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ASSESSMENT OF THE EFFECTIVENESS OF POSTOPERATIVE PAIN RELIEF IN ELDERLY AND SENILE PATIENTS WITH CIRCULATORY INSUFFICIENCY

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ABSTRACT

Patient-controlled analgesia is an alternative to traditional analgesic regimens for geriatric patients with circulatory insufficiency who have undergone lower extremity surgery. This method should become one of the primary approaches for postoperative pain management, as it ensures adequate analgesia and has a positive impact on hemodynamics.

Key words: Patient-controlled analgesia, prolonged epidural anesthesia, gerontology, hemodynamics.

INTRODUCTION

Medical rehabilitation of patients with diseases and injuries of the lower extremities is one of the important social tasks. With the increasing life expectancy, the growing number of vascular diseases, and the rising demand for reconstructive, plastic, and orthopedic surgeries (9.5.). Pain caused by trauma and surgical pain has a profound impact on the body, leading to a series of pathological shifts in the major life-supporting systems. Under certain conditions, it can trigger

the breakdown of compensatory mechanisms, potentially leading to the development of a terminal condition (4.8.). The problem of improving the effectiveness of treatment for patients in this age group is pressing both abroad and in our country. Techniques for optimizing the perioperative period are gaining increasing popularity, starting with the "fast track" approach (FT), followed by enhanced recovery after surgery (ERAS), and the accelerated recovery program (ARP) [7.10]. Their goal is to reduce the response to surgical stress, decrease the number of complications, and shorten the length of hospital stay without increasing the risk to the patient [3, 12].

However, significant and traumatic surgeries in orthopedics and traumatology, such as lower extremity joint arthroplasty, which are typically performed on geriatric patients, remain quite problematic. This group of patients requires specific measures, such as: reducing the volume of infusion therapy, providing adequate intraoperative and postoperative pain management, and early activation.

A number of authors [1,11] have presented a ranking of the most painful surgical interventions, with orthopedic and trauma surgeries ranking second. According to current understanding of the pathophysiology of acute pain, it is the intensity of pain in the first 24 hours after surgery that determines the subsequent dynamics of the pain syndrome and even the potential risk of its chronicity [10,2.].Postoperative pain syndrome following total joint arthroplasty of the lower extremities can significantly impact the quality of life of patients and the functional outcome of the surgery, limiting early patient mobilization. This can lead to an increased risk of thromboembolic complications and prolong hospitalization [6, 13, 14].

The aim of the study: to assess the effectiveness and safety of acute pain management following lower extremity surgeries using patient-controlled analgesia with prolonged epidural analgesia.

Materials and Methods.

We analyzed the postoperative period of 38 elderly and senile patients with heart failure (NYHA functional class II–III), caused by ischemic heart disease, multifocal atherosclerosis, and post-infarction cardiosclerosis.

All patients underwent minimally invasive surgeries on the lower extremities. The patients' ages ranged from 65 to 90 years (with an average age of 78 ± 8 years), and their physical status was classified as ASA 3 or higher. The patients were hospitalized in the trauma department of the TMA clinic.

Depending on the method of postoperative pain management, the patients were divided into two groups, with 19 patients in each. The main group received patient-controlled analgesia (PCA) in the postoperative period via prolonged epidural analgesia. A 0.125% bupivacaine solution (10 ml) was combined with 0.03–0.04 mg/kg of morphine, administered at a rate of 4-10 ml/hour. Alternatively, a bolus injection of the medications was used, controlled by an electronic pump ("Accumate - 1100. Electronic PCA"), with postoperative pain management programmed by us. The epidural catheter was removed on the third day after surgery. For patients in the main group, epidural space puncture was performed at the L3-L4 level before spinal anesthesia, with the insertion of an 18G epidural catheter with a bacterial filter, which was then secured.

In patients of Group II, for the treatment of acute postoperative pain, standard systemic multimodal analgesia was used. A combination of NSAIDs (ketoprofen 100 mg once daily) and paracetamol (1 g three times a day) was administered during the first 24 hours, along with opioids (morphine 1%, promedol 2%, administered subcutaneously or intramuscularly).

In the preoperative period, all patients were instructed on the use of the 10-point Visual Analog Scale (VAS). Monitoring of key vital signs (ECG, blood pressure, heart rate, respiratory rate, SpO2) and assessment of daily urine output were conducted postoperatively for 72 hours. Central hemodynamics were also studied, the degree of sedation was assessed, and the frequency of complications and side effects was recorded. The study was conducted in 5 stages: during acute postoperative pain, 2-3 hours after the onset of analgesia, and at 24, 48, and 72 hours. The results obtained during the study were processed using parametric statistical methods with the Statistica 6 program. Data were presented as the mean (M) with standard deviation and were evaluated using the Student's t-test. Differences were considered significant at $p < 0.05$.

Results and Discussion

The intensity of the pain syndrome before surgery in both groups of patients showed significant changes in the functional status indicators of the cardiovascular system during the postoperative period

Table No. 1: Indicators of the functional status of the cardiovascular system in patients with hear failure during the postoperative period

Parameter	Stage of research				
	I	II	III	IV	V
Heart rate, per minute	90,4±2,8	82,8±1,4 av	83,6±1,2 a	78,6±1,3 av	78,8±1,9 a
	92,6±2,1	88,6±1,9 v	86,8±1,3 a	82,4±2,4 a	80,3±2,1 a
Systolic blood pressure, mm Hg	112,3±3,6	90,3±2,1 av	86,2±2,6 av	86,4±2,1 av	86,4±2,2 a
	110,2±3,2	101,8±2,5 av	98,4±1,9 ав	93,1±1,8 абv	90,8±2,4 a
Cardiac Index, L/m²·min"	1,97±0,08	2,06±0,1	2,12±0,12	2,07±0,09	2,12±0,11
	1,91±0,06	1,99±0,09	2,01±0,11	1,96±0,1	2,01±0,12
Total Peripheral Vascular Resistance, dyn·s·cm⁵	2682,3±71,3	2128,3±40,8 av	1970,6±50,4 abv	2022,9±48,3 av	1955,4±42,3 av
	2796,2±80,3	2493,5±65,4 av	2315,3±60,3 av	2311,4±52,4 av	2196,4±42,4 av
Diuresis, ml/h	20,1±2,3		46,3±1,9 av	52,3±2,2 abv	53,9±2,1 av
	20,6±3,2		32,1±2,5 av	41,4±3,4 abv	46,8±1,6 av
ST segment depression	8	4	2	1	1
number of observations	7	7	6	3	2

Note. In the numerator – data from the 1st group, in the denominator – data from the 2nd group. p<0.05: a - compared to the baseline value; b - compared to the previous stage; c - compared to the 1st group

The data presented show that in both groups of patients, changes in the indicators began 2-3 hours after the operation was completed. Patients complained of severe pain and required immediate pain relief. The heart rate (HR) was 90.4±2.8–92.6±2.1 bpm, and systolic blood pressure (SBP) was 110.2±3.6–112.3±3.2 mm Hg. All hemodynamic signs of moderately expressed heart failure were observed. These indicators, presented in the table, indicated an increase in systemic vascular resistance (SVR) and a decrease in urine output (20-30 ml/hour), which suggested significant peripheral vascular spasms.

Two to three hours after the start of pain relief, at the peak of postoperative analgesia, a significant reduction in heart rate (HR), a decrease in systolic and

diastolic blood pressure (SDP), and systemic vascular resistance (SVR) were observed, along with a tendency towards increased stroke volume and cardiac output, indicating an improvement in the studied hemodynamic parameters. These changes were significantly more pronounced in the patients of the first group.

When using continuous peripheral anesthesia (CPA) and epidural analgesia, by this time, patients developed a moderately pronounced segmental sympathetic block, which manifested as a decrease in SDP and SVR by 19.6% and 20.7%, respectively, and a reduction in HR by 8.5%.

In the multimodal postoperative analgesia group, the decreases in SDP and SVR were only 7.7% and 10.9%, respectively, and HR decreased by only 4.4%. In the first group, ST interval inversion below the baseline was present in only 4 patients, while in the second group, it remained in 7 patients, indicating a more effective restoration of perfusion to the affected organs, particularly the myocardium, against the background of a moderately pronounced preganglionic blockade caused by CPA and epidural analgesia.It should be noted that the parenteral administration of analgesic drugs, particularly opioids, in patients of the second group inevitably led to excessive sedation, pronounced drowsiness, and adynamia, which caused partial obstruction of the upper respiratory tract. In patients of the first group, after the epidural administration of microdoses of morphine, only brief (20-30 minutes) drowsiness was observed, with full consciousness maintained during the following 18-24 hours.Twenty-four hours after the surgery, against the background of adequate postoperative analgesia, both groups of patients showed positive dynamics in the studied hemodynamic and peripheral circulation parameters, which remained significantly more pronounced in the first group. In the second group, moderately pronounced arterial hypertension, increased systemic vascular resistance (SVR), and oliguria persisted, indicating ongoing peripheral vessel spasm and associated organ dysfunctions. In 6 patients, inversion of the ST interval below the baseline was still present.

In patients of the first group, under the influence of moderately expressed segmental sympathetic blockade, the peripheral vessel spasm and related organ dysfunctions were almost resolved by this time, as evidenced by a reduction in SVR to 1970.6±50.4 dyn·s·cm^{-5}, an increase in hourly diuresis to 46.3±1.9 ml/h, and a decrease in the number of patients with ST interval inversion below the baseline to 2.Forty-eight and seventy-two hours after the use of continuous peripheral anesthesia (CPA) and epidural analgesia, patients in the first group achieved hemodynamic stability. The studied hemodynamic parameters approached their preoperative baseline values. Adequate diuresis was restored, and inversion of the ST interval below the baseline remained in only one patient.At the

same time points, in patients of the second group, the functional status of the cardiovascular system recovered significantly more slowly. The spasm of peripheral vessels and associated organ dysfunctions partially persisted.It is worth noting that the use of CPA and epidural analgesia reduced the number of general postoperative complications, which can be explained by the absence of excessive sedation, early mobilization, and moderately expressed segmental sympathetic blockade.

Table No. 2. Dynamics of pain intensity at the stages of the study in groups according to VAS

Stages of the study	**Group 1 (n=19)**	**Group 2 (n=19)**	**P**
3-5 hours after surgery	0.90±0.06	2.89±0.12	<0.05
First postoperative day	2.04±0.11	2.91±0.13	<0.05
When bending the affected joint	28 (44.4%)		
Preoperative	6.32±0.96	6.27±1.04	>0.05
3-5 hours after surgery	1.72±0.08	5.47±0.92	<0.05
First postoperative day	1.66±0.11	4.78±0.70	<0.05

From the presented data, it is easy to observe that as early as 3-5 hours after surgery, in the first group, with CPA and epidural analgesia, pain at rest was 31.1% less intense compared to the control group (P<0.05). Joint movements before surgery were equally painful in both groups, ranging from 5.5 to 7 points. However, by 3-5 hours postoperatively and by the end of the first day, the intensity of pain in the second group exceeded that in the first group. The most pronounced pain syndrome during attempts to bend the leg on the surgical side was noted in the second group as early as 3-5 hours after surgery, which necessitated the administration of opioids.

The study on the first postoperative day showed significant differences in the intensity of pain syndrome between patients in the first group both at rest and during walking, which ultimately affected their activity levels. Patients who received CPA and epidural analgesia did not experience pain at rest or during movement throughout the second postoperative day, while all patients in the second group continued to experience pain both at rest and while walking. A similar pattern was observed on the third day before the catheter was removed.To summarize the data presented, it can be noted that the highest effectiveness of postoperative pain relief was demonstrated in the first group, where no patient

experienced severe pain (more than 5 points on the VAS), requiring additional administration of opioid analgesics.

Table No. 3 below shows the complications and side effects associated with the use of the mentioned postoperative pain relief methods.

Table No. 3. Side Effects of Postoperative Pain Relief Methods

Side Effects, Complications	**Group 1 (n=19)**	**Group 2 (n=19)**
Severe pain (6 points)	0	32.6%
Hypotension (including orthostatic)	6 (19.0%)	1 (2%)
Respiratory depression (12 minutes)	2 (3.17%)	4 (6%)
Nausea, vomiting	2 (11.1%)	4 (10%)
Skin itching	2 (12.6%)	6 (8%)

Analyzing the presented data, it should be noted that in the first group, with CPA and epidural analgesia, episodes of arterial hypotension, including orthostatic hypotension, were relatively more frequent. However, this hypotension was quickly corrected with infusion solutions and the addition of adrenaline to the epidural space. Complications such as nausea, vomiting, and skin itching were not predominant in the first group, while the frequency of respiratory depression, bradycardia, gastrointestinal dysfunction, and constipation were higher in the second group with multimodal postoperative analgesia.

Conclusions:

1)The use of an epidural catheter for prolonged postoperative analgesia with minimal doses of bupivacaine and morphine provides adequate pain relief, is a safe and highly effective method.

2)The application of prolonged analgesia with small doses of local anesthetics promotes early mobilization, stabilization of hemodynamics, and peripheral circulation.

3)Prolonged epidural analgesia through infusion has a clear advantage over traditional postoperative pain relief methods in geriatric patients with circulatory insufficiency.

REFERENCES

1. Akiljanov, K. R., & Zhanaspayev, M. A. (2018). Diagnosis of orthopedic pathology of the patellofemoral joint. Literature review. Science and Healthcare, (5), 31-41.

2. Ermolayev, V. A., Mar'in, E. M., Lyashenko, P. M., Sapozhnikov, A. V., Terent'eva, N. Yu., Mukhitov, A. Z., ... & Ivanova, S. N. (2022). Local anesthesia in animals.

3. Ezhevskaya, A. A., Prusakova, Z. B., Gostenko, A. M., & Belova, A. N. (2017). Surgical stress response and cognitive dysfunction during spinal surgeries: the role of epidural analgesia. Anesthesiology and Resuscitation, 62(3), 185-190.

4. Koryachkin, V. A., Chuprys, V. G., Cherny, A. Z., Kazarin, V. S., Liskov, M. A., Malevich, G. M., & Maltsev, M. P. (2015). Systemic toxicity of local anesthetics in regional anesthesia in orthopedics and traumatology. Traumatology and Orthopedics of Russia, (1(75)), 129-135.

5. Voronova, M. O., & Vatnikov, Y. A. (2021). The role of regional anesthesia in preventing acute postoperative pain syndrome during surgery on the thoracic limb in dogs. Veterinary Pathology, (4 (78)), 28-36.

6. Zabolotskikh, I. B., Gorobets, E. S., Grigoriev, E. V., Kozlov, I. A., Lebedinsky, K. M., Musaeva, T. S., ... & Khoronenko, V. E. (2018). Perioperative management of geriatric patients. Clinical recommendations project by FAR. Journal of Intensive Therapy named after A. I. Saltanov, (1), 60-74.

7. Ziatdinov, B. G., Akhtyamov, I. F., & Sadykov, R. I. (2015). Modern possibilities for the prevention of thromboembolic complications during hip and knee joint endoprosthetics. Practical Medicine, (4-1 (89)), 66-70.

8. Likholettov, A. N., Lobanov, G. V., & Zhilitsyn, E. V. (2023). Treatment of combined spinal and lower extremity injuries in a child (clinical case). *University Clinic*, (4(45)), 75-79.

9. Lisichenko, I. A., & Gusarov, V. G. (2022). Choice of anesthetic support method for elderly and senile patients during orthopedic interventions (review). *General Resuscitology*, 18(3), 45-58.

10. Ovechkin, A. M. (2015). Postoperative pain: the current state of the problem and modern trends in postoperative pain management. *Regional Anesthesia and Acute Pain Treatment*, 9(2), 29-39.

11. Rozin, Y. E., Marochkov, A. V., & Kulagin, A. E. (2023). The role of combined anesthesia in postoperative pain management during orthopedic-traumatologic surgeries on lower limbs in children.

12. Solenkova, A. V., Lubnin, A. Yu., Konovalov, N. A., Korolishin, V. A., Asyutin, D. S., Martynova, M. A., ... & Teryaeva, N. B. (2017). Postoperative prolonged epidural analgesia in spinal neurosurgical interventions, part II. The effect of prolonged epidural analgesia on the overall inflammatory stress response. *Anesthesiology and Resuscitology*, 62(3), 178-184.

13. Tarasov, D. A., Lychagin, A. V., Rukin, Ya. A., Kozhevnikov, V. A., Yavorovsky, A. G., & Strokov, A. V. (2019). Postoperative pain management during total knee arthroplasty: comparative analysis of the effectiveness of modern techniques. *Traumatology and Orthopedics of Russia*, 25(2), 31-41.

14. Zhi, H. H., Akhtyamov, I. F., Karimov, M. Yu., & Ardashev, S. A. (2023). Prevention of pain syndrome after hip arthroplasty in patients with proximal femoral fractures. *Genius of Orthopedics*, 29(5), 500-506.