A COMPARATIVE STUDY BETWEEN THE EFFECT OF PRE-LOAD COLLOID AND CO-LOAD CRYSTALLOID ADMINISTRATION ON BLOOD PRESSURE AFTER SPINAL ANESTHESIA IN ELECTIVE CESAREAN DELIVERY

Basma Hassan, Raafat Abdel-Azim, DaliaAbdel-Hamid, Sanaa Farag and Heba Fouad Abd El Aziz Toulan

Department of Anesthesia, Intensive Care and Pain Management Faculty of Medicine - Ain Shams University

Corresponding Authors
Basma Hassan

Mobile: 01017002728

Email:
dr.basmahassan2010@gmail.com

Received: 9/3/2020
Accepted: 6/4/2020

Online ISSN: 2735-3540

ABSTRACT:

Background: *Hypotension following spinal anaesthesia is a common complication with an incidence ranging from 25-75% among general population and a little higher in women undergoing Caesarean section with more intraoperative and postoperative morbidity. Several techniques and protocols have been used for the prevention of this neuraxial hypotension with varying degree of success.*

Aim of the study: *to compare the effect of pre-load colloid and co-load crystalloid fluid administration on maternal blood pressure during spinal anesthesia for Cesarean delivery.*

Patients and Methods: *This Prospective, randomized, comparative clinical trial included fifty pregnant women whounder-went elective cesarean section under spinal anesthesia, aging 25-35 years old. The patients were divided into two equal groups, Pre-load group:received rapid infusion of a colloid solution 10 ml/kg of Voluven [6% Hydroxyethyl starch 130/0.4 in 0.9 Sodium Chloride] over 20 minutes before initiation of spinal anaesthesia.Co-load group: patients received a crystalloid solution 20ml/kg of lactated Ringer's solution at the beginning of the procedure of spinal anaesthesia over 20 minutes.*

Results: *There were no statistically significant differences between both groups regarding systolic, diastolic and mean blood pressure, as well as Oxygen saturation and heart rate at all times. Side effects (nausea and vomiting) and blood loss were insignificantly less in the co-load group compared to pre-load group. There was no statistically significant difference between both groups in Apgar score at 1min. and at 5min. There were no statistically significant differences between groups in the need for ephedrine and total dose administered.* ***Conclusion:*** *There is no significant difference between both groups in prevention of spinal anesthesia- induced hypotension in elective cesarean cases. Valuable time need not be wasted in preloading parturient as preloading alone is not effective for the prevention of maternal hypotension during a cesarean section under spinal anesthesia.*

Key words:*Caesarean, spinal anaesthesia, colloid.*

INTRODUCTION:

Hypotension following spinal anaesthesia is a common complication with an incidence ranging from 25-75% among general population and a little higher in women undergoing Caesarean section with more intraoperative and postoperative

morbidity[1]. Hypotension following spinal anaesthesia mainly occurs due to sympathetic block leading to peripheral vasodilatation and venous pooling of blood. As a consequence, there is a reduction in venous return and cardiac output leading to hypotension. The risk of hypotension is increased in a parturient due to the higher level of block (T4) required for Caesarean section and the unique physiological and anatomical changes of pregnancy which increase susceptibility to the effects of medical sympathectomy[2].

Several techniques and protocols have been used for the prevention of this neuraxial hypotension with varying degree of success. The usage of intravenous fluids to improve the blood volume with medical sympathectomy has been the most used as the primary line therapy among these protocols. Infusion of a crystalloid or a colloid solution is widely used for the prevention of maternal hypotension prior and during spinal anaesthesia administration, the techniques appropriately named as pre-loading and co-loading respectively. A combination of simultaneous rapid crystalloid infusion with vasopressor has also been suggested[3].

AIM OF THE WORK:

The aim of this work is to compare the effect of pre-load colloid and co-load crystalloid fluid administration on maternal blood pressure during spinal anesthesia for Cesarean delivery.

PATIENTS AND METHODS:

Thisprospective, randomized, compa-rative clinical trialhas been carried out in in the gynecology and obstetrics operating rooms at Ain-Shams University hospitals on females underwent elective cesarean section under spinal anesthesia, between January 2018 till January 2019 after approval of Research Ethics Committee (REC) of Faculty of Medicine, Ain Shams University and written informed consent from all the patients.

Eligibility of patients for the study included female patients age of 25-35 years, ASA physical status I, with weight ranges between 80-100 kg, height ranges between160-170 cm and healthy fetus by ultrasonography and cardiotocography (CTG).

Sample size:

A sample size of 50 patients into 2 equal groups, 25 each was determined based on a power of 80%, an alpha error 0.05 and 20% difference in the occurrence of hypotension.

Exclusion criteria:

Patients were excluded from the study if they had history of diabetes mellitus, cardiovascular, renal, hepatic or neuromuscular disease. Preoperative systolic blood pressure less than 90 mmHg. Psychiatric disorders. Refusal of participation in the study. Refusal of spinal anaesthesia and any contraindi-cateion of spinal anaesthesia (local infection, coagulopathy, anatomical difficulties, etc.).

Patients complying with all inclusion and exclusion criteria were randomly assigned to two equal groups 25 patients each. Pre-load Group: patients received rapid infusion of a colloid solution 10 ml/kg of Voluven [6% Hydroxyethyl starch 130/0.4 in 0.9 Sodium Chloride] over 20 minutes before initiation of spinal anaesthesia. Co-load group: patients received a crystalloid solution 20ml/kg of lactated Ringer's solution at the beginning of the procedure of spinal anaesthesia over 20 minutes.

Study procedure:

History, clinical examination and routine investigations including com-plete blood count (CBC), random blood sugar (RBS), liver function test (LFT), kidney function test (KFT), prothrombin time (PT) and activated partial thrombo-plastin time

(aPTT) were performed to all patients. Also, fetal health was checked by ultrasonography and fetal heart rate by cardiotocography (CTG). Demographic data including age, weight, height and parity were collected.

After admission to the induction room, baseline values of systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean blood pressure (MBP) were recorded. Eighteen-gauge cannula was inserted and antacid prophylaxis consisting of ranitidine 50 mg and metoclopramide 10mg intravenously be-fore surgery was given. No pre-operative sedation was given to the patients. The patient was fasting at least 6 hours before the procedure. After sterilization and infiltration of the skin with 2 ml of local anesthetic (2% lidocaine) in the sitting position, the lumbar puncture was performed at the level of L4/5 interspace by a 25- gauge spinal needle. Slow injection of 2 ml of 0.5% hyperbaric bupivacaine and 0.5 ml of fentanyl citrate (25 μg) was performed. Then, the patient was positioned in supine position and the head on a pillow. A slight left lateral tilt of the operating table was done after the fixation time has been reached. Fixation time is defined to be about 15 - 20 minutes after injection of a local anesthetic into the subarachnoid space, at which the block is fixed to a certain level(4). After 5 minutes from injection of local anesthetic, the assessment of sensory block was done using pinprick test (3-point scale). Hemodynamic data were recorded every 2 minutes in the first 6 minutes, then every 3 minutes till the end of fixation time, then every 5 minutes till the end of the surgery.

Ephedrine hydrochloride was given in increments of 3 mg for hypotension (reduction of SBP more than 20% of the preoperative value). The need for ephedrine and total dose used was calculated for each patient. Atropine sulphate was given in the dose of 0.01-0.02 mg/kg in case of bradycardia. Bradycardia is defined as heart rate less than 60 beats per minute(5). The surgeon was allowed to start after reaching the fixation time and after ensuring satisfactory spinal anesthesia level at T4.

After delivery, all patients received 20 IU of oxytocin IV and the baby was assessed by using APGAR score at first and fifth minutes(6). Intraoperative fluid management: after administration of the study fluids, patients in both groups received lactated Ringer's solution in a rate of 10 ml/kg/hour.In the event of excessive blood loss (>1000ml as asses-sed by volume in suction bottle and soaked swabs), the patient was excluded from the study and treatedappropriately. Management of any intraoperative complication of the technique (e.g. nausea, vomiting or excessive cephalic spread leading to respiratory insuffici-ency necessitating interference), study drugs (e.g. allergy or toxicity) or surgery (e.g. blood loss, urinary bladder or rectum injury) was done.

The following data were recorded and statistically analysed; demographic data: age, weight, height, gestational age, gravidity and dermatomal level of the block. Systolic blood pressure, diastolic blood pressure, mean arterial pressure and heart rate were recorded at baseline (before the block), then every 2 minutes in the first 6 minutes, then every 3 minutes till the end of fixation time, then every 5 minutes till the end of the surgery. Oxygen saturation (Intraoperative and for one hour postoperative). Blood loss (from skin incision till the end of surgery). Nausea and vomiting (from time of induction and for two hours postoperative). APGAR score at 1 and 5 minutes. Total doses of ephedrine needed.

Statistical analysis:

The statistical analysis was performed using a standard SPSS software package version 23 (SPSS Inc., Chicago, Illinois, USA). Normally distributed numerical data are presented as mean ± SD and differences

between groups were compared using the independent Student's t-test, data not normally distributed were compared using Mann-Whitney test and are presented as median and Inter-quartile range (IQR) and categorical variables were analyzed using the $\chi 2$ test or Fisher's exact testand are presented as number (%). All P values are two-sided. The confidence interval was set to 95% and the margin of error accepted was set to 5%.

$P < 0.05$ is considered statistically significant.

RESULTS:

A total of 50 subjects were enrolled in the study, they were divided into 2 equal groups. All the patients completed the study. There were no statistically significant differences between both groups regarding patients' characteristics, dermatomal level and duration of surgery (Table 1).

Table (1): Patients' characteristics, dermatomal level and duration of surgery.

Demographic data	Pre-load group *(n=25)*	Co-load group *(n=25)*	t-test	p-value
Age (years)	29.64±3.23	30.24±2.74	0.502	0.482
Height (cm)	164.76±3.06	164.20±3.07	0.418	0.521
Weight (kg)	87.60±6.22	88.80±6.82	0.422	0.519
Gestational age (weeks)	38.76±1.16	39.08±1.04	1.052	0.310
Gravidity: Median (IQR)	2 (1-3)	2 (1-3)	0.430	0.515
Dermatomal level: Median (IQR)	T4 (T2-T6)	T4 (T2-T6)	1.565	0.667
Duration of surgery (minutes)	68.52±7.7	72.01±6.8	1.698	0.095

Data are presented as mean ±SD, median (IQR).*t-Independent Sample t-test.*.

There were no statistically significant differences between both groups at all observation times regarding systolic blood pressure(Table 2), diastolic blood pressure (Table 3), mean blood pressure (Table 4), heart rate (Table 5)and oxygen saturation (Table 6).

Table (2): Comparison of systolic blood pressurevalues (mmHg) in both groups

Systolic blood pressure (mmHg)	Pre-load group *(n=25)*	Co-load group *(n=25)*	t-test	p-value
Pre-operative	122.40±5.34	123.56±6.35	0.489	0.488
At 2min.	116.00±7.79	118.44±6.99	1.358	0.250
At 4min.	111.72±8.83	114.12±8.58	0.950	0.335
At 6 min.	107.44±11.17	110.08±10.37	0.750	0.391
At 9min.	105.04±13.23	108.36±10.12	0.993	0.324
At 12min.	104.56±9.98	107.72±10.33	1.210	0.277
At 15min.	103.76±10.64	106.72±11.38	0.902	0.347
At 20 min.	104.72±10.62	106.56±9.44	0.419	0.520
At 25min.	106.24±8.39	105.32±9.70	0.129	0.721
At 30 min.	109.00±6.89	108.36±7.67	0.096	0.758
At 35 min.	110.33±6.86	109.60±8.10	0.116	0.735
At 40min.	108.63±4.79	109.76±7.33	0.408	0.526
At 45min.	108.29±4.69	109.76±6.77	0.773	0.384
At 50min.	110.75±6.15	111.10±6.82	0.026	0.874
At 55min.	109.00±6.68	111.82±6.48	1.417	0.244
At 60min.	108.42±7.27	110.12±6.23	0.457	0.505
At 65min.	108.80±6.76	110.08±5.76	0.159	0.696
At 70min.	111.50±9.04	109.00±7.62	0.204	0.665
At 75min.	112.50±10.61	111.50±4.95	0.015	0.915

Data are presented as mean ±SD.*t-Independent Sample t-test.*

Table (3): Comparison of diastolic blood pressurevalues (mmHg) in both groups.

Diastolic blood pressure (mmHg)	Pre-load *group (n=25)*	Co-load group *(n=25)*	t-test	p-value
Pre-operative	76.28±5.77	75.96±7.87	0.027	0.870
At 2min.	73.08±6.65	74.08±7.29	0.257	0.614
At 4min.	70.20±5.86	74.04±4.05	1.270	0.110
At 6 min.	68.44±5.58	72.00±6.32	1.457	0.140
At 9min.	67.56±6.02	71.32±4.60	1.157	0.117
At 12min.	66.72±6.27	70.28±6.55	0.852	0.155
At 15min.	65.60±5.87	69.36±3.68	0.735	0.109
At 20 min.	65.12±5.37	68.48±3.74	0.958	0.313
At 25min.	66.36±6.34	67.80±4.72	0.831	0.367
At 30 min.	67.44±6.28	68.40±4.96	0.360	0.551
At 35 min.	68.38±6.21	68.68±5.06	0.036	0.851
At 40min.	68.21±5.66	68.72±5.09	0.111	0.740
At 45min.	68.71±5.50	68.32±4.86	0.069	0.794
At 50min.	69.25±6.80	68.90±5.64	0.029	0.867
At 55min.	68.64±6.91	68.76±5.27	0.003	0.956
At 60min.	69.00±7.24	67.88±5.23	0.234	0.632
At 65min.	66.40±6.19	68.83±5.31	0.677	0.423
At 70min.	69.75±5.50	71.00±6.16	0.100	0.761
At 75min.	70.00±7.07	69.50±6.36	0.006	0.948

Data are presented as mean ±SD. *t-Independent Sample t-test.*

Table (4): Comparison of mean arterial blood pressure values (mmHg) in both groups.

Mean arterial blood pressure (mmHg)	Pre-load group *(n=25)*	Co-load group *(n=25)*	t-test	p-value
Pre-operative	91.60±5.12	91.84±7.03	0.019	0.891
At 2min.	87.28±6.19	88.84±6.60	0.743	0.393
At 4min.	84.04±5.83	87.36±4.82	2.811	0.133
At 6 min.	81.40±6.34	84.64±6.89	2.991	0.090
At 9min.	80.00±7.43	83.64±5.18	2.036	0.093
At 12min.	79.28±6.81	82.72±5.92	3.634	0.063
At 15min.	78.24±6.96	81.76±5.18	0.911	0.148
At 20 min.	78.28±6.37	81.16±5.11	1.110	0.184
At 25min.	79.68±6.09	80.24±5.55	0.115	0.736
At 30 min.	81.40±5.88	81.68±4.85	0.034	0.855
At 35 min.	82.33±5.35	82.28±5.22	0.001	0.972
At 40min.	81.71±4.56	82.28±4.95	0.176	0.676
At 45min.	81.83±4.58	82.16±4.53	0.063	0.803
At 50min.	83.13±5.62	82.90±5.03	0.016	0.900
At 55min.	82.21±5.94	83.12±4.37	0.238	0.629
At 60min.	82.08±6.11	82.00±4.37	0.002	0.966
At 65min.	80.40±5.68	82.67±4.31	0.815	0.381
At 70min.	84.50±4.93	83.40±5.59	0.095	0.767
At 75min.	84.00±8.49	83.50±6.36	0.004	0.953

t- Independent Sample t-test.

Data are presented as mean ±SD.

Table (5): Comparison of heart rate values (beat/min) in both groups.

Heart Rate (beat/min)	Pre-load *group (n=25)*	Co-load group *(n=25)*	t-test	p-value
Pre-operative	79.40±6.45	79.48±6.49	0.002	0.965
At 2min.	82.96±6.45	82.24±6.15	0.163	0.688
At 4min.	86.60±6.00	83.92±5.82	1.184	0.233
At 6 min.	93.24±7.28	90.16±6.98	2.333	0.133
At 9min.	95.92±9.54	93.20±9.03	1.072	0.306
At 12min.	97.04±6.04	94.16±6.98	2.434	0.125
At 15min.	98.36±6.70	95.04±8.69	2.289	0.137
At 20 min.	98.76±8.43	94.64±6.73	3.650	0.062
At 25min.	97.64±7.28	96.68±8.02	0.196	0.660
At 30 min.	94.48±5.97	93.76±8.60	0.118	0.733
At 35 min.	92.96±5.01	92.13±7.39	0.216	0.644
At 40min.	92.20±6.51	91.17±7.09	0.282	0.598
At 45min.	91.56±6.08	90.38±7.14	0.392	0.534
At 50min.	90.70±4.50	89.50±5.81	0.489	0.489
At 55min.	91.06±5.83	89.77±5.90	0.357	0.555
At 60min.	91.18±4.69	90.17±4.15	0.357	0.555
At 65min.	89.83±6.62	89.20±8.11	0.029	0.868
At 70min.	88.20±6.83	88.50±7.94	0.004	0.953
At 75min.	88.00±4.24	89.50±6.36	0.077	0.808

t- Independent Sample t-test

Data are presented as mean ±SD.

Table (6): Comparison of oxygen saturation values (%) in both groups.

SpO2%	Pre-load *group (n=25)*	Co-load group *(n=25)*	t-test	p-value
Pre-operative	98.36±0.49	98.60±0.48	2.939	0.093
At 2min.	98.36±0.49	98.60±0.50	2.939	0.093
At 4min.	98.36±0.49	98.60±0.50	2.939	0.172
At 6 min.	98.36±0.49	98.32±0.48	0.086	0.771
At 9min.	98.48±0.51	98.40±0.50	0.314	0.578
At 12min.	98.48±0.59	98.40±0.48	0.270	0.606
At 15min.	98.48±0.65	98.40±0.46	0.236	0.629
At 20 min.	98.36±0.49	97.64±1.71	0.927	0.340
At 25min.	98.52±0.65	98.40±0.50	0.532	0.469
At 30 min.	98.56±0.71	98.40±0.50	0.846	0.362
At 35 min.	98.36±0.49	98.42±0.51	0.159	0.692
At 40min.	98.36±0.49	98.42±0.50	0.159	0.692
At 45min.	98.41±0.50	98.35±0.48	0.148	0.702
At 50min.	98.55±0.60	98.35±0.49	1.153	0.290
At 55min.	98.35±0.49	98.43±0.51	0.174	0.679
At 60min.	98.47±0.62	98.33±0.47	0.402	0.531
At 65min.	98.42±0.51	98.20±0.46	0.669	0.426
At 70min.	98.40±0.55	98.25±0.47	0.179	0.685
At 75min.	98.50±0.71	99.00±0.00	1.000	0.423

t-Independent Sample t-test.

Data are presented as mean ±SD

Side effects (nausea and vomiting) and blood loss were insignificantly less in the co-load group compared to pre-load group and urine output was insignificantly less in the pre-load group compared to the co-load group (Table 7).

Table (7): Side effects, blood loss and urine output.

Side Effect	Pre-load group *(n=25)*	Co-load group *(n=25)*	t/x^2	p-value
Nausea	7 (28.0%)	5 (20.0%)	0.439#	0.508
Vomiting	5 (20.0%)	3 (12.0%)	0.595#	0.44
Blood loss (ml)	832.00±110.75	810.40±87.11	0.587	0.447
UOP (ml)	260.00±52.04	304.00±53.85	1.630	0.105

Data are presented as number (%) or mean ±SD. *t-Independent Sample t-test.* x^2 Chi square test

There was no statistically significant difference between both groups in Apgar score at 1min. and at 5min **(**Table 8). There were no statistically significant differences between groups in the need for ephedrine and total dose administered (Table 9).

Table (8): Apgar score.

Apgar score	Pre-load group *(n=25)*	Co-load group *(n=25)*	z-test	p-value
At 1min.	8.00±0.71	8.20±0.71	1.000	0.322
At 5min.	8.92±0.28	9.00±0.00	2.087	0.155

Data are presented as mean ±SD. *z-Mann-Whitney.*

Table (9): Comparison between both groups regarding use of ephedrine.

Ephedrine	Pre-load group *(n=25)*	Co-load group *(n=25)*	t/x^2	p-value
Need for ephedrine Yes No	 15 (60.0%) 10 (40.0%)	 17 (68.0%) 8 (32.0%)	0.347	0.556
Total doses of ephedrine (mg)	8.70±1.70	8.25±2.12	0.250	0.624

Data are presented as number (%) or mean ±SD. *t-Independent Sample t-test.* x^2 Chi square test.

DISCUSSION:

In this study, there was no difference in occurrence of spinal-induced hypotension, pulse rate, SpO_2 and neonatal Apgar score in pre-load group compared to co-load group. The incidence of side effects was lower in the co-load compared to pre-load but with no significant statistical difference. Vasopressor requirement was higher in pre-load colloid compared to co-load crystalloid but was statistically insignificant.

Regarding the incidence of hypotension, Tawfik et al., in 2014, studied 210 parturients undergoing cesarean section, who received either colloid pre-load or crystalloid co-load; there were no significant differences in the incidence of hypotension (52.4% vs. 42.2% respectively)[7]. Loubert in 2012 reported in his study that, the administration of co-loading fluid is superior to (or at least the same as) preloading fluid administration when using the same type of fluid for prevention of maternal hypotension. He concluded that crystalloid co-loading is superior to crystalloid pre-loading and similar to colloid preloading, while colloid co-loading is not superior to colloid preloading. Also when he compared the fluids of different types, crystalloid co-loading was similar to colloid co-loading,

the fluid volume needed with colloids was less than the volume needed with crystalloids and the use of larger volume of colloid preload provides no additional benefit[8].

Hahn (2010)studied the pharmaco-kinetics of crystalloid and colloid fluids. Colloids are distributed into only one compartment resulting in plasma expansion and they are eliminated by urinary excretion and insensible water loss. While crystalloids are distributed into two compartments; initially into central body fluid resulting in plasma expansion then redistributed peripherally to the interstitium after 30 minutes which leads to only 70% of the solution is retained in the plasma with same elimination as colloids. Plasma expansion by crystalloid is increased when it is administered after induction of spinal anesthesia. At the onset of spinal anesthesia, the central fluid compartment shrinks and becomes smaller than the plasma volume due to the fluid shift into peripheral venous compartment (splanchnic circulation and lower limbs). The distribution of crystalloid into the interstitium also decreases due to the fall in hydrostatic pressure as a result of spinal-induced vasodilatation and hypotension. These result in more volume expansion when crystalloid is infused as a co-load after spinal anesthesia which leads to the same effect as colloid pre-load administration and this leads to the same incidence of spinal-induced hypotension. Such findings agree with the present study[9].

Concerning the time of fluid administration, Farid et al. in 2016 showed that, the timing of fluid administration had no difference in the prevention of spinal induced hypotension[10]. A total of 74 patients undergoing cesarean section were included in their study. There was no statistically significant difference between the pre-load crystalloid group versus co-load crystalloid group(62.2% versus 48.6% respectively) in the incidence of spinal-induced hypotension. Another study by Sayed and Amjad in 2013 also showed that, there was no difference in incidence of maternal hypotension after spinal anesthesia in preload and co-load groups when using the same type of fluid in cesarean section and they concluded that neither of the two techniques effectively prevents spinal-induced hypotension[11].

Teoh and Sia in 2009found that, there were no significant differences between colloid pre-load versus co-load for spinal anesthesia for cesarean delivery in the incidence of hypotension[12]. On the contrast, Pandav et al., in 2017(Not in the references list) have shown that co-load fluid was better than pre-load fluid (with the same type of fluid) in prevention of spinal-induced hypotension. A total of 80 patients were randomly allocated in two equal groups to receive either crystalloid pre-load or co-load[13]. This is not Pandav et al. The incidence of hypotension between the two groups was found in pre-load group (72.5%) and only (27.5%) in the co-load group. This difference was statistically significant.

Varshney and Kapoor in 2016 studied hypotensive incidence for forty patients after spinal anesthesia in elective cesarean section. The patients were randomized in two groups: pre-load crystalloid and co-load crystalloid. The incidence of hypotension was 40% in pre-load group as compared to 15% in co-load group with a significant difference[14]. Khan et al. (2015) studied 100

patients randomized into two equal groups to receive either crystalloid pre-load or co-load in cesarean section under spinal anesthesia. Maximum episodes of hypotension were found in pre-load group 70% and only 44% in the co-load group. The difference was statistically significant[15].

Regarding pulse rate**,** there was no statistically significant difference in the heart rate between the two groups in the current study. These findings are similar to the study done by Aparna et al. (2016) Not in the references listthat compared pre-load and co-load crystalloid groups posted for cesarean section under spinal anesthesia[16]as well as Tawfik et al. (2014) who confirmed this in their study that compared pre-load colloid and co-load crystalloid groups undergoing cesarean section under spinal anesthesia[7]. On the other hand, Varshney and Kapoor in 2016 reported that the incidence of tachycardia after spinal anaesthesia in cesarean section was significantly higher in the pre-load crystalloid group compared to co-load crystalloid group[14]. This reflex tachycardia to hypotension could be explained as intravenous co-load infusion of crystalloid after spinal anaesthesia provided better control of arterial pressure and heart rate than intravenous pre-load infusion. Crystalloid co-load is subjected to rapid redistribution but the fluid administration can be timed with anesthesia to achieve the maximum increase in intravascular volume as vasodilatation occurs.

Concerning oxygen saturation (SpO_2), there was no significant difference in the current study between the two groups. The same results also were confirmed by Aparna et al. in 2016Not in the references list[16]This is not Aparna et al. (2016),Varshney and Kapoor in 2016[14].

Neonatal Apgar score was recorded at 1 and 5 minutes and there was no significant statistical differencein this study between the two groups. Aparna et al. in 2016 Not in the references listand Varshney and Kapoor in 2016 studies have recorded the same neonatal outcome[14].

Side effects (nausea, vomiting) and blood loss were lower in the co-load group in the current study but there was no significant statistical difference. Farid et al. in 2016 showed no significant difference in side effects between the two groups who received crystalloid fluid either as pre-load or co-load inparturients undergoing cesarean section with spinal anaesthesia[10]. Also Teoh and Sia in 2009 found that, there were no significant difference in incidence of nausea and vomiting between colloid pre-load versus colloid co-load groups under-going cesarean section[12]. Pandav et al. in 2017showed that the incidence of nausea and vomiting was higher in pre-load crystalloid group than co-load crystalloid group after spinal anesthesia for cesarean section and this difference was statistically significant[13].

Vasopressor requirement was higher in pre-load colloid than co-load crystalloid in the current study but with no statistically significant difference. Dyer et al. in 2010 demonstrated lower vasopressor requirement with crystalloid co-load than crystalloid pre-load as intravenous co-hydration infusion after spinalanaesthesia provided better control of arterial pressure and low vasopressor requirement[17].

Study Limitations:

The used BP measurement was only noninvasive blood pressure and could not get beat to beat or every minute measurement for maternal BP.

Conclusion:

Our results demonstrate that there is no significant difference between colloid preloading and crystalloid co-loading in prevention of spinal-induced hypotension in cesarean section.

REFERENCES:

1. *Friedly C, Simmons S, Riddle D. Prophylactic ondansetron for prevention of maternal hypotension following spinal anesthesia in women undergoing cesarean section. Int J Evid Based Healthc. 2016;14(4):196–7.*
2. *Lee A, Kee WDN, Gin T. A quantitative, systematic review of randomized controlled trials of ephedrine versus phenylephrine for the management of hypotension during spinal anesthesia for cesarean delivery. AnesthAnalg. 2002;94(4):920–6.*
3. *Loughrey JPR, Yao N, Datta S, Segal S, Pian-Smith M, Tsen LC. Hemodynamic effects of spinal anesthesia and simultaneous intravenous bolus of combined phenylephrine and ephedrine versus ephedrine for cesarean delivery. Int J ObstetAnesth. 2005;14(1):43–7.*
4. *Povey HMR, Jacobsen J, Westergaard-Nielsen J. Subarachnoid analgesia with hyperbaric 0.5 % bupivacaine: effect of a 60-min period of sitting. ActaAnaesthesiol Scand. 1989;33(4):295–7.*
5. *Bishop DG. Predicting spinal hypotension during Caesarean section. South African J AnaesthAnalg. 2014;20(4):170–3.*
6. *Finster M, Wood M. The Apgar Score Has Survived the Test of Time. Anesthesiology. 2005;102(4):855–7.*
7. *Tawfik MM, Hayes SM, Jacoub FY, Badran BA, Gohar FM, Shabana AM, et al. Comparison between colloid preload and crystalloid co-load in cesarean section under spinal anesthesia: a randomized controlled trial. Int J ObstetAnesth. 2014;23(4):317–23.*
8. *Loubert C. Fluid and vasopressor management for Cesarean delivery under spinal anesthesia: Continuing Professional Development. Can J Anesth. 2012;59(6):604–19.*
9. *Hahn R G. Volume kinetics for infusion fluids. Anesthesiology. 2010; 13(2):470-81.*
10. *Farid Z, Mushtaq R, Ashraf S, Zaeem K. Comparative efficacy of crystalloid preloading and co-loading to prevent spinal anesthesia induced hypotension in elective caesarean section. Pak J Med Heal Sci. 2016;10(1):42–5.*
11. *Sayed A & Amjad I. Comparison between preloading & coloading. PakArmed Forces Med J. 2013; 65(2):231-5.*
12. *Toeh A and Sia H. Comparative study between colloid preload and coload. Anesth Analg. 2009; 108(5): 1592-8.*
13. *Pandav A, Hanch M, Curlin F, et al. A better option than crystalloid pre-load for prevention of hypotension. World Journal of pharmaceutical and medical research. 2017; 3 (3): 188-92.*
14. *Varshney RK, Kapoor K. A Randomised Prospective Double Blind Study to Compare The Effects of Fluid Preloading and Co-Loading During Spinal Anaesthesia for Caesarean Delivery . Ann Int Med Dent Res. 2016;2(1):410–4.*
15. *Khan M U, Memon A S, Ishaq M. & Aqil M. Preload versus coload and vasopressorrequirement for the prevention of spinal anesthesia induced hypotension in non-obstetric patients. Journal of the College of Physicians and Surgeons Pakistan.2015; 25(12): 851–5.*
16. *Apara G, Omshubham A and Abhimanyus S. Comparative evaluation of co-loading versus pre-loading for prevention of post-*

spinal hypotension. Indian Journal of Clinical Anesthesia.2016; (3): 335-41

17. *Dyer R A, Farina Z, Joubert A, Du Toit P, Meyer M, Torr G. Crystalloid Preload versus RapidCrystalloid Administration after Induction of Spinal Anaesthesia (Coload) for Elective Caesarean Section. Anaesthesia and Intensive Care. 2010; 32(3), 351–7.*

المقارنة بين تأثير إعطاء السوائل الغروية قبل التخدير والسوائل البللورية أثناء التخدير على ضغط الدم بعد التخدير النصفي خلال الولادة القيصرية الإختيارية

رأفت عبد العظيم حماد و داليا عبد الحميد نصرو سناء فرج محمود وهبه فؤاد عبدالعزيز طولان
و الطبيبة / بسمه حسن محمد السعيد.

الملخص

المقدمة:التخدير النصفي للعمليات القيصرية يتميز بفوائد عديدة مقارنة بالتخدير الكلي كالإسترخاء القوي للعضلات وأيضآ يمنح إفاقة جيدة بعد إنتهاء العملية و من خلال التخدير النصفي نتجنب مخاطر التخدير الكلي على الأم مثل اليقظه أثناء التخدير الكلي و صعوبة وضع الأنبوبه الحنجرية و النزيف الحاد أثناء إجراء العمليه و من خلال التخدير النصفي نتجنب أيضآ تعرض الجنين لأدوية التخدير الكلي و نسرع إلتحاق المولود بأمه. قد أستخدمت تقنيات عديدة لمحاولة تجنب إنخفاض ضغط الدم الذي يعقب التخدير النصفي كالحقن بالتنقيط, تقليل جرعة المخدر الموضعي أو استخدام الأدوية القابضة للأوعية. يعتبر الحقن بالتنقيط الوريدي المسبق للتخدير طريقة آمنة و فعالة و لكنها تستهلك الكثير من الوقت ولايمكن استخدام هذه الطريقة في كل الأوقات و خاصة في حالات الحوادث. و لذلك تمت محاولات عديدة من قبل الباحثين لدراسة مدى كفاءة التنقيط الوريدي المصاحب للتخدير النصفي بدلآ من التنقيط المسبق و نالت المحاولات نسبة نجاح مختلفة. **الهدف من الدراسة:** المقارنة بين تلك المجموعتين من حيث ضغط الدم الإنقباضي و الإنبساطي و المتوسط و ضربات القلب و كذلك حدوث مضاعفات كالقيء و الغثيان و كمية الإحتياج للأدوية القابضة للأوعية الدموية و تأثير كل هذا على حالة الجنين. **الطرق والحالات:** المقارنة بين تأثير إعطاء السوائل الغروية قبل التخدير والسوائل البللورية أثناء التخدير على ضغط الدم بعد التخدير النصفي خلال الولادة القيصرية الإختيارية ٢٥ سيده في كل مجموعة.**النتائج:** تم التوصل إلى أن التنقيط الوريدي المسبق و المصاحب للتخدير النصفي لا يختلفان كوسائل مستخدمه لمنع حدوث انخفاض ضغط الدم بعد التخدير النصفي في حالات العمليات القيصرية. **الخاتمة:** و بناء على ذلك فإن إهدار الوقت من أجل التنقيط الوريدي المسبق للتخدير لا فعالية معينة أو فائدة محددة له خاصة مع ضيق الوقت لمنع انخفاض ضغط الدم للأم الناجم عن التخدير النصفي.