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Optimization of Neuroaxial Anesthesia in Cesarian Section

**Atashov Aybek Raimberganovich, Sapaev Otabek Kadirovich, Ruzmatov Izzatbek Bakhtiyorovich,
Sobirov Elyorbek Jumyozovich, Sabirov Umidbek Sabirjanovich, Avezova Sadokat Yuldashevna**

PhD. Senior Lecturer, Department of Pediatric Surgery, Anesthesiology-Reanimatology, Urgench Branch of Tashkent
Medical Academy, Uzbekistan

MD Head of the Department of Pediatric Surgery, Anesthesiology-Reanimatology, Urgench branch of Tashkent
Medical Academy, Uzbekistan

PhD. Senior Lecturer, Department of Pediatric Surgery, Anesthesiology-Reanimatology, Urgench Branch of Tashkent
Medical Academy, Uzbekistan

Assistant Senior Lecturer, Department of Pediatric Surgery, Anesthesiology-Reanimatology, Urgench Branch of
Tashkent Medical Academy, Uzbekistan

Assistant Senior Lecturer, Department of Pediatric Surgery, Anesthesiology-Reanimatology, Urgench Branch of
Tashkent Medical Academy, Uzbekistan

Assistant Senior Lecturer, Department of Pediatric Surgery, Anesthesiology-Reanimatology, Urgench Branch of
Tashkent Medical Academy, Uzbekistan

RELEVANCE: Spinal anesthesia is currently the main method of anesthesia for caesarean section, providing a fast, deep and symmetrical high quality sensory motor unit. However, despite the measures taken (the use of low doses of local anesthetics, preventive volumetric preinfusion, vasopressors, tight bandaging of the legs and the "left-hand" position), arterial hypotension remains a frequent complication of neuroaxial anesthesia and, under certain conditions, can lead to severe disruption of the basic life support systems, as with sides of the mother and the newborn [1,6,7,8,9, 12,15].

Historically, preventive fluid therapy and left uterine displacement have been considered a means of reducing the incidence of hypotension [7]. However, recent studies have questioned these recommendations. It was shown that with a combination of preload and "left-hand" position, significant arterial hypotension occurred in about half of the women studied [7,9,11,12]. In this connection, the obligatory intravenous administration of crystalloid in a large volume to prevent spinal-induced hypotension in a woman in labor was questioned [10,13]. In addition, the association between an increase in crystalloid volume and a decrease in postpartum colloid osmotic pressure raises concerns about the risk of maternal and fetal pulmonary edema [13].

Research Jackson R, et al., (1995), Husaini SW, Russell I.F. (1998) showed that 1000 ml of a single crystalloid is not more effective than preloading with 200 ml or without prehydration [10,11].

The aim is to study the effect of different volumes of preinfusion with crystalloids for the prevention of arterial hypotension performed under spinal anesthesia during cesarean section.

I. MATERIALS AND RESEARCH METHODS

In total, we used spinal anesthesia (SA) as an anesthetic aid for abdominal delivery in 470 women (aged 21 to 36 years). In the structure of extragenital pathology, chronic anemia of varying severity prevailed - in 135 (71.4%), urinary tract infection (BMI) - 139 (29.5%), type 1 diabetes mellitus in the stage of compensation - 45 (9.5 %), chronic nonspecific lung diseases - 29 (6.1%), all operations were performed in a planned manner. The indications for surgery were: disease of the operated uterus, inconsistency of the scar on the uterus, clinical narrow pelvis, high myopia. The duration of the surgery ranged from 30 to 50 minutes. Risk degree according to ASA II degree.

Anesthesia technique. After premedication with diphenhydramine (0.2 mg / kg) under local infiltration anesthesia in the position "on the side" at the level L3-L4 or L2-L3 (not higher), a lumbar puncture was performed followed by the introduction of a 0.5% hyperbaric solution of longocaine (bupivacaine) heavy calculated according to the pro-

posed method [6]. Longocaine heavy (Yuria Pharm), the original hyperbaric solution of 0.5% bupivacaine solution with a solution density of 1.026. For puncture, needles of the Pencil Point 25G type were used. Immediately after intrathecal administration of anesthetic solutions, the patients were turned "supine" and the Fowler position was placed on the operating table and a "left-hand" position was created. Fowler's position was maintained until the end of the operation.

All patients were divided into group II. I (231) - I intravenous infusion was carried out with 0.9% sodium chloride in a volume of 10-15 ml / kg, II (239) - I Rheosorbilactom 5 ml / kg. Surgical intervention began after the appearance of all signs of the surgical stage of SA (complete segmental sensory-motor block), as a rule, at 4-6 minutes. Perioperative infusion was 10-15 ml / kg with 0.9% sodium chloride. After the fetus was removed, sibazone (0.07-0.15 mg / kg) was injected intravenously in order to reduce psychoemotional stress.

A feature of Rheosorbilact is a composition balanced in potassium, calcium and magnesium, which contains an excess of sodium in the form of two salts - chloride and lactate. The sodium in this preparation provides an osmolality of about 600 mosmol / kg. It contains sorbitol in an isotonic concentration (60 g / l), which together provides a theoretical osmolality of about 900 mosmol / l, which is 3 times higher than the plasma osmolality. Due to its high osmolality, it causes the flow of fluid from the intercellular space into the vascular bed, providing a good volemic effect [3].

Non-invasive monitoring of central and peripheral hemodynamics was studied using a cardiorespiratory apparatus KM-AR-01 "DIAMANT" (St. Petersburg) in the mode of integral rheography and impedance measurement. For comparison, we used the norms, indicators of water balance developed by the manufacturers of the apparatus KM-AR-01 "DIAMOND" [4]. Measurements at each stage were carried out three times, taking into account the average result. The following hemodynamic parameters were studied: SDS - mean dynamic pressure (mm Hg, HR - heart rate (beats / min); cardiac index (l / min m²), OPSS - total peripheral vascular resistance (dyn. The state of the ANS was assessed by the method of mathematical analysis of the heart rate according to S.Z. Kletskin [5] The variation range ($\square x$), mode (Mo), amplitude of the mode (AMo), stress index (TI) were studied. in 4 stages: 1st - on the operating table before preliminary infusion of crystalloids, 2nd - before a skin incision after reinfusion and at the height of anesthesia, 3rd - immediately after fetal extraction, 4th - after the end of the operation.

Newborns were assessed on the Apgar scale at 1 and 5 minutes. The results obtained were processed statistically using the Student's t-test.

II. RESULTS AND ITS DISCUSSION

The initial state of women in labor was characterized by moderate tachycardia, a slight increase in SDS, a decrease in the one-time and minute cardiac output, and activation of the sympatho-adrenal system.

Adequate block (stage II) for the operation was achieved in all study groups. The peak level of the motor block in the groups corresponded to Th VIII. The average time to reach the block to the dermatomal level reached 4.2 ± 0.18 min. The intraoperative quality of anesthesia was excellent in both groups.

Against this background, all women examined by us recorded a significant decrease in SDP within the range of 13.7-13.4%, a decrease in heart rate by 7.7-5.1% relative to the initial values. At the same time, cardiac output was significantly lower than the initial values only in the first group, despite significant preinfusion, relative to the outcome by 18.7%, while in the second it tended to decrease. The pharmacological effects of CAn led to a selective decrease in sympathetic influences (decrease in IN by 41-36.6%). No signs of suppression of the function of external respiration, as well as significant changes in SpO₂, were recorded.

Comparative assessment of the studied parameters between the studied groups showed a decrease in TPR and SI in group I relative to group II by 15.7 - 7.3%, respectively (P < 0.05).

The patients did not react to a skin incision, as well as the most traumatic stages, including fetal withdrawal, and did not present any complaints. Attention was drawn to the excellent muscle relaxation at the appropriate segmental level, which is in no way inferior to that when using muscle relaxants.

Immediately after fetal extraction (III), despite the outwardly calm behavior of women and the absence of any complaints, a significant increase in cardiac output by 19.3% was noted in the second group relative to the outcome. At the same time, OPSS, SDS and IN in both groups remained significantly low relative to the initial values (table). Comparative assessment of the studied indicators between the studied groups showed still lower indicators of OPSS and SI in group I relative to II, respectively, by 12.7 - 6.4% (P < 0.05).

Immediately after the end of the operation, the studied hemodynamic parameters, SpO₂, remained stable. At the same time, SI in group II was significantly higher than the outcome by 16.1%, systemic vascular resistance still remained below the initial values by 13.2% (P < 0.05). Against this background, ID in women of group I was significantly lower than the outcome by 7.3%. While the IN in group II, as before, remained significantly higher than in group I, respectively, by 7.3%.

Thus, the onset of anesthesia was rapid (average 4 minutes for both groups). The peak level of the motor block reached Th VIII. The duration of the sensory-motor block practically did not differ in the studied groups and corresponded to 178.4±12.4 minutes in the 1st and 181.5 to 11.5 minutes in the 2nd.

The development of hypotension in group I requiring correction by vasopressors (mezaton 50 µg injected fractionally) was in 113 (48.9%) patients, 79 (33.1%) women in group II developed arterial hypotension, of which 49 (20, 5%) required an additional injection of 50 µg mesatone. Considering the above, it can be assumed that the volumetric infusion of crystalloids (0.9% sodium chloride) did not provide reliable hemodynamic and vegetative stability [16]. This can be explained by the rapid redistribution of the crystalloid into the interstitial space, as well as the release of atrial sodium uretic peptide for rapid infusion, which has a vasoplegic effect [14]. At the same time, the use of Rheosorbilact in the program of low-volume infusion therapy provided a good volemic effect due to high osmolarity and rapid redistribution of fluid from the intercellular space into the vascular bed, provided a more stable hemodynamic and vegetative profile throughout the operation [2].

Intense pain syndrome in patients of both groups developed 4-6 hours after the end of the operation.

In 5 cases, transient neurological symptoms (paresthesia of the lower extremities and pain along the root) were noted, which was associated with technical errors in performing SAn.

The SAn variants studied by us did not have a negative effect on newborns. The average score according to the Apgar scale was significantly high in the studied groups and ranged from 7-9.

We did not register any signs of drug-induced depression in newborns at birth, which allowed the formation of an adequate physiological response to the birth process, regardless of the SAn variant.

III. CONCLUSIONS

1. Neuroaxial anesthesia with 0.5% longocaine heavy solution (hyperbaric bupivacaine) is a highly effective and safe method of anesthesia for caesarean section.
2. The proposed SAN options do not have a pronounced negative effect on the main life support systems of the mother and the newborn.
3. The use of Rheosorbilact 5-7 ml / kg as a pre-infusion, in comparison with 0.9% sodium chloride 10-15 ml / kg, provided a more stable hemodynamic and vegetative profile.
4. The development of arterial hypotension in group I requiring adrenomimetic correction was observed in 113 (48.9%) patients and in 79 (33.1%) women, II of whom 49 (20.5%) required additional administration of mezaton 50 mcg.

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Table
Some indicators of central hemodynamics and ANS during cesarean section

Indicators	Gr	Research stages			
		I	II	III	IV
SI l/min m2	I	3,2±0,15	2,6±0,14*	3,4±0,16**	3,48±0,17
	II	3,1±0,14	2,96±0,16	3,7±0,15*,**	3,6±0,15*
OPSS dyn / s • cm5	I	1648,6±79,1	1228±52,1*	1308,6±62,3*	1518,3±60,3**
	II	1750,2±82,4	1456,2±58,3*,***	1498,6±50,2*,***	1520,6±56,4*
SDD mm. Hg	I	93,3±1,7	80,6±1,5*	83,3±1,6*	90,3±1,5**
	II	95±1,63	83,3±1,7*	86,6±1,5*	93,3±1,6**
Heart rate In min	I	89,3±1,4	82,2±1,2*	86,6±1,4	88,4±1,6
	II	88,8±1,6	84,3±1,4*	87,2±1,6	86,2±1,5
IN (conv. units)	I	384,4±7,93	265,4±5,6*	324,2±7,8*,**	356±8,2*,**
	II	379,8±8,85	286,3±4,5*,***	346±8*,**,***	382,4±7,4**,***

Note. * - reliability of differences in relation to the initial values, ** - reliability of differences to the previous stage, *** - reliability of differences between groups.



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