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Evaluation of the effectiveness of central blockade in pregnant women with mitral stenosis

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Summary. The study was carried out in order to determine the most rational and safest variant of regional anesthesia for abdominal delivery in patients with moderately pronounced mitral stenosis with an area of 2.9-2.0 cm^2 and decreased coronary reserves. The latter included 51 women. All patients are divided into three equal groups depending on the type of anesthesia. The patients of the 1st group were operated under conditions of spinal anesthesia, the 2nd - under the conditions of epidural anesthesia, the patients of the 3rd group were operated on under the conditions of balanced epidural anesthesia with reduced concentrations of local anesthetic in combination with fentanyl and preventive analgesia. At the stages of anesthesia and surgery, the central and peripheral hemodynamics and the functional state of the sympathoadrenal and hypothalamic-pituitary systems were studied. It was found that the most rational and safe method of pain relief in patients with mitral stenosis and reduced coronary reserves is epidural anesthesia with reduced concentrations of bupivacaine hydrochloride in combination with fentanyl and preventive analgesia.

Key words: spinal anesthesia, variants of epidural anesthesia, cesarean sections, mitral stenosis, coronary reserves.

Central (neuraxial) blockades (CNB), in particular, spinal anesthesia (SA), are recognized as the most rational method of anesthetic management during caesarean section (1, 2, 3, 10, 11). Meanwhile, their use in patients with reduced coronary reserves provoked by mitral stenosis (MS) may be accompanied by severe hemodynamic disturbances caused by high segmental blockade, as well as a decrease in the adaptive capacity of the cardiovascular system (APVSS) (2,3,5). In this case, the most problematic is the contingent of patients with moderately expressed MS with an area of 2.9-2.0 cm^2. In whom, already at a gestational age of 34-36 weeks, circulatory failure and hypokinetic circulatory regime are formed. Thus, pregnant women with MS 2.9-2.0 cm^2 are at high risk of developing intra- and postpartum (postoperative) complications and require an individual approach in each specific clinical situation. (4.5). In this regard, the study of the state of hemodynamics in pregnant women with MS during the use of the CNS in order to determine the safest and most acceptable method of anesthesia in obstetric practice is of particular importance.

Objective of the study : to assess the parameters of blood circulation and the effectiveness of SA and EA variants in pregnant women with moderate MS and reduced adaptive capacity of the cardiovascular system during CS.

Materials and methods of research: the study is based on the results of clinical observations and a complex of clinical, functional and biochemical studies during cesarean section (CS) in 51 women aged 20-28 years with a gestation period of 34-36 weeks. All patients had moderate MS (A.N. Okorokov). The indication for early delivery in this contingent of patients is progressive circulatory failure associated with an increase in gestational age according to multifactorial criteria for the degree of preservation of coronary reserves (there should be a link to your articles Samarkand with your names, 7). In all 51 cases, the adaptive capacity of the cardiovascular system was reduced. The operation was performed in a planned manner, their duration was 30-60 minutes. All patients are divided into 3 equal groups depending on the method of pain relief. Patients of group I (n-37) were operated on under conditions of SA, group II (n-37) - under conditions of traditional EA. In 27 patients of the 3rd group, EA was performed with reduced concentrations of local anesthetic in combination with fentanyl.

The technique of anesthesia was as follows; after intravenous administration of diphenhydramine (diphenhydramine) at a dose of 0.2 mg / kg and dexamethasone (0.07 mg / kg) in the 1st group of patients at the LII-LIV level, puncture of the subarachnoid space was performed, followed by the introduction of 2.0-2 , 5 ml (10.12.5 mg) 0.5% hyperbaric solution of bupivacaine hydrochloride. The dose of bupivacaine hydrochloride was calculated according to individual patient characteristics morphometric [□8,7,5,]

In the second group of patients, after a similar premedication under local infiltrative anesthesia in the lateral position at the Th_{XII}- L_{I} level , puncture and catheterization of the epidural space were performed. The catheter was inserted in the cranial direction at 4 + 5 cm, followed by the introduction of a test dose (2.0 ml of 2% lidocaine hydrochloride solution). In the absence of signs of CA, a 0.5% isobaric solution of bupivacaine hydrochloride was injected fractionally slowly through an epidural catheter at the rate of 1.25-1.5 ml per spinal segment. Method EA at III-th group of women differed from the previous one using preventive analgesic paracetamol, administered in / neposredstvennoo to puncture and cannulation of the epidural space in a 1% solution in a volume of 100 ml (infulgan), [□10,11,4]□and using a 0.375% solution of bupivacaine hydrochloride in combination with fentanyl (1.4 μg / kg). The operation began with the appearance of clinical signs of complete segmental motor blockade. Patients were given a “left-handed” position, and the head and middle fragments of the operating table were raised by 10-15º (Fowler position). After the fetus was removed, diazepam (sibazone 0.2 mg / kg) was administered intravenously in order to reduce psychoemotional stress.

The effectiveness of pain relief was judged on the basis of generally accepted clinical signs. The level of the sensory block was assessed by the loss of pain sensitivity (pin prick test). The upper limit of the blockade was assessed after its stabilization. The P. Bromage scale was used to assess the depth of motor blockade. Central hemodynamics was studied by echocardiography using an SA-600 apparatus (Medison). Stroke index (SI), cardiac index (SI), total peripheral vascular resistance (OPSS) were studied. Average dynamic pressure (FBC), heart rate (HR), hemoglobin oxygen saturation (SpO_2) monitored by the monitor Schillera. (4,9,15,). The adequacy of anesthesia was assessed by the stress index (TI) using a mathematical analysis of the heart rate (9), by the level of total cortisol (CK) in the blood plasma (radioimmune method) and the rate of excretion of norepinephrine (NA) in the urine (10).

The research was carried out in 4 stages:

I- On the operating table;

II- Before a skin incision;

III- At the most traumatic stage of the operation

(removal of the fetus, revision of the abdominal cavity);

IV- After the end of the operation;

All numerical values obtained in the study were processed by the methods of variation statistics using the Student's test (using Microsoft Excel) and presented in the form M + -m where M is the arithmetic mean, m is the standard error of the mean, the differences were considered statistically significant at $p < 0.05$ ... The results obtained are presented in table 1, 2.

Results and discussion Characterizing the clinical course of SA in group I, it should be noted that the classic signs of a complete segmental sensory-motor block developed by 6-8 minutes after the subarachnoid injection of the calculated dose of local anesthetic and persisted for 1.5-2 h. At the same time, the segmental level of sensory blockade corresponded to Th_5-Th_6 dermatomes. When EA variants were used (groups 2-3), signs of complete segmental sensory-motor blockade were formed by the 15-18th minute, the segmental level of sensory blockade corresponded to Th7-Th9 dermatomes, the duration of the surgical stage of EA was 1.5-2 hours. It should be noted that in patients of group III, 8-10 minutes after the epidural administration of anesthetic solutions, a pronounced sedative effect was observed, probably due to the systemic action of fentanyl, which made it possible to further abandon the administration of benzodiazepines. During the entire operation, including at its most traumatic stages, the patients of all 3 study groups did not react, did not present any complaints, and did not require additional pain relief. No signs of respiratory depression were observed. However, the absolute value SpO_2 do not exceed 94-96%, requiring periodic oxygen inhalation. The initial state of hemodynamics in all three studied groups fit into the hypodynamic type of blood circulation. There was a pronounced tachycardia, a significant decrease, relative to the proper values, one-time and minute cardiac output, SD and OPSS were increased, and minute urine output corresponded to the lower limits of its physiological fluctuations (see Table 1). There were no intergroup differences in the studied indicators.

Against this background, a rather pronounced activation of the sympathetic division of the ANS was recorded. However, it did not go beyond the boundaries of physiological fluctuations (IU was 336.4 + 20.6-349.4 + 35.7 conventional units). The predominance in the negative balance of the activity of the sympathetic division is associated with pregnancy, a decrease in coronary reserves, and circulatory insufficiency, which has a negative effect on the main life support systems of women in labor. The concentration of SA in blood plasma and NA in urine was also increased relative to those in patients with a normal pregnancy at 34-36 weeks. There were no significant intergroup differences in the studied indicators.

Before the skin incision against the background of a complete segmental block in patients of all three groups, the classic clinical and functional manifestations of central segmental blockade were recorded

- a decrease in heart rate, a decrease in SD and TPR (see Table 1), significantly more pronounced with the use of SA. Thus, SD and OPSS in group I patients decreased by 28.9% and 17.2%, HR by 11.4%, respectively. This required vasopressor support. Against this background, SI significantly decreased to 2.43 ± 0.04 L / m2 / min to 1,97 ± 0,06l / m ^{2} / min. At the same time, the changes in the studied hemodynamic parameters in patients of the II group were not of such a pronounced character. SD and TPR decreased only by 16.4% and 10.3, respectively, and heart rate was adjusted by 6.4%. SI tended to decrease and amounted to 2.28 ± 0.09 l / m2 / min. Group 3 patients had minimal hemodynamic changes. SD and TPR decreased only by 9.1% and 4.8%, heart rate was adjusted by 2.7%. SI was 2.72 ± 0.09 l / m2 / min, not significantly differing from the initial values.

It should be noted that vasopressor support was required in the 1st group of patients in 100% of our observations, in the 2nd group only in 6 (42.8%), and in the 3rd group - only in 2 women (11.7%).

Immediately before the operation, against the background of complete segmental sensory-motor and sympathetic blockade, a significant decrease in IU was recorded in patients of group I by 31.8%, which indicated a significant decrease in sympathetic influences and the degree of tension of the regulatory systems of the heart rhythm. At the same time, blood plasma SC increased by 53.1%, which is due to an adequate protective reaction of the hypothalamic-pituitary-adrenal system to the restructuring of hemodynamics and a decrease in sympathetic influences.

At this stage, in patients of groups 2 and 3, IN had only a tendency to decrease, amounting to 298.2 ± 20.2 conv., Respectively. units and 218,, 4 ± 302.1 ± 20.5 conventional units. At the same time, the concentration of SC in blood plasma significantly increased by 42% (group 2) and 33.5% (group III). At the most traumatic stages of the operation, significant changes in the studied parameters of hemodynamics in all 3 study groups relative to the previous stage were not reserved. As before, the most significant changes were observed in the 1st group of patients in whom SA was used, minimal hemodynamic disturbances were recorded in the 3rd group with the use of a local anesthetic (see Table 2.). SI in all 3 studied groups significantly increased relative to the initial to operational values and the previous stage of the study, amounting to 446.4 ± 21.6 conv units, 450.2 ± 23.4 conv units and 490.8 ± 24.3 conv units, respectively. Accordingly, the concentration of SC in the blood plasma increased, reaching 743.3 ± 38.4 nmol / l in group I, 687.2 ± 36.1 nmol / l in group II, 677.6 ± 37.4 nmol / l in group III. / l. It should be noted that in none of the three study groups did the studied parameters go beyond the "stress-norm", thereby confirming the adequacy of anesthesia.

The end of the operation in patients of all studied groups was accompanied by a tendency towards the normalization of the studied hemodynamic parameters (see Table 2), however, the hypodynamic regime of blood circulation was still maintained.

All patients registered a significant, relative to the previous stage of the study, anticipation of heart rate, an increase in minute urine output. SI in patients of groups 2 and 3 did not differ significantly from prenatal values. At the same time, in patients of group I SDD, SI minute urine output remained significantly lower, while being 76.4 ± 1.6 mm.article, 2.21 ± 0.05 ml / min / m2 and 0.42 ± 0.03ml / min (see tab 2).

The end of the operation was accompanied by a moderate intensity of the regular systems of the heart rhythm. SI in patients of groups I, II, III significantly exceeded the preoperative absolute values by

23.6, 17.4 and 16.8%, respectively. The plasma concentration of SC at this stage of the study was moderately decreased, but did not differ significantly from the previous stage of the study (see Table 2). NA excretion with urine during the operation compared to the initial preoperative values increased in group I by 13.1 ± 1.1 nmol / l, in group II by 12.5 ± 1.3 n / mol / l and in group III th by 12.3 ± 1.3 n / mol / l.

The above indicates a moderately pronounced activation of the sympathoadrenal and hypothalamic-pituitary-adrenocortical, and hypothalamic-pituitary-adrenocortical systems in response to surgical trauma, confirming the high efficiency of the CNS variants we used.

Summarizing the above, we can conclude that, in view of the high antinociceptive efficacy of the CNS variants we used, EA with reduced concentrations of bupivacaine in combination with fentanyl should be considered the most acceptable in terms of safety due to its minimal negative effect on the main life support systems.

Conclusions:

1. The most appropriate method of anesthetic management for CS in patients with moderately severe MS and reduced coronary reserves with gestational age of 34-36 weeks is balanced epidural anesthesia with reduced concentrations of 0.375% bupivacaine solution in combination with fentanyl at a dose of 1.4 µg / kg and preventive analgesia 100ml of 1% paracetamol solution.
2. The method is highly effective, has a minimal effect on central hemodynamics, and provides the possibility of continuous postoperative pain relief.

	Studied parameters					
Research stages	Groups	Heart rate, in min	SDD, mm Hg	SI, 1 / m ^{2} / min	OPSS dyn / s × m $^{-5}$	Minute diuresis ml / min
On the operating table	1	98.8 ± 1.2	87.8 ± 3.2	2.34 ± 0.04	1806.1 ± 60.4	0.52 ± 0.02
	2	97.6 ± 1.8	86.8 ± 4.1	2.42 ± 0.07	1796.4 ± 58.4	0.54 ± 0.04
	3	98.5 ± 1.8	85.9 ± 3.1	2.43 ± 0.05	1788.0 ± 60.1	0.54 ± 0.02
Before skin incision	1	87.5 ± 1.1 * Δ	62.4 ± 2.6 ** □	1.9 ± 0.06 * Δ □	1495.5 ± 70.6 * Δ	0.19 ± 0.01 * Δ □
	2	91.4 ± 1.2 * Δ	72.6 ± 1.9 * Δ □	2.13 ± 0.05 * Δ	1612.1 ± 64.4 *	0.32 ± 0.01 * Δ □
	3	95.9 ± 1.4	78.1 ± 1.8 *	2.28 ± 0.09 *	1703 ± 58.4	0.41 ± 0.01 *
Traumatic stage	1	104.4 ± 2.3 *** □	72.9 ± 2.1 ***	2.12 ± 0.09 ***	1769.9 ± 82.3 **	0.26 ± 0.01 *** Δ □
	2	101.2 ± 1.2 **	75.8 ± 2.2 *	2.2 ± 0.07 *	1714.5 ± 67.4	0.39 ± 0.01 *** Δ □
	3	100.3 ± 1.8	80.2 ± 1.6	2.3 ± 0.06	1713.2 ± 60.9	0.47 ± 0.02 *** □
End of operation	1	98.1 ± 2.1 **	76.4 ± 2.1 *	2.21 ± 0.05 * Δ	1720.3 ± 54.6	0.42 ± 0.03 ***
	2	96.2 ± 2.1 **	76.9 ± 2.0 *	2.38 ± 0.06Δ **	1615 ± 58.1 *	0.51 ± 0.04 **
	3	94.1 ± 1.9 **	78.6 ± 2.4	2.45 ± 0.08	1604 ± 56.6 *	0.59 ± 0.03 **

Table 1 Some indicators of hemodynamics and peripheral circulation at the stages of anesthesia and surgery

Note: * - statistically significant differences (p <□0.05) relative to the initial preoperative values; ** - statistically significant differences (p <□0.05) relative to the previous stage of the study; Δ

- statistically significant differences (p <□0.05) between groups I and II; □ - statistically significant differences (p <□0.05) in comparison with group III;

table 2 **Some indicators of the autonomic, sympathoadrenal and hypothalamic-pituitary-adrenocortical systems at the stages of anesthesia and surgery,**

Studied parameters	group	Research stages			
		On the operating table	Before skin incision	Traumatic stage	End of operation
Ying, mustache. units	1	336.4 ± 20.6	229.4 ± 208 ** Δ	446.4 ± 21.6 Δ	416.1 ± 22.3 *
	2	349.6 ± 18.6	289.2 ± 20.2 **	450.2 ± 23.4Δ	410.3 ± 21.3 *
	3	339.4, ± 23.1	302.1 ± 20.5	490.8 ± 24.3 * Δ	396.6 ± 20.2 *
SC, nmol / l	1	410.8 ± 26.4	628.2 ± 26.1 * □	734.3 ± 38.4 Δ	691.5 ± 29.3 □
	2	402.3 ± 38.4	582.7 ± 32.5 *	687.2 ± 36.1 * Δ	627.4 ± 30.6 *
	3	390.5 ± 34.3	521.4 ± 30.8 *	677.6 ± 37.4 * Δ	601.4 ± 32.6 *
NA, nmol / l (urine)	1	8.9 ± 1.2	-	-	13.1 ± 1.1 *
	2	9.1 ± 1.1	-	-	12.5 ± 1.3 *
	3	8.8 ± 1.2	-	-	12.3 ± 1.3 *

Note: * - statistically significant differences (p <□0.05) relative to the initial values; Δ-statistically significant differences (p <□0.05) relative to the previous stage of the study; ** - statistically significant differences (p <□0.05) between groups I and II; □ - statistically significant differences (p <□0.05) relative to the third group;

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