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Comparison between Hypertonic Saline (3%) and Normal Saline (0.9%) as a Preload before Spinal Anaesthesia in Caesarean Section

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ABSTRACT

Background: spinal anesthesia is frequently used for cesarean delivery because of its rapid onset, a dense neural block, little risk of local anesthetic toxicity and minimal transfer of drug to the fetus. General anesthesia is preferred in emergency obstetric situations, such as cord prolapse, in which there is a need for reliable induction, and also bleeding placenta previa. Unfortunately it is frequently accompanied by hypotension, which may be defined in absolute terms as a systolic blood pressure (SBP) of 90 or 100 mmHg or in relative terms as a percentage (20% fall from baseline). **Aim of the Work:** the aim of this study is to compare hypertonic saline (3%)and normal saline (0.9%) in preventing spinal induced hypotension. **Patients and Methods:** in our study, 40 patients were randomly divided into 2 equal groups: Group A: received hypertonic saline (3%) (4ml/kg) . Group B: received normal saline (0.9%)(13ml/kg). **Results:** our study showed that hypertonic saline (3%) was more effective than normal saline to prevent spinal induced hypotension and it did not affect the neonatal outcome. **Conclusion:** neonatal outcome was excellent with the use of either hypertonic saline (3%) or normal saline (0.9%) as a preload for the parturient who received spinal anesthesia before cesarean section.

Keywords: Blood Pressure, Diastolic Blood Pressure, Gestational Age, Systolic Blood Pressure

INTRODUCTION

Hypotension is the most common complication following spinal anaesthesia for cesarean delivery. In severe cases, it can have detrimental effects on both mother (unconsciousness and pulmonary aspiration) and neonate (hypoxia, acidosis, and neurological injury) [(1)]. The prevention of hypotension appears more likely to decrease maternal symptoms than the treatment of established hypotension [(2)]. Initial fluid administration with isotonic fluids is often used for the prevention of hypotension. It is well tolerated by healthy young patients but not in patients with cardiovascular restrictions. Because in patients with diminished cardiac reserve, if preloading is performed with a large volume of fluid, a substantial amount of excess free water will remain in the body after spinal anaesthesia, the excess free water may be harmful during postoperative recovery. Colloid preload seems to be more effective than crystalloid in the prevention of spinal anesthesia induced hypotension but they are linked to a number of complications like anaphylactoid reactions and changes in coagulation function [(3)]. Hypertonic saline increases plasma osmolarity and causes fluid shift from the intracellular to the extracellular space. This improves the hemodynamic changes occurring with spinal anaesthesia. There is no risk of allergic reactions like colloid infusion and is desired for cardiovascular restrictions because there is reduction of free water administration [(3)].

AIM OF THE WORK

This study compares between hypertonic saline (3%) and normal saline (0.9%) in prevention of spinal induced hypotension in females undergoing elective caesarean section.

PATIENTS AND METHODS

Type of Study: prospective randomized controlled Trial. **Study Setting:** the operating theatres of Ain shams University Hospitals at the gynecological and obstetric department, Cairo, Egypt**.** **Study Period:** 5 months. **Study Population:** pregnant females undergoing cesarean section under spinal anesthesia. **Inclusion Criteria:** ASA I,ASA II, 18 to 35 years old, ideal body weight 60-90 kg. **Exclusion Criteria:** Patient refusal, ASA III,ASA IV, age less than 18 or more than 35 years old, body weight less than 60 or more than 90 kg, if there is contraindication of spinal anesthesia like diseases of the central nervous system, marked degree of anemia, cardiac decompensation, patients with coronary artery disease, history of coagulation abnormality or bleeding tendency. **Group Allocation Method:** random. **Sample Size**: 40 Patients. **Ethical Considerations:** will be followed. **Study Procedures:** All Patients were assigned randomly by computer to two equal groups (20 patients per group)**.** ***Group A (20):*** Pregnant females received hypertonic

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saline (3%) as a preload before spinal anesthesia for elective cesarean section. ***Group B (20):*** Pregnant females received normal saline (0.9%) as a preload before spinal anesthesia for elective cesarean section. **Preoperative preparation:** Routine preoperative assessment was done to all the parturient before the operation including; medical history, clinical examination, laboratory investigations (i.e, complete blood picture, kidney function tests, liver function tests, prothrombin time, partial prothrombin time), chest X-ray (CXR) and Electrocardiogram (ECG). **The study was approved by the Ethics Board of Ain Shams University and an informed written consent was taken from each participant in the study. Statistical analysis:** Data were analyzed using Statistical Program for Social Science (SPSS) version 20.0. Quantitative data were expressed as mean +/- standard deviation (SD). Qualitative data were expressed as frequency and percentage. **The following tests were done:** Independent- samples t-test of significance was used when comparing between two means. Chi-square (X^2) test of significance was used in order to compare proportions between two qualitative parameters. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So the p-value was considered significant as follows: Probability (p-value): P-value ≤ 0.05 was considered significant. P-value ≤ 0.001was considered as highly significant. P-value > 0.05 was considered insignificant.

RESULTS

In our study 2 out of 20 parturient who received hypertonic saline (3%) needed ephedrine to maintain adequate blood pressure, but 15 out of 20 of the parturient who received normal saline (0.9%) needed ephedrine. This goes with ***Baraka et al.*** [8] as the mean dose of phenylephrine required to maintain systolic blood pressure > 75 % of the control value was greater in the group who received normal saline (0.9%) than the other group who received hypertonic saline (3%).

Table 1: Variation of demographic data among the study population.

	Group A	Group B	Test value*	P-value	Sig.
Age (years)	27.65 ± 2.68	27.30 ± 3.06	0.385	0.703	NS
Wt (kg)	70.40 ± 5.86	69.55 ± 5.87	0.458	0.649	NS
Ht (cm)	163.90 ± 5.07	164.10 ± 4.95	- 0.126	0.900	NS
G.A (wk)	38.80 ± 0.77	38.80 ± 0.77	0.000	1.000	NS

Table 2: Duration of surgery of estimated blood loss.

	Group A	Group B	Test value*	P-value	Sig.
Estimated blood loss (ml)	630.00±80.13	650.00±72.55	-0.827	0.413	NS
Duration of surgery(Min)	49.25±5.91	47.25±7.52	0.935	0.356	NS

Table 3: Blood pressure at T1.

T1	Group A	Group B	Test value*	P-value	Sig.
SBP	118.40 ± 4.33	118.70 ± 6.04	- 0.180	0.858	NS
DBP	74.55 ± 5.08	74.05 ± 5.59	0.296	0.769	NS
MBP	89.00 ± 3.77	88.5 5 ± 5.13	0.316	0.754	NS

Table 4: Blood pressure at (T2)

T2	Group A	Group B	Test value*	P-value	Sig.
SBP	117.90 ± 2.38	116.45 ± 3.24	1.614	0.115	NS
DBP	73.85 ± 6.63	72.30 ± 5.97	0.777	0.442	NS
MBP	88.10 ± 4.39	86.70 ± 4.18	1.033	0.308	NS

Table 5: Lowest blood pressure value at T3.

T3	Group A	Group B	Test value*	P-value	Sig.
SBP	94.70 ± 9.14	72.15 ± 6.23	9.117	0.000	HS
DBP	62.40 ± 7.49	43.85 ± 3.73	9.910	0.000	HS
MBP	73.05 ± 7.55	53.20 ± 3.37	10.723	0.000	HS

*: Independent t-test
NS: Non significant; S: Significant; HS: Highly significant
P-value > 0.05 Non significant
P-value < 0.05 Significant
P-value < 0.01 Highly significant

Table 6: Blood pressure in group A.

Group A	T1	T2	T3	Test value*	P-value	P1	P2	P3
SBP	118.40±4.33	117.90±2.38	94.70±9.14	98.221	0.000	1.000	0.000	0.000
DBP	74.55±5.08	73.85±6.63	62.40±7.49	22.528	0.000	1.000	0.000	0.000
MBP	89.00±3.77	88.10±4.39	73.05±7.55	55.042	0.000	0.875	0.000	0.000

Table 7: Blood pressure in group B.

Group B	T1	T2	T3	Test value*	P-value	P1	P2	P3
SBP	118.70±6.04	116.45±3.24	72.15±6.23	482.093	0.000	0.347	0.000	0.000
DBP	74.05±5.59	72.30±5.97	43.85±3.73	479.766	0.000	0.002	0.000	0.000
MBP	88.5 5±5.13	86.70±4.18	53.20±3.37	1000.568	0.000	0.007	0.000	0.000

P1: T1 VS T2
P2: T1 VS T3
P3: T2 VS T3

Table 8: Dose of ephedrine

	Group A	Group B	Test value*	P-value	Sig.
Dose of ephedrine	6.75± 1.06	11.80 ± 2.56	2.604	0.020	S

*: Independent t-test
NS: Non significant; S: Significant; HS: Highly significant
P-value > 0.05 Non significant
P-value < 0.05 Significant
P-value < 0.01 Highly significant

Table 9: Serum Na concentration.

Serum Na concentration	Group A	Group B	Test value*	P-value	Sig.
T1	137.15 ± 1.53	138.30 ± 2.23	- 1.903	0.065	NS
T2	137.75 ± 1.55	138.95 ± 2.48	- 1.834	0.075	NS
T3	138.90 ± 1.62	138.95 ± 2.52	- 0.075	0.941	NS
T4	139.10 ± 1.62	138.40 ± 2.28	1.119	0.270	NS

T1: Before preloading
T2: After preloading
T3: 30 min after preloading
T4: 90 min after preloading

Table 10: APGAR score after 1min and 5min.

	Group A	Group B	Test value*	P-value	Sig.
Neonatal Apgar (1min)	6.52 ± 0.75	6.30 ± 0.80	-0.916	0.366	NS
Neonatal Apgar (5min)	8.95 ± 0.76	8.80 ± 0.83	-0.595	0.555	NS

DISCUSSION

Anesthesiologists prefer spinal anesthesia for cesarean section because of its rapid onset, a dense neural block, little risk of local anesthetic toxicity and minimal transfer of drug to the fetus, as well as little risk of failure of block [4]. Hypertonic saline of different concentrations (3%,5%,7.5%) has been used in several studies for preloading before spinal anesthesia but for operations other than cesarean section [5,6,7]. Our study showed that the incidence of hypotension in group (A) who received hypertonic saline (3%) was 10% and the lowest blood pressures recorded were within 80% of the baseline. But hypotension occurred in 75% of the parturient in group (B) who received normal saline (0.9%) and the lowest blood pressure readings were less than 80% of the baseline. This goes with reports of ***Baraka et al.*** [8] who compared between (group I) hypertonic saline (3%) (7 ml/kg) and group (II) normal saline (0.9%) (7 ml/kg) as prehydration in patients undergoing transurethral resection of the prostate under spinal anaesthesia. The study showed that prehydration with hypertonic saline resulted in a significant increase in CVP and less hypotension after spinal anaesthesia compared with prehydration with isotonic saline. The incidence of systolic arterial pressure values < 75 % of control value was greater in group (II) than in group (I). This study compares between hypertonic saline (3%) and normal saline (0.9%) as a preload before spinal anesthesia in cesarean section to prevent spinal induced hypotension. This study measured and compared blood pressure before preload and after preload. The lowest readings throughout the surgery were recorded. Also in this study we measured APGAR score at 1 minute and 5 minutes and measured serum Na before preloading, after preloading and after 30 and 90 minutes of preloading. Also our results go with ***Wang et al.*** [9] who compared between hypertonic saline (3%) (7 ml/kg) and isotonic ringer's solution (7ml/kg) as a preload before spinal anesthesia in herniorraphy. The incidence of hypotension in hypertonic saline group was much less than that in normal saline group (17 out of 30 in normal saline group and 7 out of 30 in hypertonic saline group). According to ***Durasnel et al.*** [10], hypotension occurred in 2 out of 24 patients of who received hypertonic saline (7.5%) before spinal anesthesia and 8 out of 24 of the patients who received normal saline (0.9%) ($P < 0.05$). Also ***Durasnel et al.*** [10]**stated that** ephedrine was not required in hypertonic saline group, however in 7 out of the 24 patients of the isotonic saline group needed it. But according to ***Veroli and Benhamou*** [5] who compared between hypertonic saline (5%) (2.3ml/kg) and normal saline (0.9%)(13 ml/kg) as a preload before spinal anesthesia, patients required same amounts of ephedrine in the 2 groups to maintain an adequate blood pressure. Also According to ***Järvelä et al.*** [7] who compared between the effect of hypertonic saline (7.5%) (1.6 ml/kg) and normal saline (0.9%)(13ml/kg) on extracellular water volume when used for preloading before spinal anesthesia, The amount of etilefrine (adrenergic agonist, vasoconstrictor agent) administered to maintain hemodynamics was similar in the treatment groups. In our study, the maximum plasma serum sodium increase was 3mmol/l after hypertonic saline infusion. This goes with ***Veroli and Benhamou*** [5] **as** in the hypertonic saline group plasma concentration of sodium increased slightly but significantly after fluid preload. However, this increase was minimal and the maximal plasma sodium concentration observed was 147mmol/l. In our study we measured APGAR score and it was excellent in the 2 groups.

CONCLUSION

Use of hypertonic saline (3%) as a preload before spinal anesthesia in cesarean section was more effective than normal saline (0.9%) in prevention of

spinal induced hypotension. Also the use of ephedrine to maintain adequate blood pressure was more in the parturient who received normal saline (0.9%) than those who received hypertonic saline (3%). Use of hypertonic saline (3%) as a preload before spinal anesthesia was accompanied by just a small rise in plasma sodium level (about 2-3 mmol/l). Neonatal outcome was excellent with use of either hypertonic saline (3%) or normal saline (0.9%) as a preload for the parturient who received spinal anesthesia before cesarean section.

CONFLICTS OF INTEREST

There are no conflicts of interest.

REFERENCES

1. **Cyna AM, Andrew M, Emmett RS *et al.* (2006):** Techniques for preventing hypotension during spinal anaesthesia for caesarean section. Cochrane Database Syst Rev., 18(4).
2. **Husaini SW and Russell IF (1998):** Volume preload: lack of effect in the prevention of spinal-induced hypotension at caesarean section. Obstet Anesth., (7): 76–81.
3. **Azoubel G, Bartolomeu N, Mauricio F *et al.* (2008):** Operating room use of hypertonic solutions: a clinical review. Clinics (Sao Paulo), 63(6):833-840.
4. **Oh AY, Hwang JW, Song IA *et al*. (2014):** Influence of the timing of administration of crystalloid on maternal hypotension during spinal anesthesia for cesarean delivery: preload versus coload. BMC Anesthesiology, 14(1):36.
5. **Veroli P and Benhamou D (1992):** Comparison of hypertonic saline (5%), isotonic saline and Ringer's lactate solutions for fluid preloading before lumbar extradural anaesthesia. Br J Anaesth., 69(5):461-4.
6. **Kati J, Seppo EH, Timo J *et al.* (2000):** The Comparison of Hypertonic Saline (7.5%) and Normal Saline (0.9%) for Initial Fluid Administration Before Spinal Anesthesia, Anesth Analg., 91(7): 76-81.
7. **Järvelä K, Kööbi T, Kauppinen P *et al.* (2001):** Effects of hypertonic 75 mg/ml (7.5%) saline on extracellular water volume when used for preloading before spinal anaesthesia. Acta Anaesthesiol Scand., 45(6):776-81.
8. **Baraka A, Taha S, Ghabach M *et al.* (1994):** Hypertonic saline prehydration in patients undergoing transurethral resection of the prostate under spinal anaesthesia., Br J Anaesth., 72(2):227-8.
9. **Wang BW, Chiou YH, Chen WB *et al.* (1997):** Intravenous pretreatment ofhypertonic saline can prevent systemic hypotension induced by spinal anesthesia., Acta Anaesthesiol Sin., 35(2):85-90.
10. **Durasnel P, Cresci L, Madougou M *et al.* (1999):** [Practice of spinal anesthesia in a developing country: usefulness of vascular preloading with a 7.5% hypertonic saline solution]. Ann Fr Anesth Reanim., 18(6):631-5.