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Intraoperative Sedation With Dexmedetomidine During Cesarean Section Under Spinal Anesthesia

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Abstract.

Cognitive dysfunction associated with surgical intervention and anesthesia is one of the most discussed problems in modern anesthesiology. Thirty-five women were examined, including those with premature pregnancy, uterine scarring after cesarean section, congenital or acquired pathology of pelvic bones, absence of neurological symptoms of brain damage, preeclampsia, and myopia. Analysis of the results of this study revealed that sedation with dexmedetomidine is preferable during cesarean section surgery under spinal anesthesia.

Keywords. *Spinal anesthesia, POCD, sedation, dexmedetomidine (quanadex), sibazon, cesarean section.*

Introduction.

Postoperative cognitive dysfunction (POCD) is a cognitive disorder that develops in the early postoperative period and persists in the late postoperative period, clinically manifested as memory impairment, difficulty concentrating, and impairment of other higher cortical functions (thinking, speech, etc.) [2,5].
Cognitive impairment after surgery is a common and undesirable phenomenon, and interest in it is accompanied by an increasing number of scientific papers published recently [1]. In recent years, there have been reports of a definite relationship between the drugs used for anesthesia and POCD, making it possible to reduce the risk of cognitive impairment by optimizing anesthetic management. In 2011, the European Medicines Agency investigated and approved dexmedetomidine (quanadex) as a highly selective alpha-2-adrenoreceptor agonist, which was proposed as a sedative, anxiolytic, and analgesic drug for general, regional anesthesia, and sedation of patients in intensive care units [3]. Despite the large number of studies, there is currently no unified opinion or clinical protocol for the prevention and treatment of postoperative cognitive disorders.

Purpose of the study: To investigate the effect of sedation with dexmedetomidine during spinal anesthesia on POCD after cesarean section.

Materials and methods:

This prospective, randomized study was performed in Multidisciplinary Clinic of Samarkand State Medical University in the Department of Obstetrics and Regional Perinatal Center (Samarkand). Thirty-five women

were examined, including those with premature pregnancy, uterine scarring after cesarean section, congenital or acquired pathology of pelvic bones, absence of neurological symptoms of brain damage, preeclampsia, and myopia. Exclusion criteria were: massive blood loss (> 30% of CBC), eclampsia, chronic nonspecific and acute lung diseases, cardiovascular diseases, morbid obesity, and patient's refusal to undergo CA. All patients were examined by an anesthesiologist before surgery and were ASA class II compliant. All pregnant women provided written informed consent for anesthesia and received standard preoperative preparation: compression bandaging of the lower extremities and pre-infusion of 500 mL of 0.9% sodium chloride solution.

The study groups were comparable with respect to baseline variables including age, weight, ASA physical status (class II), gestational age, and extragenital pathology. There were also no significant differences in the perioperative period (sensory level of anesthesia, duration of surgery, intraoperative infusion, and blood loss), with the duration of the operative intervention ranging from 30 to 40 min.

All women were divided into two groups. In the 1st group (n = 18), sedation was administered with sibazon (5 mg). Puncture of the subarachnoid space was performed at the level of the LII-LIV with Pencil-Point G 25-26 needles in the supine position. A hyperbaric solution of 0.5% bupivacaine with a density of 1.026 was injected slowly (within 2 min). The anesthetic dose was calculated according to the proposed dosage. In group II (n = 17), starting from the moment of premedication, 0.5 μg/kg quanadex (Yuria Pharm) was administered intravenously for 15 min, the maintenance dose was 0.5-0.8 μg/kg/h throughout the operation until its completion.

Cognitive function was evaluated using the Mini-Mental State Examination (MMSE) scale, and the depth of sedation was controlled using the Richmond Agitation-Sedation Scale (RASS) and maintained at -2 and -3.

Statistical processing was performed using "Data analysis," "Descriptive statistics" using the program package "Microsoft Excel" 2013 with a package of statistical processing applications. The criterion of significance was the value of the error probability index or the probability of accepting an erroneous hypothesis (p) of not more than 5% ($p \leq 0.05$).

Results and their discussion.

After fractional injection of sibazon 5 mg (1st group) and a 15-minute intravenous loading dose of quanadex (2nd group), a degree of sedation of 2.8±0.12 was observed in the 1st group of patients, while in group II - 2.4±1.6 points. At the height of anesthesia before skin incision, RASS parameters in the 1st group, increased by 7.4% to moderate, and in the 2nd group, it decreased by 8.2% (P>0.05) to a mild degree. After fetal retrieval, the RASS in the 1st group increased by 10.4% (P>0.05) by the end of the operation and decreased by 8.7% (P>0.05) and 70.8% (P 0.05), respectively, 4 h after the end of the operation relative to baseline. In the 2nd group, the degree of sedation at all stages of the study according to the RASS remained stable within -2.1 and -1.8 points (P>0.05) (Table 2). The initial cognitive status one day before the operation showed no statistically significant differences between the groups. According to the MMSE, the median score in the 1st group was 28 points, whereas that in the 2nd group was 28.5 points (Table 1). The frequency of POCD development in the early postoperative period in both groups was 14.3% (5 patients), of which 11.4% (4 women) belonged to the 1st group and 2.9% (1 woman) to 2nd group. The dynamics of the cognitive status indicators during the postoperative period are shown in Table 1.

Table 1. Indicators of cognitive functions in the pre- and postoperative period

Cognitive status	1st group (n = 18)	2nd group (n = 17)	p
Mini mental state examination scale, preoperative period, scores	28 [27; 29]	28 [28; 29]	0,001
Mini mental state examination scale on the 1st day, scores	27 [26; 28]	28 [27; 29]	0,05
Mini mental state examination scale on the 5th day, scores	29 [27; 29]	30 [29; 30]	0,001

As can be seen from Table 1, the cognitive status on all scales used in the study was lower on the 1st day after surgery, and it should be noted that the effect of anesthetic drugs had ended by the time of neuropsychological testing and all women were lucidly conscious.

Table 2. Some indicators of the main life support systems during intravenous sedation with sibazon and quanadex during cesarean section.

Indicators	Group	On admission	After admission to the operating room	During the dominant effect of spinal anesthesia	After skin incision	After fetal retrieval	End of surgery	Next day after surgery	On the day of patient discharge
HR, beats per min.	1	92,3±7,2	98,3±2,1	93,1±2,6	88,4±0,8*	88,2±2,8	76,1±2,8**	72,1±2,8	74,1±1,8***
	2	90,8±3,1	88,4±6,4	86,7±3,1	82,7±1,2*	80,6±1,6	72,3±1,6**	73,3±1,6	72,3±1,6
BP systolic mm Hg.	1	136,35±6,4	138,4±8,5	104,8±3,7*	107,4±3,6	112,7±0,4**	112,7±0,4	112,7±0,4	100,4±1,4***
	2	135,7±5,3	127,7±1,7	112,4±0,8*	111,6±6,8	118,4±9,3**	118,4±9,3	118,4±9,3	97,4±5,3
BP diastolic mm Hg.	1	92,3±4	77,3±6,2	67,4±4,2*	60,4±9,3	59,2±3,3	55,2±3,3**	67,2±3,3	62,2±3,3***
	2	91,7±2,4	71,8±0,4	64,8±3,3*	67,2±8,1	70,4±8,1	62,4±8,1**	72,4±8,1	66,4±8,1
SpO_2	1	97,4±1,4	98,1±0,3*	95,7±0,9**	96,5±6,3	97,3±2,4	97,3±2,4	97,3±2,4	98,3±0,4***
	2	98,2±3,3	96,6±2,7*	98,4±1,6**	97,8±1,1	98,7±0,7	98,7±0,7	98,7±0,7	97,7±0,7
CI, l/min×m^2	1	2,46±0,035	2,30±0,025	2,32±0,047*	2,41±0,04**	2,50±0,06	2,64±0,6	2,40±0,06	2,38±0,06***
	2	2,41±0,031	2,27±0,04	2,31±0,062*	2,47±0,016**	2,41±0,03	2,31±0,03	2,61±0,03	2,25±0,03
SVR, dyn ×s×cm^{-5}	1	1879,2±40,5	1823,5±21,1	1743±18,1*	1651±0,05	1750±0,17**	1720±0,17	1720±0,47	1630±0,6
	2	1881,5±31	1878,2±19,7	1741±30,5*	1667±20,2	1763±9,3**	1753±9,3	1703±8,3	1603±0,3
RASS (scores)	1		0±0,0	0±0,0	0±0,0	-2,8±0,12***	-1,5±0,12	0±0,0**	0±0,0
	2		1,5±0,14	-2,2±0,7	-2,7±0,4 *	-2,4±1,6	-2,2±0,5	0±0,0**	0±0,0

Note: * reliability of differences to the outcome; ** to the previous stage; *** between groups (P < 0.05)

Hemodynamic parameters, blood oxygen saturation during the operation, and parameters of laboratory and instrumental studies after the operation were within acceptable values. The observed decrease in HR and BP in the mother is probably related to the activation of central postsynaptic adrenoreceptors -2 by dexmedetomidine, which leads to a decrease in sympathetic activity, with a subsequent decrease in BP and HR. The initial state of hemodynamics in the studied patients was characterized as hypertensive-hypodynamic dissociation, systolo-diastolic dysfunction was present in the structure of hemodynamic changes, low Cardiac Index (CI) - in 1st and 2nd groups, respectively, 2,46±0,035 and 2,41±0,03 1/min×m2, high systemic vascular resistance (SVR) 1879,2±40,5 and 1881,5±31 dyn×s×cm^{-5}. Minute cardiac output and SVR at the stages of anesthesia in both groups corresponded to the clinical and physiological picture of spinal anesthesia without sharp changes even during the most traumatic stage of surgical intervention. in the 1st group the CI changes were more pronounced relative to the 2nd group, at the height of anesthesia and after the end of the operation. Thus, it was significantly lower by 3.2% and 2.8%, respectively. A comparative evaluation of the effect of dexmedetomidine and sibazon on the level of consciousness (RASS) showed that sedation induced by dexmedetomidine is characterized by easier awakening of patients, which provides more effective interaction and communication with the medical staff. The simultaneous presence of dexmedetomidine's analgesic properties, especially in the sense of potentiating the effect of opioids and the absence of respiratory suppression, seems to be useful, especially before fetal extraction or during premedication.

Analysis of the results of the study revealed a statistically significant difference in the level of cognitive function between the groups on the 1st and 5th day after surgery. Thus, on the 1st and 5th days after surgery, the cognitive status indicators in the group using dexmedetomidine were significantly higher than those in the group using sibazon, indicating a minimal negative effect of spinal anesthesia with dexmedetomidine sedation on cognitive potential in women in labor.

Conclusion.

Sedation with dexmedetomidine is preferable for cesarean section surgery under spinal anesthesia. Its use leads to a decrease in the frequency of POCD in the early postoperative period, a decrease in the intensity of pain syndrome, and a favorable effect on recovery and activation after surgery.

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