the systolic blood pressure was below the baseline value. In the control group (Bolus dose) phenylephrine 100 µg bolus was given when the systolic blood pressure decreased to 20% of the baseline value. The following parameters were noted as per study protocol, Pulse rate and blood pressure every minute until delivery of the baby and every five minutes thereafter, various time intervals from Subarachnoid block to delivery of the baby, APGAR scores a to asses the neonatal outcome, Analysis of umbilical cord blood gas values (pH, paco2) Total dose of the Phenylephrine used ,episodes of the hypotension, usage of atropine and Incidence of nausea and vomiting.

RESULTS: In the infusion group there was less hypotension ($p< 0.0001$), Total dosage of phenylephrine was more in infusion group 300-600mcg vs 100-300 mcg with p value <.0001,Fetal outcome measured by APGAR was better in the infusion group($p <.0001$), fetal acid base status showed no difference in both groups, the usage of atropine was more in the control group ($p<0.0202$),there was no incidence of nausea or vomiting in both groups.

CONCLUSION: We conclude that Phenylephrine infusion is an effective and simple method of reducing the incidence and magnitude of hypotension during spinal anesthesia for caesarean delivery with no adverse effect on neonatal outcome

KEYWORDS :

Introduction

Spinal anesthesia for cesarean delivery may be associated with hypotension and fetal acidosis (Robert et al, Mueller et al) [1] . Many different strategies have been investigated for the prevention of hypotension. studies have described the use of IV infusions of α agonists to maintain maternal SBP (Ngan et al) [2,3] . A Previous studies [4,5] (Warwick D. Ngan et al) suggested that starting a prophylactic vasopressor infusion immediately after the induction of anesthesia was more effective for reducing both the incidence and frequency of hypotension.

This prospective control study was undertaken with the aim of comparing two methods of administration of Phenylephrine, Infusion vs Bolus dose in prevention and treatment of hypotension in cesarean section under spinal anaesthesia. Parameters like Incidence and magnitude of hypotension,Incidence of adverse effects,Fetal outcome and total dose of Phenylephrine used were assessed.

MATERIALS AND METHODS

After getting the approval from the ethical committee, the study was conducted in 100 patients aging between 18 to 30 yrs , all were primi gravidas undergoing emergency cesarean section. After getting consent and explaining the procedure details, the study was performed.

The patients selected for this study were of ASA Risk I. It was a randomized double blinded study. The usual indications for the cesarean section were cephalopelvic disproportion, breech presentation, and premature rupture of membranes. Patients with a history of allergy or sensitivity to amide-type local anesthetics, maternal diabetes, alcohol, drug or medication abuse, multiple pregnancies, suspected fetal abnormality, or complicated pregnancies were excluded.

The preoperative baseline parameters like pulse rate, blood pressure, respiratory rate were recorded. Three readings were taken and the average of the three was taken as the mean baseline value of the patient. IV line started with 18 gauge intravenous cannula and the patients were infused with Ringer lactate solution 15ml/kg .They were premedicated with Inj. Ranitidine 50 mg and Inj.Metoclopramide 10 mg intravenously. The subarachnoid block was performed under strict aseptic precaution with the patient in right lateral position with a 25 gauge Quincke spinal needle in the L2-L3 interspace, and 10mg of 0.5% hyperbaric Bupivacaine was injected after ensuring free flow of cerebrospinal fluid.The patients were immediately turned to the supine position with a wedge of 10 cm below the right buttock. The patients were randomly allocated to receive the study drugs, either Phenylephrine infusion or bolus dose.

In the infusion group ,Phenylephrine 100µg /min was infused for the initial 3 minutes after the subarachnoid block and were supplemented with 100µg infusion,whenever the systolic blood pressure was below the baseline value. Bradycardia was treated with injection atropine 0.5 mg IV, if the heart rate was below 50 per minute. After delivery of the baby, blood pressure and heart rate were maintained by infusing fluids and vasopressors and the umbilical cord was clamped at two ends, blood samples were taken from umbilical artery and umbilical vein for blood gas analysis.

The following were noted and recorded as per the study protocol

1. Pulse rate and blood pressure every one minute until delivery of the baby and every five minutes thereafter.
2. The time interval between subarachnoid block to skin incision, skin incision to uterine incision, and uterine incision to delivery of the baby.
3. APGAR scores at 1 minute and 5 minutes to asses the neonatal outcome.
4. Analysis of umbilical cord blood gas values (pH, paco2)
5. Total dose of the Phenylephrine used until the delivery of the baby in both groups.
6. Total episodes of the hypotension.
7. Need for the usage of atropine.
8. Incidence of nausea and vomiting.

POST OPERATIVE OBSERVATION

Immediately after the surgery, Pulse rate and blood pressure were recorded. Patients were transferred to recovery room and observed till the time of total regression of analgesia and recovery from motor paralysis. Blood pressure and pulse rate were recorded at regular intervals of 30 mins. Once the patient is recovered and the vital functions are stable, patients were transferred to post-operative ward. In the post-operative ward the vital parameters were monitored. Patients were followed up till discharge

RESULTS AND DISCUSSION : The results are tabulated (Mean,SD, Range , pvalue)

TABLE 1

Method	Infusion group	Control group	p-value
n	50	50	
Age group	24.2 (2.9;20-32)	24.1(1.7;21-27)	0.5844 NS
PREOPERATIVE VAIABLES			
Systolic Bp	121.6 (9.6)	122.4(8.6)	0.5163 NS
Diastolic Bp	77.7(5.8)	76.8(4.3)	0.5012 NS
Pulse rate	82.2(5.9)	80(8.6)	0.5101 NS
INTRAOP BP			
At 1min	122.1(9.7)	121.4(7.9)	0.5215(NS)
At 2 min	117.5(13.1)	114.8(12.7)	0.2759(NS)
At3min	121.8(16.0)	106.5(11.8)	0.0001(S)
At4min	124.2(10.7)	105.1(9.8)	0.0001(S)
At 5min	126(9.6)	99.8(11.0)	0.0001(S)
At 6min	124.8(13)	92(7.2)	0.0001(S)
At 7min	125.6(10)	102(9.9)	0.0001(S)
At 8min	120.7(12.8)	111.6(9.0)	0.0008(S)
At 9min	120(11.1)	120	0.8383(NS)
INTRAOP PR (from SAB to delivery)			
At 1min	82.2(9)	80.3(11.6)	0.5101(NS)
At 2 min	77.4(10)	78.3(11.2)	0.7347(NS)
At3min	70.8(8.9)	80.4(12.2)	0.0001(S)
At4min	65.4(7.6)	69.9(11.2)	0.1501(NS)
At 5min	67.0(12.5)	69.5(12.3)	0.9917(NS)
At 6min	68.8(15.3)	69.6(10.6)	0.7141(NS)
At 7min	73.7(8.4)	72.3(8.9)	0.4446(NS)
At 8min	75.7(7.6)	65.1(7.4)	0.0001(S)
At 9min	71.5(8.3)	60	0.227(NS)
TIME INTERVAL(in minutes)			
From SAB to skin incision	4.22(0.42)	4.8(0.4)	0.0001(S)
From Skin to uterus	2.28(0.45)	2.02(0.14)	0.0003(S)
From uterus to baby delivery	1.14(0.35)	1.0(0)	0.0063(S)
Total time from SAB to Baby delivery	7.64(0.75)	7.82(0.44)	0.0501(NS)
TOTAL DOSE OF PHENYLEPHRINE (in mcg)			
Up to 200	-	37(74%)	
201-400	33(66%)	13(26%)	0.0001(S)
401-600	17(34%)	-	
>600	-	-	
Total dose	402 (91.5;300-600)	212(62.2;100-300)	

TABLE 2

APGAR SCORE			
1 min	7.12(0.56;5-8)	6.66(0.52;5-7)	0.0001(S)
5min	8.16(0.51;7-9)	7.96(0.28;7-9)	0.0001(S)
ABG VALUES			
Umbilical artery pH	7.31(0.01;7.26-7.32)	7.30(0.02;7.28-7.34)	0.4337
Umbilical vein pH	7.36(0.02;7.33-7.39)	7.35(0.02;7.33-7.39)	0.8771(NS)
Umbilical artery PCO2	51(2.7;48-58)	53(2.2;49-56)	0.0543(NS)
Umbilical vein PCo2	44(1.9;40-48)	44(1.9;40-48)	0.7889(NS)
ATROPINE USAGE			0.0202 (S)
YES NO	11(22%) 39(78%)	23(46%) 27(54%)	
NAUSEA/VOMITING			
YES/NO	0/50	0/50	-
TOTAL EPISODES OF HYPOTENSION			
0	16(32%)	-	
1	8(16%)	6(12%)	
2	24(48%)	31(62%)	
3	1(2%)	13(26%)	
4	1(2%)	-	
MEAN(SD;Range)	1.26(1.0;0-4)	2.14(0.61;1-4)	0.0001(S)

DISCUSSION

HEMODYNAMIC PROFILE:

It was found that maternal HR was statistically significantly slower in the control group compared to the infusion group contrary to the study done by the Ngan kee et al. This could be attributed to the rate of injection of the drug which was faster in the bolus group. However, because these cases were not associated with hypotension, the likely mechanism was a baroreceptor reflex. There were no associated adverse clinical sequelae. Atropine was used in 11 of the 50 cases in the infusion group compared to 23 of the 50 cases in the control group. All the cases required only one dosage of atropine of 0.5 mg. The maternal systolic blood pressure was maintained till the delivery of the baby in the infusion group, but in the control group,systolic blood pressure decreased and this decrease was statistically significant every minute till the delivery of the baby with a 'p' value of 0.0001. In one case in the infusion group there was an increase in the blood pressure as soon as the infusion was started to more than 20% of the base line in that case it was a failed subarachnoid block which needed a repeat spinal. This case was excluded from the study group. The blood pressure became normal in 5 minutes.

VARIOUS TIME INTERVALS FROM SAB TO BABY DELIVERY

The time interval between the SAB to skin incision, skin to uterus incision, uterus incision to baby delivery time showed statistically significant difference. But the total time between the SAB to the baby

delivery showed no significant difference. The average time was 7.6 min in the infusion group compared to 7.8 minutes in the control group.

EPISODES OF HYPOTENSION

In the infusion group 32% of the cases did not have a single episode of hypotension. In the control group all cases had hypotension.But both in the infusion and the control group there was maximum cases which had 2 episodes of hypotension there was 48% of cases in the infusion group and 62% of cases in the control group. The mean episode of hypotension was 1.2 in the infusion group and 2.1 in the control group which was statistically significant with a 'p' value of 0.0001. Despite a more frequent incidence of hypotension in the control group, it was found that fetal acid-base status was not worse compared with that in the infusion group. This likely reflects the fact that when hypotension occurred, it was treated promptly with boluses of Phenylephrine. In this study hypotension was defined as a decrease in SBP by more than 20% less than baseline. However, the exact degree of hypotension that should be treated is undetermined.

The level of block measured at 10 minutes was one segment higher in the infusion group compared with the control group. Although the clinical significance of a one-segment difference in height is uncertain, because a higher block level might result in a greater degree of sympathetic block, this should have predisposed to a more frequent incidence of hypotension in the infusion group compared with the control group. But this did not happen because of the prophylactic Phenylephrine given in the infusion group.

TOTAL DOSAGE OF PHENYLEPHRINE

The total dosage of phenylephrine in the infusion group ranged between 300 to 600 µ g. In the control group it ranged between 100 to 300µ g. The difference between the 2 groups was statistically significant with a "p' value of 0.0001.

FETAL PROFILE

The APGAR score at the 1st and the 5th minute showed better in the infusion group and that was also statistically significant. It was 7.1 at 1st minute in the infusion group compared to 6.6 at the same time in the control group .It was 8.6 at 5th minute in the infusion group compared to 7.9 at the same time in control group. It was significant with a 'p' value of 0.0001.

The umbilical cord blood gas values showed no significant difference between both the groups. And they were comparable to the standard values.

INCIDENCE OF NAUSEA OR VOMITING

There was not a single patient who reported with nausea or vomiting. This may be attributed to the Inj.Metoclopramide 10mg given as a premedication.

CONCLUSION

In conclusion, these data suggest that a prophylactic Phenylephrine infusion is an effective and simple method of reducing the incidence and magnitude of hypotension during spinal anesthesia for cesarean delivery with no adverse effect on neonatal outcome when compared to Phenylephrine bolus usage.

REFERENCES

1. Roberts SW, Leveno KJ, Sidawi JE,. Fetal acidemia associated with regional anesthesia for elective cesarean delivery. Obstet Gynecol 1995;85:79-83
2. Ngan Kee WD, Lau TK, Khaw KS, Lee BB. Comparison of metaraminol and ephedrine infusions for maintaining arterial pressure during spinal anesthesia for elective cesarean section. Anesthesiology 2001:95:307-13.
3. Ngan Kee WD, Khaw KS, Lee BB, et al. Metaraminol infusion for maintenance of arterial pressure during spinal anesthesia for cesareandelivery:ANESTH ANALG 2004:98:815-21
4. prophylactic intravenous ephedrine for the prevention of hypotension during spinal anesthesia for cesarean delivery. Anesth Analg 2000:90:1390-5
5. Mercier FJ, Riley ET, Frederickson WL, et al. Phenylephrine added to prophylactic ephedrine infusion during spinal anesthesia for elective cesarean section. Anesthesiology 2001;95: 668-74.