UDC: 618.291.618.3-06

REDUCTION IN THE INCIDENCE OF POSTOPERATIVE COGNITIVE DYSFUNCTION IN WOMEN UNDERGOING CAESAREAN SECTION UNDER SPINAL ANESTHESIA WITH DESMEDETOMIDINE SEDATION


Matlubov Mansur Muratovich, Khudoyberdiyeva Gulrukh Sobirjonovna
Samarkand State Medical University, Republic of Uzbekistan, Samarkand

ДЕСМЕДЕТОМИДИН БИЛАН МЕДИКАМЕНТОЗ СЕДАЦИЯ ҚИЛИНГАН СПИНАЛ АНЕСТЕЗИЯСИ ОСТИДА КЕСАР КЕСИШ ОПЕРАЦИЯСИНИ ЎТКАЗГАН АЁЛЛАРДА ОПЕРАЦИЯДАН КЕЙИНГИ КОГНИТИВ ДИСФУНКЦИЯ ЧАСТОТАСИНИ КАМАЙТИРИШ

Матлубов Мансур Муратович, Худойбердиева Гулрух Собиржоновна
Самарқанд давлат тиббиёт университети, Ўзбекистон Республикаси, Самарқанд ш.

СНИЖЕНИЕ ЧАСТОТЫ ПОСЛЕОПЕРАЦИОННОЙ КОГНИТИВНОЙ ДИСФУНКЦИИ У ЖЕНЩИН, ПЕРЕНЕСШИХ КЕСАРЕВО СЕЧЕНИЕ ПОД СПИНАЛЬНОЙ АНЕСТЕЗИЕЙ С МЕДИКАМЕНТОЗНОЙ СЕДАЦИЕЙ ДЕСМЕДЕТОМИДИНОМ

Матлубов Мансур Муратович, Худойбердиева Гулрух Собиржоновна
Самаркандский государственный медицинский университет, Республика Узбекистан, г. Самарканд

e-mail: mansur.matlubov@gmail.com

Резюме. *Замонавий анестезиологияда энг кўп муҳокама қилинадиган масалалардан бири бу жарроҳлик аралашуви ва беҳушлик билан боғлиқ когнитив бузилишдир. Операциядан кейинги когнитив бузилиш кенг тарқалган ва исталмаган ҳодиса бўлиб, унга қизиқиш яқинда нашр этилган илмий ишлар сонининг кўпайиши билан бирга келади. Операциядан кейинги когнитив дисфункция синдроми (КДС) операциядан кейинги даврда ривожланиши мумкин бўлган ва жарроҳлик ва беҳушлик туфайли юзага келадиган юқори ақлий функцияларнинг бузилишини англатади, Л.С. Расмуссеннинг сўзларига кўра, бу эрта босқичларда ривожланадиган ва операциядан кейинги кеч даврларда давом этадиган, клиник жиҳатдан хотира бузилиши, қийинчилик билан намоён бўладиган когнитив касалликдир. Диққатни жамлаш ва бошқа юқори кортикал функцияларнинг бузилиши (фикрлаш, нутқ ва бошқалар.), нейропсихологик тест маълумотлари билан тасдиқланган. Бундан ташқари, анестетик дорилар бевосита токсик таъсир билан тавсифланади. Бир қатор муаллифлар беҳушликнинг когнитив функцияларга салбий таъсирини тасвирлайди.*

Калит сўзлар: *дексмедетомидин, операциядан кейинги когнитив дисфункция, спинал анестезияси, кесарча кесиш, седация.*

Abstract. *One of the most discussed issues in modern anesthesiology is cognitive impairment associated with surgical intervention and anesthesia. Postoperative cognitive impairment is a common and unwanted phenomenon, and interest in it is accompanied by an increase in the number of scientific works published recently. Postoperative cognitive dysfunction syndrome (PKD) refers to disorders of higher mental functions that can develop in the postoperative period and are caused by surgery and anesthesia, according to L.S. Rasmussen, is a cognitive disorder that develops in the early stages and persists in the late postoperative periods, clinically manifested by memory impairments, difficulty concentrating attention, and impairments of other higher cortical functions (thinking, speech, etc.), confirmed by neuropsychological testing data. In addition, anesthetic drugs are characterized by a direct toxic effect. A number of authors describe the negative impact of anesthesia on cognitive functions.*

Keywords: *dexmedetomidine, postoperative cognitive dysfunction, spinal anesthesia, cesarean section, sedation.*

Introduction. To date, the mechanisms of influence of individual anesthetics and associated agents on the vital processes of nerve cells and cognitive function have been formulated. Thus, propofol, barbiturates, benzodiazepines, isofluorane, and halotane suppress neuronal activity, while general anesthetics indirectly block glutamate and acetylcholine receptors in the limbic region and thalamus. The

concentration of these receptors is especially high in the structures responsible for behavior and emotions - the hippocampus, the tonsils, and the optic thalamus. Additionally, barbiturates cause mitochondrial dysfunction, potentiating glutamate toxicity. Ketamine, nitrogen oxide, xenon also affect cortical GABA receptors, but indirectly, through NMDA receptors [5]. Despite a large number of studies, there is currently no consensus and clinical protocols on the prevention and treatment of postoperative cognitive impairments. The goal is to reduce the risk of POD development by optimizing drug sedation during cesarean section.

Postoperative cognitive dysfunction (POCD) remains one of the most significant complications following surgery, particularly in vulnerable populations such as parturients undergoing cesarean section. The underlying mechanisms of POCD are complex and multifactorial, involving direct neurotoxic effects of anesthetic agents, perioperative hemodynamic fluctuations, inflammatory responses, and individual patient susceptibility. Barbiturates, in particular, may induce mitochondrial dysfunction, potentiating excitotoxicity through glutamate-mediated pathways.

Despite extensive research, standardized clinical protocols for the prevention and treatment of POCD remain limited. Current strategies focus on optimizing anesthetic management, maintaining hemodynamic stability, and selecting sedative agents that provide sufficient analgesia and anxiolysis while minimizing adverse neurocognitive effects. This study aims to evaluate the impact of dexmedetomidine sedation during cesarean section under spinal anesthesia on the incidence of early postoperative cognitive dysfunction, hemodynamic stability, and overall recovery profile, compared to traditional sedative agents such as sodium oxybutyrate.

Material and methods. To fulfill the assigned tasks, during the period from 2024 to 2025, at the SamSMU multidisciplinary clinic, 38 women at gestational ages of 37-40 weeks were examined and delivered via planned cesarean section, including: full-term pregnancy, uterine scar after cesarean section, congenital or acquired pelvic bone pathology, preeclampsia, as well as high-degree myopia. Exclusion criteria were: massive blood loss (more than 30% CBC), eclampsia, chronic nonspecific and acute lung diseases, cardiovascular diseases, morbid obesity, patient's refusal to undergo CA, as well as patients with fluctuations in blood pressure (intraoperative blood pressure decrease by 30% or more of the initial value), hemodynamic instability, and those requiring vasopressor support were excluded from the study. All patients were examined by an anesthesiologist on the eve of the operation and corresponded to class II according to ASA. All pregnant women gave written informed consent for anesthesia and examination. All pregnant women underwent standard preoperative preparation: compression bandage of the lower extremities, preliminary infusion of 0.9% sodium chloride solution - 500 ml. All women were divided into 2 groups. In group I (n = 15), sedation with sodium oxybutyrate 40 mg/kg was performed. Subarachnoid space puncture was performed at the LII-LIV level using Rencil-Roint G 25-26 type needles in a lateral position. A hyperbaric solution of 0.5% bupivakaine solution with a solution density of 1.026 was administered slowly (2 min). The anesthetic dose was calculated according to the proposed dosage [3]. In group II (n =15), starting from premedication, 0.5 mcg/kg of dexmedetomidine (Kvanadexa, "Yuria Pharm") was administered intravenously for 15 minutes, the maintenance dose was 0.5-0.8 mcg/kg/h throughout the entire operation until its completion. Cognitive functions were assessed using scales: MMSE (Mini Mental State Examination - brief mental status assessment scale), sedation depth was monitored using the RASS scale and maintained at the level of -2,-3. No deaths or life-threatening complications were observed. Two women were excluded from the study due to their refusal of neuropsychological testing in the postoperative period according to the study protocol. Statistical processing was carried out by the "Data Analysis," "Descriptive Statistics" section using the "Microsoft Excel" 2013 software package with a statistical processing application package. The significance criterion was the value of the error probability indicator, or the probability of accepting the erroneous hypothesis (p) – not more than 5% ($p \leq 0.05$).

Research results and their discussion. As our studies have shown, all 38 women had high-effectiveness CA. The prevalence level of the complete sensory-motor block corresponded to Th4-S5 dermatomas. Throughout the operation, including its most traumatic stages, patients showed no reaction or complaints. Signs of respiratory depression were observed in group I in 5 pregnant women. SpO2 was 90-94%. In the main group, no signs of respiratory depression were observed. Hemodynamic stability was maintained (see Table 1). However, when assessing hemodynamic changes in the 1st group, unlike the 2nd group of women, an increase in heart rate (HR) from 88.2±2.3 bpm to 94.8±2.5 bpm was established, an increase in SBP at all stages of observation, a slight decrease in the heart index (HI), and an increase in OPSS.The activation of the sympathetic regulation link was also the highest in the 2nd group of women using dexmedetomidine, with a stress index (SRI) of 398.2±9.1 units at the most traumatic stage of the operation, however, a low content of total cortisol (SC) of 120.8±3.1 nmol/l was noted in women. (see Table 1).

Table 1. Some indicators of the main life support systems during intravenous sedation with sodium oxybutyrate and dexmedetomidine during cesarean section

Studied parameters		Stages of research				
		I	II	III	IV	V
Heart rate, in 1 minute	1 gr.	90,7±3,1	91,9±2,1*	90,2±2,6*	96,6±2,3	92,2±1,1*
	2 gr.	89,7±2,1	84,9±1,1*	84,2±1,6*	85,6±1,3	82,2±2,1*
SAD. M m.s.u	1 gr.	97,2±1,4	89,6±1,2*	83,2±2,1*	92,4±1,6	91,1±1,2*
	2 gr.	96,4±1,9	84,6±1,8*	85,2±1,6*	90,4±2,6	94,1±1,3*
SI, l/m2/min	1 gr.	2,65±0,1	2,58±0,09	2,70±0,07	2,62±0,09	2,65±0,09
	2 gr.	2,75±0,09	2,77±0,13	2,81±0,09	2,69±0,1	2,81±0,07
OPSS, dyn×s/cm5	1 gr.	1412,1±42,2	1314,3±46,3*	1311,4±44,2	1412,3±43,1*	1511,3±46,2*
	2 gr.	1414,3±46,1	1288,3±42,3*	1293,4±48,4	1372,4±46,3	1304,2±42,3*
IN, in conventional units	1 gr.	358,8±9,3	352,1±7,2*	354,2±10,1 Δ	398,2±9,1	354,4±9,4 Δ
	2 gr.	356,4±10,2	278,4±8,4*	337,6±11,4 Δ	381,3±10,8	334,5±8,0 Δ
Cortisol in blood, nmol/l	1 gr.	400,8±44,2	467,7±53,3	–	680,8±53,2* Δ	406,2±67,8* Δ
	2 gr.	398,4±36,3	304,2±50,3	–	319,4±46,6* Δ	240,4±42,2* Δ
IN URINE, nmol/L	1 gr.	9,2±1,2	-	-	-	18,1±2,1
	2 gr.	8,9±0,8	-	-	-	11,4±1,4
RASS scale (points)	1 gr.		-2,7±0,1	-2,4±0,7	-1,8±0,4	0,5±0,12
	2 gr.		-2,5±0,14	-2,4±0,2	-2,1±0,8	0±0,0

*Note: * - significance of differences (P <0.05) relative to the initial values; Δ- significance of differences (P <0.05) compared to the previous stage of the study. Stages: I - before the start of the operation; II - on the operating table; III - after skin incision; IV - traumatic stage of surgery; V - end of the operation*

Table 2. Cognitive function indicators before and after surgery

Когнитивный статус	first group (n = 18)	second group (n = 17)	r
Scale Mini mental state examination, preoperative period, points	29 [27; 29]	29 [28; 29]	0,001
Scale Mini mental state examination on the 1st day, points	24 [26; 27]	27 [27; 28]	0,05
Scale Mini mental state examination on the 5th day, points	28 [27; 29]	30 [28; 29]	0,001

After fractional administration of sodium oxybutyrate (40 mg/kg) (Gr. I) and a 15-minute intravenous load dose of dexmedetomidine (0.8 mcg/kg) (Gr. II), the sedation rate in patients of the 1st group was 2.8±0.42, while in the 2nd group - 2.6±0.36 points. At the height of anesthesia before skin incision, RASS in group I increased by 7.4% to moderate, and in group II decreased by 4.2% (P>0.05) to mild. After fetal removal, RASS in group I increased by 10.4% (P0.05) by the end of the operation and decreased by 8.7 (P>0.05) and 70.8% (P 0.05) respectively after 4 hours of its completion compared to the initial stage. In the second group, the degree of sedation at all stages of the study according to RASS remained stable within the range of -2.1 and -1.8 points (P>0.05) (Table. 1).

As can be seen from the table. 2. the initial cognitive status one day before the operation did not have statistically significant differences between the groups. According to the Mini mental state examination scale, the median in the 1st group was 29 points, in the 2nd - 29 points, the cognitive status according to all the scales used in the study was lower on the 1st day after surgery, while it should be noted that the effect of anesthetic drugs by the time of neuropsychological testing had ended and all women were in clear consciousness.

The frequency of POD 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 the 2nd group. The dynamics of cognitive status indicators in the postoperative period is presented in Table. 2.

Conclusions. The use of 0.8 mcg/kg of dexmedetomidine as a sedative drug against the background of CA ensures hemodynamic stability throughout the operation and is quite acceptable for the anesthetic support of abdominal delivery. The use of dexmedetomidine leads to a decrease in the frequency of cognitive impairments in the early postoperative period, a decrease in the intensity of pain syndrome, and a favorable effect on recovery and activation after surgery.

The results of this study demonstrate that the administration of dexmedetomidine as a sedative adjunct during cesarean section under spinal anesthesia is associated with several clinically significant benefits. Hemodynamic stability was

consistently maintained throughout all stages of surgery, with minimal fluctuations in heart rate, blood pressure, and cardiac index, indicating a favorable cardiovascular profile. In contrast, patients receiving sodium oxybutyrate exhibited more pronounced sympathetic activation, including transient increases in heart rate and systolic blood pressure, highlighting the potential advantage of dexmedetomidine in maintaining perioperative cardiovascular homeostasis.

Cognitive outcomes were markedly improved in the dexmedetomidine group. Postoperative assessment using the Mini-Mental State Examination revealed a lower incidence and severity of early postoperative cognitive dysfunction, with only 2.9% of patients affected compared to 11.4% in the control group. Importantly, these effects were observed in the context of full consciousness recovery, confirming that the neuroprotective benefits of dexmedetomidine extend beyond mere sedation. This effect may be attributed to its ability to attenuate perioperative stress responses, reduce cortisol release, and modulate sympathetic nervous system activity, all of which are implicated in the pathophysiology of POCD.

Furthermore, dexmedetomidine demonstrated favorable effects on postoperative pain control and recovery activation. Patients in the experimental group reported lower pain scores and exhibited more rapid mobilization and engagement in early postoperative rehabilitation, suggesting enhanced overall recovery quality. The stable sedation depth achieved, as monitored by the RASS scale, allowed for optimal patient comfort without compromising cognitive responsiveness or respiratory function.

In summary, the integration of dexmedetomidine into the anesthetic protocol for cesarean section under spinal anesthesia represents a safe, effective, and evidence-based approach to minimizing postoperative cognitive complications. Its use promotes hemodynamic stability, mitigates early postoperative cognitive dysfunction, enhances analgesia, and supports faster postoperative activation and rehabilitation. These findings have direct clinical relevance and may inform anesthetic management strategies aimed at improving maternal outcomes and optimizing neurocognitive recovery after cesarean delivery. Further research involving larger patient populations and long-term cognitive follow-up is warranted to confirm these benefits and refine dosing protocols for individualized care.

Literature:

1. Akimenko TI, Zhenilo VM, Zdiruk SV, Aleksandrovich YuS. Reduction in the incidence of postoperative cognitive impairment after uterine amputation during inhalational anesthesia with sevoflurane. Almanac of Clinical Medicine. 2018;46(7):699–707. doi: 10.18786/2072-0505-2018-46-7-699-707.
2. Monk TG, Price CC. Postoperative cognitive disorders. Curr Opin Crit Care. 2011;17(4):376–81. doi: 10.1097/MCC.0b013e328348bece.
3. Matlubov M.M., Khudoiberdieva G.S., Mamarazhabov S.E. Effect of Intraoperative Sedation in Women under Spinal Anesthesia on Cognitive Functions in the Postoperative Period. // American Journal of Medicine and Medical Sciences 2022, 12(12): 1223-1226
4. Matlubov M.M., Khudoiberdieva G.S., Khamdamova E.G. Dexmedetomidine - New opportunities in obstetric anesthesiology. // Problems of Biology and Medicine - Samarkand, 2023, No. 6 (150), pp. 448-451.
5. Matlubov M. M., Khudoiberdieva G. S., Khamdamova E. G. Intraoperative sedation with dexmedetomidine during cesarean section under spinal anesthesia // World scientific research journal. – 2023. – T. 20. – No. 1. – pp. 139-144.
6. Rizaev J. A., Maeda H., Khramova N. V. Plastic surgery for the defects in maxillofacial region after surgical resection of benign tumors //Annals of Cancer Research and Therapy. – 2019. – T. 27. – №. 1. – C. 22-23.

СНИЖЕНИЕ ЧАСТОТЫ ПОСЛЕОПЕРАЦИОННОЙ КОГНИТИВНОЙ ДИСФУНКЦИИ У ЖЕНЩИН, ПЕРЕНЕСШИХ КЕСАРЕВО СЕЧЕНИЕ ПОД СПИНАЛЬНОЙ АНЕСТЕЗИЕЙ С МЕДИКАМЕНТОЗНОЙ СЕДАЦИЕЙ ДЕСМЕДЕТОМИДИНОМ

Матлубов М.М., Худойбердиева Г.С.

Резюме. *Одной из наиболее обсуждаемых проблем в современной анестезиологии являются когнитивные нарушения, связанные с хирургическим вмешательством и анестезией. Послеоперационные когнитивные нарушения - распространенное и нежелательное явление, и интерес к нему сопровождается увеличением числа научных работ, опубликованных в последнее время. Синдром послеоперационной когнитивной дисфункции (ПКД) относится к нарушениям высших психических функций, которые могут развиться в послеоперационном периоде и вызваны хирургическим вмешательством и анестезией, по мнению Л.С. Расмуссена, это когнитивное расстройство, которое развивается на ранних стадиях и сохраняется в поздние послеоперационные периоды, клинически проявляется нарушениями памяти, затруднениями в работе. концентрация внимания и нарушения других высших корковых функций (мышления, речи и т.д.), подтвержденные данными нейропсихологического тестирования. Кроме того, анестезирующие препараты характеризуются прямым токсическим действием. Ряд авторов описывают негативное влияние анестезии на когнитивные функции.*

Ключевые слова: *дексмедетомидин, послеоперационная когнитивная дисфункция, спинальная анестезия, кесарево сечение, седация.*