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A Comparitive Study of Ephedrine Infusion with the Preload of Crystalloids for Prevention of Hypotension During Spinal Anaesthesia for Elective Caesarean Section

KEYWORDS: Ephedrine; Ringer's lactate; hypotension; spinal anesthesia; neonatal assessment; Apgar score.

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ABSTRACT *Aims and objectives-We studied the efficacy of ephedrine for preventing hypotension in patients undergoing caesarean section under spinal anesthesia. The aims and objectives were 1.To assess- the efficacy of an ephedrine infusion with crystalloid preloading for reducing incidence of hypotension during spinal anesthesia for elective caesarean section.2. To assess- the hemodynamic changes after ephedrine infusion during spinal anesthesia for caesarean section.3.To assess- the neonatal outcome after ephedrine infusion during spinal anesthesia for caesarean section Methodology-A total 100 female inpatients between 18 and 40 years undergoing elective caesarean section under spinal anesthesia. They were randomly allocated to receive either ephedrine infusion (Group A) or 20ml/kg of Ringer's Lactate solution as preloading solution prior to SAB. Heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure were recorded every minute for the first 20 minutes and once in five minutes for the next 60 minutes. The incidence of hypotension and the mean dose requirements of ephedrine were noted after spinal anesthesia. Also neonatal assessment done by Apgar scoring at 1 and 5 minutes in both the groups. Results-The incidence of hypotension was 6 of 50 (12%) in Group A, 30 of 50 (60%) in Group B. The ephedrine bolus requirements were also less in group A when compared to group B which was statistically significant. There was no significant difference in Apgar scores between two both groups at1 and 5 minutes. Conclusion-It can be concluded from the present study that ephedrine infusion offsets hypotension and hypovolemia more effectively than crystalloids in patients scheduled for elective caesarean section under spinal anesthesia.*

INTRODUCTION

Maternal hypotension is associated with decrease in uterine blood flow causing fetal hypoxia, acidosis and neonatal depression.[1] This common complication of hypotension is often exaggerated by aortocaval compression in case of full term pregnant. In patients who undergo caesarean section, abnormal Apgar and neurobehavioral scores were noted when maternal systolic blood pressure dropped by more than 30% of the baseline or stayed less than 80 mm of Hg. In spite of left uterine displacement and prehydration hypotension has been found to occur in 50-80% of patients undergoing caesarean section.[2] Thereafter, additional measures were tried such as intravenous infusion of 5% albumin in 5% dextrose Ringer lactate 15ml/kg,[3] intravenous boluses of ephedrine,[4] intravenous infusion of dopamine[5]and intravenous ephedrine infusion,[1]with varying success. Prior to spinal anesthesia crystalloid administration is recommended to reduce the incidence of hypotension and this is referred to as 'preloading' although its value has been questioned,[6-16] crystalloid solutions have a short intravascular time and are poor plasma volume expanders which may explain why hypotension associated with spinal anesthesia cannot be completely eliminated by crystalloid preloading. Large volume of crystalloids can also decrease oxygen carrying capacity and may increase the risk of pulmonary and peripheral edema during puerperium.[17] Therefore we have undertaken a study to evaluate in a randomized single blinded manner the efficacy of intravenous infusion of ephedrine for preventing hypotension in patients undergoing caesarean section under spinal anesthesia.

METHODOLOGY

A comparative study of ephedrine infusion with crystalloid preloading was undertaken after ethical committee clearance, institution approval and informed consent from the patients. The study population included 100 in patient parturient's undergoing elective caesarean section under spinal anesthesia.

Inclusion Criteria

1. ASA physical status class 1 and 2.
2. Age between 18 and 40 years.
3. Baseline systolic blood pressure 100 and 130 mmHg.
4. Patients at term, singleton pregnancies with cephalic presentation.

Exclusion Criteria

1. Emergency caesarean section.
2. Patients with medical and obstetrical complications.

Pre-anesthetic Evaluation A thorough pre-anesthetic evaluation was done with special emphasis on cardiorespiratory, nervous system and endocrinal abnormalities. Previous anesthetic exposure and drug sensitivity were enquired. A thorough general and systemic examination was carried out for baseline vital parameters, airway assessment, cardio-respiratory and CNS abnormalities. Special attention was paid for any kind of spinal deformities, active skin lesions over the lumbosacral area. Height and weight were recorded. Written informed consents were taken. Investigations done were Hb%, BT, CT, RBS, Blood Urea, Serum Creatinine, Urine Analysis for albumin, sugar & microscopy, ECG- in 12 leads, Lignocaine test dose. Patients were advised to be nil orally from 10 p.m. onwards and were pre-medicated with tab. diazepam 0.2 mg/kg, tab ranitidine 150mg, tab metoclopramide 10mg on the previous night of surgery and on morning of surgery. Patients were randomized into 2 groups of 50 patients each. Group A: Patients receiving ephedrine infusion 50mg in 500ml of Ringer's Lactate immediately after administration of spinal anesthesia at rate of 50ml/min for first 2 minutes, thereafter 10ml/min for next 18 min. Group B: Patients receiving crystalloid preload of 20 ml/kg Ringer's lactate over 20 mins before spinal anaesthesia.Before shifting the patient to the operation table, anesthesia machine was checked; emergency drugs and airway equipments were kept ready. Monitors were checked for their proper functioning.

Procedure

Patients were transported to O. T where 18G cannula were inserted. Baseline heart rate, systolic blood pressure and diastolic blood pressure were measured in supine position using a mercury sphygmomanometer. Mean arterial blood pressure

Volume : 4 | Issue : 2 | Feb 2014 | ISSN - 2249-555X

was derived from the formula, MAP = DBP + PP/3. The fluids were administered prior to spinal anesthesia over duration of 15 minutes. After intravascular administration, pulse rate and blood pressure were measured. With all aseptic conditions and patients in lateral position, spinal anesthesia was performed at L3-L4 interspace with a 25 gauge spinal needle using 2ml of 0.5% bupivacaine heavy. Patients were given left uterine displacement and oxygen supplementation 3L/min. Segmental spread of anesthesia was determined by pinprick until T4 is reached. In both groups hypotension is treated with 10mg i.v. bolus of ephedrine. All patients received Ringer lactate infusion during anesthesia at a rate 2ml/kg/hr. Pulse rate, systolic and diastolic blood pressure was recorded at 1-min intervals for the first 20 minutes and every five minutes for 1-hour duration. Hypotension was defined as decrease in systolic blood pressure to both less than 100 mm of Hg and 75% of the baseline value whichever is greater. Hypotension was treated by an intravenous bolus of 10mg ephedrine repeated as necessary until the blood pressure was increased to >75 % of the baseline value. Bradycardia (heart rate less than 50/min) when encountered was treated with 0.6 mg of atropine. After preloading all patients were given Ringer lactate at the rate of 2 ml/kg/hr as maintenance fluid. The number of patients developing hypotension as well the mean dose of ephedrine required for treatment was noted. Patients were monitored with pulse oximeter, NIBP, ECG intraoperatively.

Statistical Methods

Student t test has been used to find the significant difference of mean hemodynamic changes between two groups. Chi-square and Fisher exact test has been used to find the significant difference of proportions of bolus required and incidence of hypotension between the two groups. The odds ratio has been used to find the strength of relationship between the two groups with respect to bolus requirement and the incidence of hypotension.

OBSERVATION AND RESULTS

Table 1 shows the background characteristics of the two groups. The two groups were comparable in respect to age and weight. All the patients belonged to ASA grade 1 and 2. The baseline pulse rate and the systolic blood pressure were not significantly different among the three groups. Level of block was tested in all patients till T4 is reached. Blood loss was minimal in all the patients

Table 1 Pre-operative patients data-

Parameters	Ephedrine (Group A) (n=50)	Crystalloid (Group B) (n=50)	Significance By student t
Age in years	24.00±4.37	23.72±4.33	P=0.322
Weight in kg	50.10±1.93	49.62±1.41	P=0.750
Height in cms	150.08±2.93	150.24±1.99	P=0.613
HR in beats/min	75.56±7.17	76.46±6.59	P=0.515
SBP in mmHg	115.05±5.95	128.40±6.19	P=0.594
MAP in mmHg	87.34±5.40	93.71±3.86	P=0.204

Table2-Incidence of hypotension between two groups

SBP<100 or 75% of baseline	6 (12.0)	30 (60.0)	P<0.001
Inference	Incidence of hypo tension is significantly higher in group B (60.0%) compared to only 12% in Group A with OR=11.0 indicating that the incidence of hypo tension is 11 times more likely in group B.		

Tables 2 show the incidence of hypotension in two groups. In group A (ephedrine group) incidence was 12% compared to 60% in ephedrine group respectively. The incidence of hypotension is approximately 11 times more in group B when compared to group A.

Table3 shows the trend of mean pulse rate changes during the study. It can be observed that the baseline pulse rate values for all the two groups are similar and are statistically insignificant. It can also be seen that there is a increase in the pulse rate values in group A and the increase is statistically significant at all time intervals comparing to group B.

Table3-Varations in pulse rate

Pulse rate beats / minute	Group A		Group B		Significance Student t	P value
	Mean	SD	Mean	SD		
Baseline	75.56	7.17	76.46	6.59	0.654	P>0.05
After preload	-	-	80.30	7.40	-	-
1 minute	96.40	12.38	82.66	7.78	6.622	P<0.01
2 minute	96.58	11.48	83.62	7.45	6.696	P<0.01
3 minute	97.02	12.64	83.38	7.58	6.544	P<0.01
4 minute	97.12	12.82	83.82	7.68	6.293	P<0.01
5 minute	97.38	15.47	82.80	8.06	5.911	P<0.01
6 minute	95.56	16.16	82.44	7.72	5.180	P<0.01
7 minute	94.92	16.17	81.84	7.79	5.153	P<0.01
8 minute	95.02	13.25	82.48	7.69	5.789	P<0.01
9 minute	94.40	10.75	81.34	7.96	6.904	P<0.01
10 minute	94.94	13.56	80.84	7.80	6.374	P<0.01
11 minute	93.18	15.30	79.56	7.45	5.649	P<0.01
12 minute	95.08	14.75	79.16	7.31	6.837	P<0.01
13 minute	96.86	13.79	78.46	6.85	8.449	P<0.01
14 minute	98.16	14.95	78.16	6.99	8.569	P<0.01
15 minute	97.20	17.11	77.88	6.61	7.448	P<0.01
16 minute	99.56	16.97	77.38	6.76	8.586	P<0.01
17 minute	100.52	15.96	77.24	6.22	9.609	P<0.01
18 minute	100.20	14.22	76.98	5.98	10.645	P<0.01
19 minute	99.62	13.69	75.92	6.00	11.211	P<0.01
20 minute	98.12	13.07	76.12	6.37	10.697	P<0.01
25 minute	95.94	13.45	75.38	6.65	9.687	P<0.01
30 minute	95.34	14.15	74.32	6.02	9.665	P<0.01
35 minute	93.00	12.70	74.02	6.59	9.379	P<0.01
40 minute	91.08	11.53	72.12	5.72	10.413	P<0.01
45 minute	89.92	11.75	72.32	6.42	9.294	P<0.01
50 minute	86.28	11.12	72.10	5.90	7.962	P<0.01
55 minute	84.24	10.96	71.08	5.48	7.593	P<0.01
60 minute	82.54	10.28	71.40	4.29	7.072	P<0.01

Table 4 shows Variations in Systolic Blood Pressure between two groups

It can be seen that there is significant difference between the SBP's of the two groups at all interval of time except at 2 minute. In the tenth and fifteenth minute interval, group B had a significant fall in SBP when compared to both groups A. In the twentieth minute interval it can be seen that group B again had a significant fall in SBP when compared to group A. In the thirtieth and thirty fifth minute interval group B again had a significant fall in SB compared to group A.

Volume : 4 | Issue : 2 | Feb 2014 | ISSN - 2249-555X

Table 4 shows Variations in Systolic Blood Pressure between two groups

SBP in mmHg	Group A		Group B		Significance Student t	P value
	Mean	SD	Mean	SD		
Baseline	115.02	5.95	128.40	6.19	0.534	P>0.05
After preload			129.68	6.44	-	
1 minute	125.14	9.03	130.08	6.61	3.120	P<0.01
2 minute	127.52	7.48	126.68	6.51	0.599	P>0.05
3 minute	128.76	9.40	124.70	6.27	2.540	P<0.01
4 minute	130.48	8.65	123.36	6.63	4.617	P<0.01
5 minute	129.34	10.58	121.30	6.24	4.628	P<0.01
6 minute	129.30	10.52	120.16	7.24	5.061	P<0.01
7 minute	128.54	10.72	118.08	6.92	5.797	P<0.01
8 minute	128.96	9.44	117.16	7.68	6.856	P<0.01
9 minute	130.34	8.90	115.74	7.26	8.988	P<0.01
10 minute	129.28	9.31	114.96	7.70	8.380	P<0.01
11 minute	128.40	9.21	113.86	6.22	9.253	P<0.01
12 minute	126.82	9.64	113.08	5.71	8.674	P<0.01
13 minute	126.16	9.12	111.68	5.49	9.618	P<0.01
14 minute	126.42	9.11	110.24	5.70	10.646	P<0.01
15 minute	127.52	14.06	106.40	7.73	9.305	P<0.01
16 minute	125.68	11.86	108.42	4.56	9.606	P<0.01
17 minute	125.18	11.09	108.42	4.48	9.906	P<0.01
18 minute	125.10	11.30	108.28	4.32	9.833	P<0.01
19 minute	125.30	11.21	108.10	4.54	10.054	P<0.01
20 minute	126.30	8.92	106.28	7.41	12.210	P<0.01
25 minute	125.94	8.72	109.56	5.38	11.301	P<0.01
30 minute	125.28	7.90	110.84	4.12	11.456	P<0.01
35 minute	124.76	8.53	110.72	5.14	9.971	P<0.01
40 minute	123.86	8.07	112.12	3.37	9.495	P<0.01
45 minute	124.22	7.41	113.24	4.55	8.930	P<0.01
50 minute	124.10	6.34	113.28	4.25	10.024	P<0.01
55 minute	124.08	5.62	113.32	3.80	11.217	P<0.01
60 minute	123.56	5.83	113.68	3.39	10.362	P<0.01

Table 5 shows the trend of diastolic blood pressure between two groups during the study. It can be observed that the baseline DBP values for two groups are similar and are statistically insignificant. It can be seen that DBP is well maintained in group A and there is falling trend of DBP in group B.

Table 6 show the trend of change in mean arterial pressure in two groups. It can be seen that MAP is well maintained in group A. In group B there is falling trend in MAP. The changes in MAP is statistically significant all time intervals between group A and group B.

Table 5- Variations in Diastolic Blood Pressure between two groups

DBP in mmHg	Group A		Group B		Significance Student t	P value
	Mean	SD	Mean	SD		
Baseline	73.50	6.50	76.36	4.17	1.254	P>0.05
After preload			76.96	4.61	-	-
1 minute	79.24	8.68	76.24	4.44	2.175	P<0.01
2 minute	80.06	7.96	73.60	4.26	5.060	P<0.01
3 minute	80.50	8.07	71.66	4.14	6.889	P<0.01
4 minute	79.04	8.45	70.28	4.18	6.568	P<0.01
5 minute	78.70	8.49	68.64	4.28	7.483	P<0.01
6 minute	76.82	9.90	67.92	4.14	5.866	P<0.01
7 minute	75.86	9.66	66.32	3.80	6.502	P<0.01
8 minute	75.54	9.42	65.56	3.82	6.940	P<0.01
9 minute	76.38	10.44	64.24	3.47	7.803	P<0.01
10 minute	76.06	10.42	63.96	3.06	7.876	P<0.01
11 minute	74.90	10.63	63.40	2.95	7.374	P<0.01
12 minute	73.38	11.20	62.88	2.65	6.453	P<0.01
13 minute	74.24	11.41	61.72	2.89	7.521	P<0.01
14 minute	72.90	12.25	61.18	2.69	6.606	P<0.01
15 minute	72.18	11.32	60.52	2.79	7.071	P<0.01
16 minute	72.06	10.83	60.64	2.75	7.228	P<0.01
17 minute	71.88	10.48	60.68	2.57	7.336	P<0.01
18 minute	72.32	9.54	60.56	2.94	8.328	P<0.01
19 minute	71.86	9.64	60.56	3.21	7.867	P<0.01
20 minute	71.78	9.23	60.80	3.75	7.794	P<0.01
25 minute	71.54	8.85	62.96	3.50	6.373	P<0.01
30 minute	70.68	7.41	63.76	3.07	6.103	P<0.01
35 minute	70.88	8.95	64.00	2.80	5.190	P<0.01
40 minute	70.62	8.39	64.92	2.22	4.642	P<0.01
45 minute	70.26	7.93	65.52	2.16	4.079	P<0.01
50 minute	70.92	7.12	66.12	2.19	4.556	P<0.01
55 minute	71.88	6.09	66.56	2.52	5.709	P<0.01
60 minute	72.24	5.77	67.84	2.42	4.971	P<0.01

Volume : 4 | Issue : 2 | Feb 2014 | ISSN - 2249-555X

Table 6-Variations in MAP between two groups

MAP in mmHg	Group A		Group B		Significance Student t	P value
	Mean	SD	Mean	SD		
Baseline	87.34	5.40	93.71	3.86	1.271	P>0.05
After pre-load			94.53	4.46	-	-
1 minute	94.54	6.95	94.19	4.32	0.305	P>0.05
2 minute	95.88	6.33	91.29	4.26	4.252	P<0.01
3 minute	96.59	6.77	89.34	4.21	6.423	P<0.01
4 minute	96.19	6.57	87.97	4.34	7.375	P<0.01
5 minute	95.58	6.96	86.19	4.23	8.150	P<0.01
6 minute	94.31	8.10	85.33	4.62	6.812	P<0.01
7 minute	93.42	8.18	83.57	4.27	7.548	P<0.01
8 minute	93.35	8.09	82.76	4.50	8.086	P<0.01
9 minute	94.37	7.99	81.41	4.17	10.163	P<0.01
10 minute	93.80	7.78	80.96	4.07	10.337	P<0.01
11 minute	92.73	7.50	80.22	3.46	10.710	P<0.01
12 minute	91.19	8.35	79.61	3.16	9.178	P<0.01
13 minute	91.55	8.35	78.37	3.05	10.482	P<0.01
14 minute	90.74	8.87	77.53	3.11	9.938	P<0.01
15 minute	90.63	8.91	75.81	4.04	10.706	P<0.01
16 minute	89.93	8.81	76.57	2.83	10.215	P<0.01
17 minute	89.65	8.64	76.59	2.76	10.177	P<0.01
18 minute	89.91	8.12	76.47	2.97	11.000	P<0.01
19 minute	89.67	8.24	76.41	3.22	10.605	P<0.01
20 minute	89.95	7.69	75.96	4.56	11.070	P<0.01
25 minute	89.67	7.32	78.49	3.61	9.684	P<0.01
30 minute	88.88	6.05	79.45	2.96	9.895	P<0.01
35 minute	88.84	7.29	79.57	2.97	8.325	P<0.01
40 minute	88.37	7.03	80.65	2.00	7.462	P<0.01
45 minute	88.25	6.61	81.43	2.35	6.875	P<0.01
50 minute	88.65	5.77	81.84	2.30	7.751	P<0.01
55 minute	89.28	4.85	82.15	2.32	9.385	P<0.01
60 minute	89.35	4.73	83.12	2.14	8.485	P<0.01

Table7 shows the distribution of Apgar score between two groups-It can be seen that there is no statistical difference between two groups in Apgar scores at 1 and 5 minutes. Table 8 and Table 9 shows requirements of ephedrine boluses in treating hypotension In group A, out of 50 patients only 8 patients required treatment with ephedrine and no patients required a repeat bolus whereas in group B ,a total of 23 patients required ephedrine .In addition 4 of them required additional boluses.Also no. of ephedrine boluses used in group B is higher than group A.

Table7 - the distribution of Apgar score between two groups

Score	Apgar score at 1 minute		Apgar score at 5 minute	
	Group A (n=50)	Group B (n=50)	Group A (n=50)	Group B (n=50)
7	4 (8.0)	2 (4.0)	-	-
8	8 (16.0)	3 (6.0)	1 (2.0)	1(2.0)
9	38 (76.0)	45 (90.0)	49 (98.0)	49 (98.0)
Mean score	8.68	8.86	8.98	8.98
SD	0.62	0.45	0.14	0.14
Inference	No statistical difference between two groups (P>0.05)		No statistical difference between two groups (P>0.05)	

Table 8 Comparison of ephedrine Bolus required for the two groups

Bolus required	Group A (n=50)	Group B (n=50)	P value
10mg	8 (16.0)	23 (46.0)	0.001
20mg	-	4 (8.0)	0.117
Nil	42 (84.0)	23 (46.0)	P<0.001
Inference	Significantly higher bolus is required for group B (P<0.05) with OR=6.16 indicating that the bolus requirement for group B is 6.16 times more compared to Group A.		

Table 9 Doses of Ephedrine used, Number of boluses, and duration of surgical procedure (mean±SD)

	GROUP A	GROUP B
Total ephedrine dose (mgs)	29.60±3.70	11.48±3.62
No. of ephedrine boluses used	0.16±0.37	1.15±0.36
Duration of surgical procedure(mins)	43.96±8.67	44.40±9.08

DISCUSSION

Satisfactory analgesia for caesarean section under spinal block requires sensory block from T4/T5. This level of high thoracic block induces widespread vasodilatation with resultant hypotension. A significant number of patients suffer from disturbing hypotension and relative hypovolemia during this procedure. Many authorities suggest that crystalloid preloading is not effective in reducing the incidence of hypotension after spinal anesthesia as 75% of the infused fluid diffuses into interstitial spaces and its efficiency in expanding plasma volume is only transient.[14-16] In a study examining the effects of crystalloid administration and uterine displacement Clark et al[2] demonstrated a significant reduction in the incidence of hypotension during spinal anesthesia for caesarean section after crystalloid administration from 92% to 57%. However, crystalloid administration has been shown to have no effect on incidence or severity of hypotension and the central venous pressure decrease during spinal anesthesia despite crystalloid administration (6, 32). One reason why crystalloid preload may not successfully prevent hypotension is the short intravascular half life. Large volumes crystalloid fluid could also decrease oxygen carrying capacity or increase the risk of pulmonary edema in susceptible patients. It has been suggested that term parturient might be at greater risk of pulmonary edema, with a reduced pulmonary interstitial safety margin because of a decrease in oncotic pressure and increase in plasma volume (17). In our study patients receiv-

Volume : 4 | Issue : 2 | Feb 2014 | ISSN - 2249-555X

ing ephedrine infusion had a lower incidence of hypotension when compared to ringer lactate group. Group A patients had a incidence of 12% of hypotension and Group B had a incidence of 60%.Also mean dose of ephedrine bolus required was more in crystalloid group. Group A required a mean of 0.16±0.37 whereas Group B a mean dose of 1.15±0.36. There findings are consistent with others who had studied comparison of ephedrine infusion with crystalloid preloading. A study conducted by Dr. Dipasri Bhattacharya et at[18] shown that an ephedrine infusion at a rate of 5mg/min for the first two mins followed by 1mg/min for further 18 mins after giving spinal anesthesia for caesarean section in obstetric population is found to be more effective than crystalloid infusion of 20ml/kg over 20 mins before spinal anesthesia. Incidence of hypotension was 12% in ephedrine group and that of crystalloid group was 60%. The mean no. of ephedrine boluses required in ephedrine group was 0.2 and that in crystalloid group was 1.2.There was no statistical difference between two groups in Apgar scores at 1 and 5 minutes. Noor M. Gajraj et at[19] study in 1993 aimed to compare the efficacy of an ephedrine infusion with crystalloid administration for reducing incidence of hypotension during spinal anesthesia. Their study showed the incidence of 22.2% of hypotension in ephedrine group whereas its 55.6% in crystalloid group. There was no difference in incidence of nausea or vomiting. The crystalloid group received a mean boluses of 1.4 of ephedrine and infusion group received a mean of 0.4 ($p<0.05$).In our study incidence of hypotension was 12% in ephedrine group and 60% in crystalloid group.Yoo G.Kang et al[1] 1982 studied intravenous ephedrine infusion during spinal anesthesia for caesarean section to determine its effect on mother and fetus .They showed that prophylactic intravenous infusion of ephedrine was safe and effective in healthy parturient undergoing caesarean section under spinal anesthesia or maintaining maternal blood pressure close to baseline levels without causing significant maternal tachycardia, hypertension, nausea and/or vomiting or fetal compromise. In our study there was an increase in baseline pulse rate in ephedrine group at all time intervals and returns to baseline after 30-35 mins. In crystalloid group, there was an increase in pulse rate immediately after preloading and up to first 15 mins which is statistically significant. The systolic blood pressure increased to about 3-5 mmHg after preloading in crystalloid group where as in ephedrine group there is consistent increase SBP so that its maintained between mean SBP of 120 and 130mm Hg. The fall in SBP<100 mm Hg after spinal block was as early as 6 minutes in crystalloid group The same trend was observed when MAP was taken into consideration. The DBP was increased in first 3-5mins after preloading crystalloid and then starts declining whereas in ephedrine group there is consistent increase in DBP in the initial period of infusion of 10 mins and later DBP is maintained between 70-80 mm Hg.There was no statistical significant difference in Apgar scores at 1 and 5 minutes between the two groups.

Ephedrine is a CNS stimulant known to cause anxiety and restlessness. In our study we had observed it in 4 patients receiving ephedrine infusion. There were no other side effects observed during the study. Our study does have some limitations. The investigators were not blinded and so there is a possibility of bias. Patients in the crystalloid group did not receive additional boluses of fluid if hypotension had occurred. Although this may have affected the duration of hypotension, the incidence of hypotension would not have been affected. Our study confirms that the ephedrine infusion is better than crystalloid preloading in preventing hypotension in patients scheduled for elective caesarean section under spinal anaesthesia.

CONCLUSION

It can be concluded from the present study that ephedrine infusion offsets hypotension more effectively than preloading with crystalloids in patients scheduled for elective caesarean section under spinal anesthesia.

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