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OPTIMIZATION OF PAIN RELIEF IN PATIENTS WITH CARDIOVASCULAR DISEASE DURING TRAUMATOLOGICAL SURGERY.

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Abstract The problem of comorbid conditions is relevant in modern clinical medicine and one of the most difficult in the practice of a doctor. First of all, this is due to the wide prevalence of comorbid conditions. Nosological syntropy is relevant, first of all, in relation to widespread and socially significant pathology of the cardiovascular system and gastrointestinal tract [1,2,6-8,24-26]. Thus, 60% of patients with coronary heart disease have concomitant CPP - [Crit. Rev. Microbiol., 2003]. In this case, mutual aggravation and progression of diseases is based on the combination of some pathological links and the presence of common risk factors.

Keywords: Medical practice shows that many patients develop traumatic pathologies

Introduction:

The problem of comorbid conditions is relevant in modern clinical medicine and one of the most difficult in the practice of a doctor. First of all, this is due to the wide prevalence of comorbid conditions. Nosological syntropy is relevant, first of all, in relation to widespread and socially significant pathology of the cardiovascular system and gastrointestinal tract [1,2,6-8,24-26]. Thus, 60% of patients with coronary heart disease have concomitant CPP - [Crit. Rev. Microbiol., 2003]. In this case, mutual aggravation and progression of diseases is based on the combination of some pathological links and the presence of common risk factors. In particular, chronic infections (including Helicobacter pylori) are recognized as an additional cause contributing to the occurrence and development of coronary heart disease by initiating inflammation and atheromatous changes - [Wyrobiec G., Helewski K., Stepien M., 2001]. Currently, more attention is paid to the so-called alimentary and stress factors. The topic of healthy eating is fashionable and relevant. Medical practice shows that many patients develop traumatic pathologies after errors in nutrition or violation of its regimen due to situational neurosis. The emergence of new ideas about the pathogenesis of diseases, the progress of pharmaceutical technologies, the development of minimally invasive surgical methods make it possible to effectively improve the prevention of fatal complications [G. Van Camp., 2014]. Therefore, today the number of patients regularly receiving various antiplatelet and antithrombotic therapy is growing [C.H. So, M. E. Eckman., C.N. Floyd, A. Ferro., 2017]. This fact is due to the prevalence of acute and chronic cardiovascular pathology, as well as standards for the prevention of venous thromboembolic complications [C.H. Yeh, P.L. Gross, J.I. Weitz., 2014., F.A. Spencer, C. Emery, S.W. Joffe et al. 2009, R.H. White., 2003]. The term "venous thromboembolism" does not lose its relevance in the discussion of the management of these patients and the prevention of possible embolic complications [A.M. Shilov, M.V. Melnik, I.S. Svyatov., 2006, S.V. Konstantinides, A. Torbicki, G. Agnelli., 2014].

By now, the clinical guidelines of the American College of Chest Physicians (ACCP) for the prevention of venous thromboembolic complications have been updated, determining the appointment of anticoagulant therapy [Bartholomew, J.R., 2017]. The main strategy is the active prevention of venous thromboembolic complications in any general hospital. One of the most common complications of long-term therapy with antiplatelet and anticoagulant drugs is gastrointestinal bleeding [M.M. Brodie, J.C.

Newman, T. Smith et al., 2018]. For a patient with cardiovascular disease - before planned interventions, after it, or in case of emergency surgery - anemia is an unfavorable background and a condition for possible complications. Therefore, the prevention of bleeding for this category of patients should be as radical as possible, the least invasive, and also with a minimum period of cancellation of antiplatelet or antithrombotic therapy [A. Tafur, J. Douketis., 2018]. Therefore, the timing of cancellation of antiplatelet therapy in the preoperative period is decided individually after assessing the risks of complications. The issue of cancellation of dual antiplatelet therapy in a patient with a high risk of cardiac complications who requires planned surgery also remains debatable. However, in patients who are scheduled for urgent surgery within a few days, according to current recommendations of the European Society of Cardiology, clopidogrel and ticagrelor should be discontinued 5 days and prasugrel 7 days before the planned intervention, except for patients who are at high risk of developing thrombosis.

At the same time, literature analysis indicates a sufficient number of not always obvious difficulties and dangers in performing traumatological interventions in elderly and senile patients.

Purpose of the study. Optimization of spinal anesthesia in combination with intravenous dexmedetomidine infusion in patients with CVD during surgical traumatological operations.

Material and methods of the study. Clinical observation covers 90 patients with concomitant CVD and traumatological pathologies who were treated in the traumatology department of the SFRTSTO. We observed patients aged 40 to 60 years. Concomitant CVD was required to include patients in the study. Patients were divided into 3 groups based on the types of anesthesia used:

In the first main group, spinal anesthesia will be performed with low doses of hyperbaric bupivacaine with dexmedetomidine infusion during the surgical period.

In the second main group, spinal anesthesia will be performed with standard doses of hyperbaric bupivacaine without preinfusion.

The effectiveness of the studied anesthesia methods was assessed by the structure of the pharmacological regimen, the state of the main hemodynamic parameters, gas exchange, the level of stress hormone (cortisol), as well as by compliance with the conditions for maintaining effective gas exchange at the main stages of anesthesia and surgery.

It was determined that all the anesthesia methods considered in the work are sufficiently effective in terms of anesthetic protection in patients suffering from concomitant CVD.

By gender and age, the patients were distributed as follows (Table 1). No statistically significant differences were found between the groups in terms of gender and age composition ($p > 0.05$).

Table 1. Distribution of patients by age (according to WHO, 2016)

		First group		Second group	
Age in years		number of patients	%	number of patients	%
40-44		13	27,1	12	28,6
45-49		17	35,4	13	30,9
50-54		10	20,8	9	21,5
55-60		8	16,7	8	19
Gender of patients	M	25	52,1	20	47,6
	W	23	47,9	22	52,4

Physical status	ASA II , %	39	81,2	29	69
	ASA III , %	9	18,8	13	31
total		48	100%	42	100%

Note: p>0.05 – reliability by criterion

As can be seen from Table 1, the vast majority of patients were 45-50 years old and only 21 patients were over 55 years old.

Criteria for inclusion in the study:

• Male and female
• Age >40 years <60 years
• Presence of chronic hemorrhoids, anal fissure and rectal fistula

Criteria for exclusion from the study:

• Sensitivity to one of the components of the drugs or solvent used
• Acute critical conditions associated with complications after abdominal surgeries, multiple injuries or acute respiratory failure
• Severe chronic diseases of the liver, kidneys, gastrointestinal tract

Methodology of preoperative preparation. Preoperative preparation included preoperative examination and premedication. In order to clarify the severity of the disease and the degree of expression of concomitant pathology, the examination protocol included, as indicated: 1) examination of the function of external respiration; 2) glycemic profile; 3) Holter monitoring; 4) echocardiography with determination of pressure in the pulmonary artery; 5) ultrasound examination of internal organs; The risk of anesthesia according to ASA and the risk of difficult intubation according to Mallampati were also assessed individually for each patient. Preparation for surgery was carried out according to the generally accepted scheme. To reduce anxiety caused by surgery, most patients require not only drug premedication, but also good psychological preparation. In order to achieve psychoemotional and positional comfort, one of the tranquilizers (midozal 3 ml intramuscularly) was prescribed in the evening before the surgery. Narcotic analgesics were not included in the premedication to exclude respiratory depression. The premedication regimen included the H-blocker cimetidine (Histodil) at a dose of 200 mg intramuscularly at night and 40-60 minutes before surgery.

In the morning on the day of surgery, premedication was administered in full: atropine 0.1% - 0.1 mg / kg, diphenhydramine 1% - 0.14 mg / kg or suprastin 0.15 mg / kg. In patients with concomitant cardiovascular pathology, to prevent circulatory reactions, the above-mentioned tranquilizer was also prescribed 2-3 hours before anesthesia or replaced by intramuscular administration of Relanium 10 mg. After spinal anesthesia, patients of group 1 were administered a loading dose of dexmedetomidine for 10 minutes, after which they switched to the administration of a maintenance dose. In all patients, the loading dose was 1 μg·kg-1 of the expected body weight, the maintenance dose was 0.35-0.45 μg·kg-1·h-1. Dexmedetomidine infusion was switched off 2 hours after the end of the operation. Intraoperative infusion therapy was performed with balanced crystalloid and colloid solutions "at the rate of 10-15 ml·kg-1.

Hemodynamic assessment. Vela monitors (Germany) were used for intraoperative monitoring of parameters necessary for anesthesia and comparative analysis (ECG, HR, BP, SpO2).

Central hemodynamic parameters (SV, CO, SI, and CI) were recorded using the noninvasive esCCO technology implemented in Life Scope monitors from Nihon Kohden (Japan). The parameters were

recorded at 10 points: upon arrival in the operating room, after the administration of a dexmedetomidine bolus, after induction anesthesia, after tracheal intubation, after the start of the operation (ensuring carbodioxyperitoneum), after changing the position of the operating table, in the middle of the operation, at the end of the laparoscopic stage of the operation, before tracheal extubation, and before transfer to the recovery room.

Evaluation of the course of the recovery period. In the early postoperative period, the rate of recovery of psychomotor functions was determined, hemodynamic parameters, the severity of pain syndrome, the frequency of complications, and a subjective assessment of the quality of anesthesia were assessed. The study of the intensity of postoperative pain syndrome, the level of postoperative fatigue, as well as the subjective assessment of satisfaction with the quality of anesthesia was performed using a visual analogue scale (VAS) with a gradation of 0-10 points.

Characteristics of anesthetic management. The characteristic of the sensory block included determining the maximum segmental level, the time to achieve it, and the number of blocked segments. The duration of sensory anesthesia was determined by the occurrence of the first pain sensations of 3 or more points on a 10-point digital rating scale. The characteristic of the motor block included determining the degree of maximum severity of the block, the time to achieve it, and the time of restoration of motor activity. Under aseptic conditions, puncture of the dura mater was performed by full-time anesthesiologists using a standard approach along the midline in a sitting position at L2-L3 or L3-L4 into the intervertebral space using a Whitacre needle of size 25 with a mouth. All patients remained in a sitting position for 10 min. The patient was asked whether he/she felt any change in motor power. Motor block was tested using the modified Bromage scale (0 = no motor block, 1 = ability to flex the ankle and bend the knee, 2 = ability to flex the ankle, and 3 = complete motor block). A successful block was defined as a block that was sufficient to proceed with the operation without any adjuncts (intravenous analgesic, local anesthetic infiltration, or general anesthesia). The dose of bupivacaine administered to each patient was determined by the patient's response, previously tested using a modified Jackson ascending and descending motion method (using 0.5 mg as the step size). The initial starting dose of 12.5 mg hyperbaric bupivacaine was chosen from the findings of Wassef R et al. who demonstrated adequate anesthesia for a short perianal operation using hyperbaric bupivacaine at a dose of 12.5 mg. Bupivacaine was prepared immediately before injection by an independent anesthesiologist and administered by a second anesthesiologist. Block evaluation and clinical observation of patients were also performed by a third anesthesiologist. The following data were recorded; Patient demographics, duration of anesthesia and surgery, level of sensory and motor block immediately before surgery, at the end of surgery and every 30 minutes until block resolution. NIBP and HR were recorded every 5 minutes. in the operating room and PACU. Also, time to ambulation, time to first voiding and time to discharge from home. were recorded. Patient and surgeon satisfaction were assessed using a 4-point scale. (0 = poor, 1 = good, 2 = very good, 3 = excellent).

We used a visual analogue scale (VAS) for pain intensity to assess the adequacy of analgesia and the need for narcotic analgesics (Picture 1).

Визуально-аналоговая шкала (ВАШ) интенсивности боли

Results and discussion. In traumatological pathologies, damage to the meniscus, cartilage and ligaments, inflammation and fluid accumulation in the joint, prolonged pain of unknown origin were often encountered. We performed arthroscopy of the knee joint, cases of limb deformation and the formation of false joints were installed Ilizarov devices, patients with complex fractures were installed and removed plates, spokes and other metal structures.

Clinical observation covers 120 patients with concomitant CVD in traumatological pathologies, who were treated in the traumatology department of the SFRTC. We observed patients aged 40 to 60 years. Concomitant CVD was required to include patients in the study.

The effectiveness of the studied anesthesia methods was assessed by the structure of the pharmacological regimen, the state of the main parameters of hemodynamics, gas exchange, the level of stress hormone (cortisol), as well as compliance with the conditions for maintaining effective gas exchange at the main stages of anesthesia and surgery.

It was determined that all the anesthesia methods considered in the work are sufficiently effective in terms of anesthetic protection in patients suffering from concomitant CVD.

We identified some concomitant CVD in patients with trauma pathologies (Table 2).

Table 2.

Characteristics of concomitant diseases in patients with proctologic pathologies (n – 90)

	First group		Second group	
Associated pathology	n	%	n	%
Hypertension	22	45,8	16	38,1
Diabetes mellitus type II	4	8,3	2	4,8
Ischemic heart disease	12	25	7	16,7
Chronic heart failure II FC	9	18,8	8	19
Varicose veins of the lower extremities	7	14,6	3	6,3
Chronic gastritis without exacerbation	16	33,3	11	26,2
Chronic pyelonephritis outside of exacerbation	25	52,1	15	35,7

The most frequently detected diseases were hypertension, coronary heart disease and chronic gastritis.

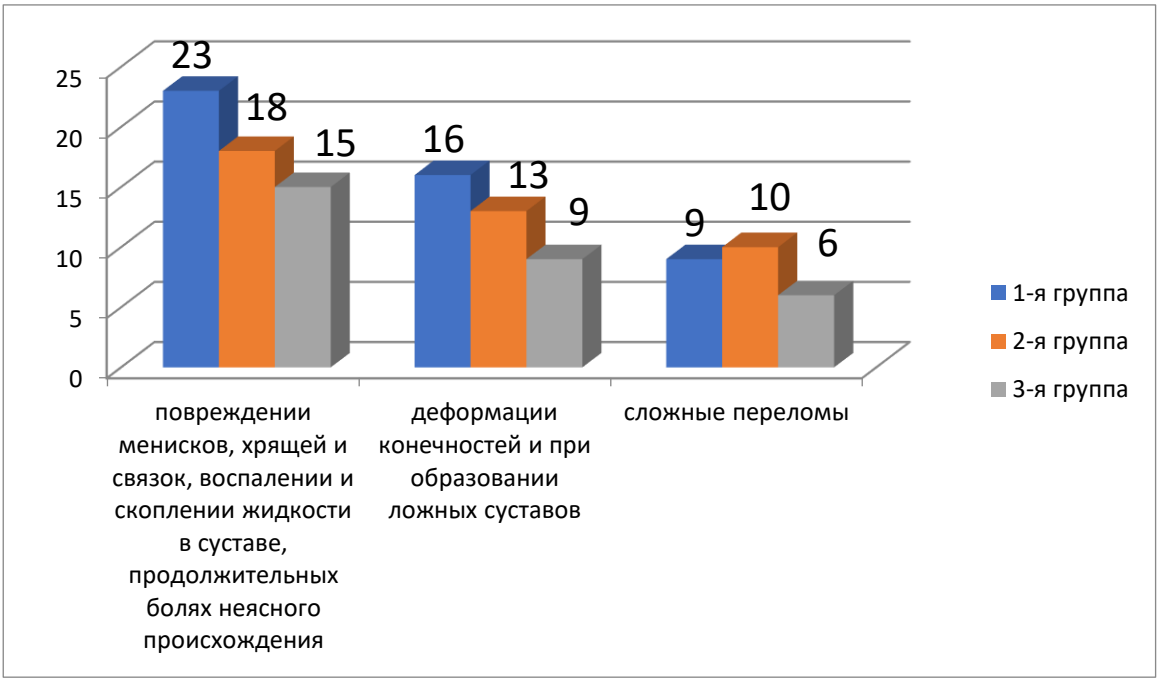
We found out the types of trauma pathology, and it turned out that in most of the operated patients the pathology was associated with hemorrhoids and cracked anus. The types of detected proctological pathology are given in Table 3.

Table 3.

Types of detected proctological pathology

Type of pathology	Total	
	Second group	First group
damage to the meniscus, cartilage and ligaments, inflammation and accumulation of fluid in the joint, prolonged pain of unknown origin	18	23
deformations of the limbs and the formation of false joints	13	16
complex fractures	10	9
Total	42	48

All the admitted patients hesitated for a long time to undergo surgery and only after their condition worsened and complications arose did they consult a traumatologist. Of all the patients, damage to the meniscus, cartilage and ligaments, inflammation and fluid accumulation in the joint, prolonged pain of unknown origin were detected in 56 patients (71.4%), limb deformities and pseudoarthrosis formation in 38 patients (11.4%) and complex fractures in 25 patients (17.2%), their distribution is shown in Picture 2.



Note: p – significance of differences in groups.

The average duration of surgery in the groups, the total volume of intraoperative blood loss and drainage losses, as well as the volume of infusion therapy did not differ significantly between the groups.

The use of adjuvants can improve certain aspects of local anesthesia caused by isobaric and hyperbaric bupivacaine. Central α2-adrenergic receptor agonists (dexmedetomidine) have a direct analgesic effect due to the effect on α2-adrenergic receptors of the spinal cord and brain. They improve the quality of

intra- and postoperative analgesia, cause the desired sedation, but provoke side effects such as hypotension and bradycardia. Dexmedetomidine is a highly selective α2-adrenergic receptor agonist with a relatively high α2/α1 activity (1620: 1). At the same time, the frequency of side effects of dexmedetomidine does not increase

In group 1 of patients, in whom pain syndrome in the postoperative period was relieved by the introduction of Dexmedetomidine, an improvement in spirometric parameters was noted, and blood gas disorders were significantly less pronounced. A tendency to a decrease in the frequency of pulmonary and hemorheological postoperative complications was also noted. Patients of group 2, who received NSAIDs, were in a state without excessive sedation, while the quality of postoperative pain relief was sufficient. A tendency to a decrease in the frequency of pulmonary and hemorheological postoperative complications was also noted.

During the analysis of the criteria for the adequacy of anesthesia in the groups, starting from the 2nd stage of the study and at subsequent stages, a significantly lower level of DBP was recorded in groups 1 and 2 compared to the initial stage of the study. In addition, a significant increase in SpO2, a-vDO2 was found in both groups compared to the 1st stage of the study. At further stages of the study, no differences were found between the groups in these parameters, however, a difference was registered in the rate of diuresis, which was significantly higher in patients of the 1st group starting from the 2nd and subsequent stages in comparison with the 2nd group (Table 4).

Table 4. Comparative characteristics of the parameters of adequacy of anesthesia between the groups

The indicators under study	Study groups	Research stages				
		1st	2nd	3rd	4th	5th
SBP, mmHg	1st group	137,5±6,2	111,1±3,7	120,2±3,7	123,6±6,2	128,1±3,3
	2nd group	140 ±6,4	112,2±4,5*	116,1±4,7**	118,5±3,7	125,2±4,3
DBP, mmHg	1st group	81,2±5,2	75,8±3,1	76,8±2,8	75,3±3,8	78,1±2,6
	2nd group	80,2±5,4	74,6±3,8	70,3±4,2	72,4±4,1	76,7±2,7
Wed	1st group	102,6±5,7	96,4±3,5	98,5±2,5	98,5±3,5	94,5±3,8
	2nd group	101,6±5,7	98,7±2,7*	98,2±3,5**	92,8±5,9	91,3±3,7
Heart rate, in 1 min	1st group	86,2±3,6	67,5±6,5	67,3±3,6	65,8±3,6	75,3±2,1
	2nd group	84,2±3,5	68,6±5,3	64,3±3,1	66,7±2,9	74,6±2,4
Diuresis, mean ± SD, ml/min	1st group	47,2 ± 2,7	58,4 ± 2,9	59,5 ± 2,8	58,9 ± 2,9	
	2nd group	47,5 ± 2,5	54,5 ± 2,3	53,5 ± 2,9	54,9 ± 2,7	
SpO2, %	1st group	—	97,8±1,7	97,6±2,1	97,9±1,7	98,1±1,4
	2nd group	—	96,7±1,5	96,2±2,3	96,7±1,3	97,3±1,7

Note: * - $p < 0.05$ compared to stage I, ** - $p < 0.05$ between groups. 1 - baseline data; 2 - after premedication; 3 - traumatic stage of surgery; 4 - end of surgery; 5 - 24 hours after the end of surgery;

No significant differences in age and gender characteristics were noted, with most patients belonging to the older age group. The criterion for the effectiveness of analgesia administered in the postoperative period was a decrease in pain syndrome according to VAS to 3 and below. The criterion for the introduction of narcotic analgesics was an increase in pain intensity according to VAS to 6-7. The average score on the pain assessment scale between the groups at different stages is presented in Table 2.

Table 2

Dynamics of pain assessment according to VAS (average value in points)

Time from resolution of spinal block	1st group	2nd group
4 hours	2,72	4,21
8 hours	3,74	6,51
12 hours	2,1	4,1
16 hours	2,14	3,7

When comparing the intensity of pain sensations according to VAS on the first day after surgery, no reliable difference was found between the groups.

Based on the data obtained, the severity of pain syndrome, and therefore the need for repeated administration of narcotic analgesics in patients of the 1st group is significantly lower.

With the same indicators of the volume of infusion therapy of blood loss and the depth of anesthesia and other criteria for the adequacy of anesthesia, an increase in diuresis was found in the 1st group, which is associated with an improvement in renal and splanchnic blood flow against the background of spinal sympathetic blockade. An increase in the values of oxygen content in mixed venous blood (SpO2), a-vDO2 in both groups compared to the initial stage of the study is associated with adequate intraoperative respiratory support, contributing to the improvement of gas homeostasis parameters in the groups. Accordingly, earlier activation of patients and restoration of intestinal peristalsis and gastrointestinal function in the early postoperative period in Group 1 contributed to a shorter stay of patients in the intensive care unit and a reduction in the overall hospitalization period in Group 1 patients, which was largely due to the prolonged sympathetic spinal block. Analysis of the effectiveness of postoperative analgesia showed the achievement of more complete pain relief in Group 2 patients on the 2nd day of the postoperative period, which is probably explained by the end of the spinal block effect. At the same time, it should be noted that the level of pain impulses in the early postoperative period on the 1st and 2nd days of the postoperative period in Group 1 did not exceed 35 mm according to VAS. At the same time, the optimal permissible pain level in the postoperative period is considered to be the blue-light blue zone, which is in the range from 0 to 40 mm according to 100 mm VAS. Thus, the use of dexmedetomidine with spinal anesthesia for postoperative analgesia has shown its high efficiency and has reduced the use of opioids in the postoperative period. This has led to a decrease in the frequency and risk of complications associated with the systemic administration of opioids and postoperative hypokinesia, improved the quality of postoperative rehabilitation and, accordingly, reduced the duration of hospitalization. The obtained results of the study indicate that the introduction of Dexmedetomidine with the use of spinal anesthesia has the most favorable effect on the course of the early postoperative period due to earlier recovery of the intestine. Conclusion. Dexmedetomidine with the use of spinal anesthesia allows it to be carried out at a sufficient level of depth, maintain adequate analgesia in the postoperative period, showing comparable effectiveness of postoperative pain relief with spinal anesthesia. Consequently, spinal anesthesia also has its niche in the practice of anesthetic care in traumatological operations.

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