Research Article

https://doi.org/10.23934/2223-9022-2024-13-2-232-240

Comparison of Prolonged Transversus Abdominis Blockade with Systemic Anesthesia During Local Access to Double-Barreled Intestinal Stoma Closure (Preliminary Results of a Prospective Randomized Trial)

I.A. Ermakov[1] ✉, V.V. Valetova[1, 2], A.V. Savushkin[1], I.E. Gridchik[1, 2], I.V. Molchanov[2], A.I. Moskalev[1], D.O. Kiselev[1]

Department of Anesthesiology and Resuscitation
[1] A.N. Ryzhikh National Medical Research Center of Coloproctology
Salyama Adilya Str. 2, Moscow, Russian Federation 123423
[2] Russian Medical Academy of Continuous Professional Education
Barrikadnaya Str. 2/1, bldg. 1, Moscow, Russian Federation 125993

✉ **Contacts:** Ilya A. Ermakov, Postgraduate Student of the Department of Anesthesiology and Resuscitation, A.N. Ryzhikh National Medical Research Center for Coloproctolog.
Email: ermakov.painkiller@gmail.com

AIM OF STUDY To evaluate the effectiveness of prolonged block of the transverse abdominal space compared with analgesia based on ketoprofen and tramadol after operations for closing intestinal stomas from local access.

MATERIAL AND METHODS The prospective single-center randomized study included 74 patients aged from 23 to 83 years (Me=61; Q1=49–Q3=67) during the period January–December 2021. Patients were randomly divided into two groups depending on the method of postoperative pain relief. Randomization was carried out using the envelope method. The main group consisted of 41 patients who, for pain relief after surgery, had a catheter installed for prolonged block of the transverse abdominal space. In case of ineffectiveness, ketoprofen and tramadol were prescribed according to the regimen. The comparison group consisted of 33 patients who received postoperative analgesia based on ketoprofen as the main drug and tramadol as a rescue drug. The groups were statistically comparable in terms of basic characteristics. Over the course of 4 days, we assessed the daily dosage of tramadol and ketoprofen, the level of dynamic and static pain on a digital rating scale, the time and degree of activity, the frequency of urinary retention, the occurrence of nausea and vomiting, the timing of return to good nutrition and restoration of bowel function, and the duration of postoperative treatment.

RESULTS The study included 74 patients. In the main group, on the first day, the frequency of additional use of tramadol (17% versus 57.6%, p=0.0007) and the frequency of use of submaximal daily dosage (0% versus 24.2%, p=0.003) were statistically significantly lower than in the comparison group. In the comparison group, the frequency of ketoprofen use was higher on days 2 (54% vs. 94%, p=0.0004), days 3 (36.6% vs. 76%, p=0.0018) and days 4 (19% versus 52%, p=0.0081) due to the administration of the maximum daily dosage (all comparisons given are statistically significant). There were no statistically significant differences between the groups in terms of the level of pain at rest and movement, as well as the level of activity of the patients. The period of activity in patients of the main group during the day was statistically significantly longer on the 2nd (on average 30 minutes versus 15 minutes, p=0.0187) and 3rd day (on average 60 minutes versus 45 minutes, p=0.043).

CONCLUSIONS Extended block of the transverse abdominal space is an effective method of pain relief after operations to close an intestinal stoma from local access, significantly reducing the need for non-steroidal anti-inflammatory drugs and opioid analgesics.

Keywords: prolonged block of the transverse abdominal space, closure of a loop intestinal stoma, multimodal analgesia

For citation Ermakov IA, Valetova VV, Savushkin AV, Gridchik IE, Molchanov IV, Moskalev AI, et al. Comparison of Prolonged Transversus Abdominis Blockade with Systemic Anesthesia During Local Access to Double-Barreled Intestinal Stoma Closure (Preliminary Results of a Prospective Randomized Trial). *Russian Sklifosovsky Journal of Emergency Medical Care.* 2024;13(2):232–240. https://doi.org/10.23934/2223-9022-2024-13-2-232-240 (in Russ.)

Conflict of interest Authors declare lack of the conflicts of interests

Acknowledgments, sponsorship The study had no sponsorship

Affiliations

Ilya A. Ermakov	Postgraduate Student of the Department of Anesthesiology and Resuscitation, A.N. Ryzhikh National Medical Research Center for Coloproctologyn; https://orcid.org/0000-0002-7196-7257, ermakov.painkiller@gmail.com; 30%, development of the concept and design of the study, data collection, analysis and interpretation of data, analysis of literature on the research topic, writing the text of the article
Valeria V. Valetova	Doctor of Medical Sciences, Professor of the Department of Anesthesiology and Emergency Medicine of Russian Medical Academy of Continuing Professional Education; https://orcid.org/0000-0001-6132-463X, valetova.valeriya@yandex.ru; 20%, development of the concept and design of the study, scientific editing, technical editing, approval of the final text of the article

Aleksandr V. Savushkin	Candidate of Medical Sciences, Head of the Department of Anesthesiology and Resuscitation, A.N. Ryzhikh National Medical Research Center for Coloproctology; https://orcid.org/0000-0001-6282-2569, avsavushkin@bk.ru; 15%, development of the concept and design of the study, analysis and interpretation of data, technical editing, approval of the final text of the article
Irina E. Gridchik	Doctor of Medical Sciences, Professor of the Department of Anesthesiology and Resuscitation, Russian Medical Academy of Continuing Professional Education; https://orcid.org/ 0000-0003-2575-5365, gridchik10@rambler.ru; 10%, scientific editing, technical editing, approval of the final text of the article
Igor V. Molchanov	Doctor of Medical Sciences, Honorary Head of the Department, Professor of the Department of Anesthesiology and Resuscitation, Russian Medical Academy of Continuing Professional Education; https://orcid.org/ 0000-0003-4252-2387, igormol46@mail.ru; 10%, technical editing, approval of the final text of the article
Aleksey I. Moskalev	Candidate of Medical Sciences, Head of the Scientific and Educational Department, A.N. Ryzhikh National Medical Research Center for Coloproctology; https://orcid.org/ 0000-0002-3038-1524, alex.moskalev@gmail.com; 10%, technical editing, approval of the final text of the article
Dmitry O. Kiselev	Doctor of the Ultrasound Diagnostics Department of A.N. Ryzhikh National Medical Research Center for Coloproctology; https://orcid.org/0000-0001-8332-7540, dokiselev@yandex.ru; 5%, participation in mastering the methodology

ASA – physical status of patients according to the classification of the American Society of Anesthesiologists
NRS – numeric rating scale
NRSm – numeric rating scale of pain during movement
NRSr – numeric rating scale of pain at rest
NSAIDs – non-steroidal anti-inflammatory drugs
TAB – transverse abdominal block

INTRODUCTION

Surgical interventions to restore intestinal continuity vary significantly in scope [1]. In the case of a previously formed single-barrel intestinal stoma during the Hartmann procedure, restoration of intestinal continuity involves laparotomy and formation of a colorectal anastomosis, which requires appropriate anesthesia and postoperative pain relief. General anesthesia in such an operation is often combined with neuraxial blocks, and in the postoperative period, prolonged epidural analgesia is used due to severe pain syndrome [2].

When closing double-barreled intestinal stomas, surgical intervention can be performed from a local approach. The smaller size and unilateral location of the wound allow the use of such methods of regional analgesia as fascial blocks of the anterior abdominal wall (for example, prolonged block of the transverse space of the abdomen or square lumbar block); prolonged intra-wound infiltration analgesia and paravertebral block [3–6]. With a postoperative wound size of 5–10 cm, the negative effects of epidural analgesia (motor block of the lower extremities, suppression of pelvic functions and hypotensive effect) prevail over the analgesic effect and can slow down the patient's postoperative recovery.

Extended block of the transverse space of the abdomen is free from many side effects of epidural analgesia and at the same time provides a comparable level of pain relief [7]. The zone of pain sensitivity block is limited to one side of the anterior abdominal wall, which is sufficient for adequate postoperative pain relief.

In case of refusal of regional methods, a common pain relief scheme is the use of non-steroidal anti-inflammatory drugs (NSAIDs) in combination with opioid analgesics as drugs for stopping breakthrough pain [2]. Opioid analgesics slow down the activation of patients in the postoperative period due to the sedative effect, nausea and vomiting, and decreased motility of the gastrointestinal tract.

In this regard, in operations to close intestinal stomas from local access, neurofascial blocks have an advantage as an alternative to traditional methods of postoperative pain relief.

The aim of this study was to evaluate the efficacy of prolonged transversus abdominis block compared with NSAID- and tramadol-based analgesia after locally approached double-barrelled intestinal stoma closure procedures.

MATERIAL AND METHODS

A prospective, single-center, randomized, unblinded clinical study was conducted from January 2021 to December 2021. It included 77 patients aged 23 to 83 years (*Me* = 61; *Q* 1 = 49– *Q* 3 = 67), 30 women (39%), 47 men (61%).

All patients had previously undergone surgery for rectal cancer, diverticular disease, familial adenomatosis of the colon, sigmoid colon cancer, ulcerative colitis, Crohn's disease, primary multiple cancer and were admitted to the clinic for intestinal stoma closure surgery. Sixty-five patients had an ileostomy, six had a transverse stoma, and three had a separate ileoascendostoma.

Inclusion criteria for the study: proposed operation to close a double-barreled intestinal stoma from local access.

Exclusion criteria: refusal of regional methods of anesthesia, refusal to participate in the study, intolerance to local anesthetics, patient's condition according to *ASA* above class III.

Exclusion criteria: changes in the volume of anesthetic care, changes in surgical tactics, emergency surgical interventions in the postoperative period.

Three patients were excluded from the study: in 2 cases, there was a change in the type of anesthesia, and in one case, there was a need for emergency surgery in the immediate postoperative period due to failure of the interintestinal anastomosis.

Thus, 74 patients were included in the analysis, who, after familiarization and signing of voluntary informed consent, were randomized into two groups using the “blind” envelope method.

The main group consisted of 41 patients, the comparison group included 33 patients.

When comparing for homogeneity, no statistically significant differences were found between the groups in terms of the main characteristics (Table 1).

Table 1

Comparison of groups for homogeneity

Indicators	Main group (*n*=41)	Comparison group (*n*=33)	*R* *
Age, years, Me (quartiles)	59 (45–64)	62 (51–69)	0.10
Height, cm, Me (quartiles)	170 (164–178)	174 (163–177)	0.66
Weight, kg, Me (quartiles)	74 (64–84)	75 (65–85)	0.32
ASA, %: II III	 73.2 26.8	 78.8 21.2	0.68
Duration of anesthesia, min, *Me* (quartiles)	100 (85–105)	100 (85–110)	0.89
Operation duration, min, Me (quartiles)	70 (55–75)	70 (65–80)	0.14
Propofol dosage, mg, Me (quartiles)	400 (400–500)	400 (300–400)	0.57
Bupivacaine dosage, mg, Me (quartiles)	12.5 (12.5–15)	12.5 (12.5–15)	0.96

Notes: * — Mann–Whitney test. ASA — physical status of patients according to the classification of the American Society of Anesthesiologists

Anesthetic care included spinal anesthesia with a block level of up to *Th*VI (Bupivacaine Spinal Heavy® KURSK BIOFABRIKA, "BIOK", FKP (Russia), Bupivacaine at a dosage of 12.5-15 mg) in combination with sedation with Propofol (depression of consciousness up to *RASS* score 2).

In the main group, after the operation, a catheter for prolonged unilateral lateral block of the transverse abdominal plane (TAB) was installed under ultrasound navigation, into which a 0.2% ropivacaine solution of 20 ml was injected every 8 hours. If the pain syndrome persisted, a 100 mg ketoprofen solution was administered intravenously; in some cases, additional ketoprofen administration was necessary, but the maximum daily dosage did not exceed 200 mg/day. If this type of analgesia was ineffective, patients were additionally prescribed an injection of a 5% tramadol solution of 100 mg intramuscularly.

In the comparison group, postoperative pain relief was performed according to the standard

technique adopted in the clinic for patients of this category, which included a double injection of ketoprofen solution at 100 mg every 12 hours. If pain relief was insufficient, patients were additionally prescribed an injection of tramadol solution, 5% 100 mg intramuscularly. In the absence of severe pain syndrome, the patient had the right to refuse the ketoprofen injection, which was noted in the questionnaire.

Patients in both groups were routinely prescribed intestinal motility stimulants (metoclopramide) and gastroprotectors (famotidine) in the postoperative period. On the day of surgery, patients were prescribed bed rest.

In the postoperative period, all patients filled out questionnaires for four postoperative days, which recorded the maximum level of static and dynamic pain on a numeric rating scale (NRS), activity level (described below), duration of activity (minutes per day), time to restore full food intake, diuresis, time to restore bowel function (on what day the first passage of gases and stool occurred), frequency of nausea and vomiting. In the first group, ketoprofen consumption was assessed. In both groups, tramadol consumption was taken into account.

The patient's activity level was determined as follows:

0 – complete lack of activity during the day and staying in bed,

I – goes to the toilet,

II – goes to the dressing room,

III – moves freely around the clinic.

The parameters were assessed on the first (day of surgery, 1), second (2), third (3), and fourth days (4).

Statistical data processing was performed using the *Statistica v.* 13 (*StatSOFT*) program. All continuous data were distributed abnormally, the indicators are presented as medians (first quartile–third quartile). The Mann–Whitney test was used to compare quantitative and ordinal features. Qualitative features were compared using the Pearson χ^2 test with Yates' correction. Differences were considered statistically significant at $p < 0.05$.

RESULTS

In patients of the main group, the level of pain syndrome on the first day reached moderate values and was 4 (2–6) points at rest (NRSr) and 6 (4–8) points in motion (NRSm) (Fig. 1–2). Subsequently, the median values of NRSr decreased by 1 point every postoperative day: 3 (2–4) points on the 2nd day, 2 (1–4) points on the 3rd and 1 (0–3) point on the 4th. The same dynamics of pain reduction were noted when assessing in motion: 5 (4–6) points, 4 (3–6) points and 3 (2–4) points on the 2nd, 3rd and 4th days, respectively.

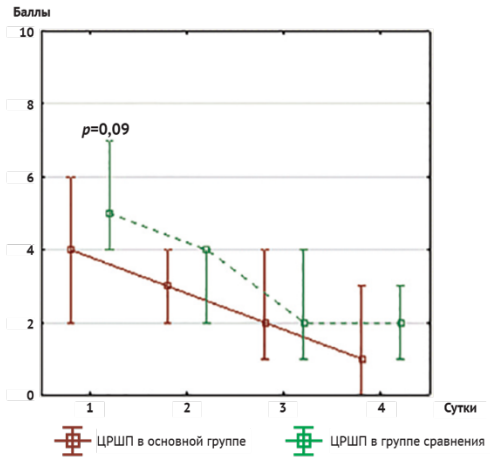

Fig. 1. Dynamics of pain intensity according to the numerical rating scale at rest (NRSr) in the postoperative period

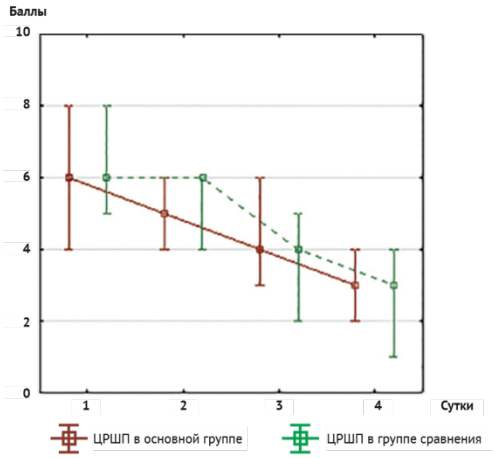

Fig. 2. Dynamics of pain intensity according to the numerical rating scale in motion (NRSm) in the postoperative period

In the comparison group, the level of pain syndrome was also maximal on the 1st day after surgery (Figs. 1 and 2). The level of NRSr during the 1st day was equal to 5 (4–7) points, which only in this single case reflected a tendency to increase compared to the main group ($p = 0.09$), the level of NRSm was 6 (5–8) points. The median values of NRSr and NRSm were 4 (2–4) and 6 (4–6) points on the 2nd, 2 (1–4) and 4 (2–5) points on the 3rd, and 2 (1–3) and 3 (1–4) points on the 4th. day, respectively,

while no statistically significant differences were found compared to the main group.

The first part of Table 2 presents data on the frequency of use and daily dose of ketoprofen in the groups on the 1st, 2nd, 3rd and 4th days of the postoperative period. As can be seen from the table, on the 1st day, the frequency of ketoprofen use between the groups did not differ. Also, no statistically and clinically significant differences in the daily dose of ketoprofen were found between the groups.

Table 2

Frequency of use and daily dose of ketoprofen and tramadol in groups

Indicators	Main group (*n*=41)	Comparison group (*n*=33)	*R* *
Ketoprofen on the 1st day			
Frequency of use, n (%)	38 (93)	27 (82)	0.2875
100 mg/day, n (%)	16 (39)	6 (18)	0,0903
200 mg/day, n (%)	22 (54)	21 (64)	0.5302
Ketoprofen on the 2nd day			
Frequency of use, n (%)	39 (95)	33 (100)	0.5720
100 mg/day, n (%)	17 (41)	2 (6)	*0,0014*
200 mg/day, n (%)	22 (54)	31 (94)	*0,0004*
Ketoprofen on the 3rd day			
Frequency of use, n (%)	30 (73.2)	27 (82)	0.5478
100 mg/day, n (%)	15 (36.6)	2 (6)	*0,0047*
200 mg/day, n (%)	15 (36.6)	25 (76)	*0.0018*
Ketoprofen on the 4th day			
Frequency of use, n (%)	23 (56)	23 (70)	0.3381
100 mg/day, n (%)	15 (37)	6 (18)	0,1373
200 mg/day, *n* (%)	8 (19)	17 (52)	*0,0081*
Tramadol on the 1st day			
Frequency of use, n (%)	7 (17)	19 (57.6)	*0,0007*
100 mg/day, n (%)	0	2 (6)	0.38
200 mg/day, n (%)	7 (17)	9 (27.2)	0.44
300 mg/day, *n* (%)	0	8 (24.2)	*0.003*
Tramadol on the 2nd day			
Frequency of use, n (%)	0	1 (3)	0.91
300 mg/day, n (%)	0	1 (3)	0.91

Note: * – Pearson χ^2 test with Yates correction

On the 2nd, 3rd and 4th days, no differences in the frequency of drug administration were noted either, but the daily dose of ketoprofen differed significantly at the observation stages. Ketoprofen at the maximum dose (200 mg/day) was prescribed more often in the comparison group: on the 2nd day – in 22 patients (54%) of the main group and 31 patients (94%) of the comparison group ($p = 0.0004$), on the 3rd day, respectively - in 15 (36.6%) and 25 patients (76%) ($p = 0.0018$), and on the 4th day - in 8 (19%) and 17 patients (52%), respectively ($p = 0.0081$) (all comparisons are statistically significant).

The second part of Table 2 presents data on the frequency of use and daily dose of tramadol in the groups. The presented data show that the frequency of use and daily dose of tramadol on the first day of the postoperative period were statistically and clinically significantly lower in the main group (Table 2). In this group, tramadol was used on the day of surgery in 7 patients (17%), and in the comparison group - in 19 patients (58%) ($p = 0.0007$), while the submaximal dose of tramadol (300 mg / day) was prescribed only to 8 patients (24.2%) of the comparison group ($p = 0.003$). On the 2nd day in the main group there was no need to prescribe the drug, in the comparison group tramadol was prescribed to only one patient at a dosage of 300 mg. The differences between the groups on the 2nd day were statistically insignificant.

Table 3 presents the level of patient activity by grade during the first 4 days and a comparison of the activity period per day. The analysis showed that more than half of the patients in both groups corresponded to grade III activity, although there were some differences, but they were not statistically significant: on the 2nd day, grade III activity was noted in 17 patients (52%) of the main group and 26 patients (63.4%) of the comparison group ($p = 0.6904$), on the 3rd, respectively, in 28 (85%) and 37 (90%) ($p = 0.7278$). On the 4th day, almost all patients reached grade III activity.

When comparing the duration of patients' activity during the day, it was found that in the comparison group the period of activity on the 2nd day was statistically significantly lower than in the main group: 15 (10–30) minutes versus 30 (20–60) ($p = 0.0187$) on the 2nd day and 45 (20–60) minutes versus 60 (40–90) minutes ($p = 0.043$) on the 3rd day (Table 3). By the 4th day, the indicators had equalized in both groups of patients. Thus, the median of the daily activity time in patients of the

Table 3

Patient motor activity

Degree and time motor activity	Main group (*n*=41)	Comparison group (*n*=33)	*P*
2nd day			
0 degree, *n* (%)	0 (0)	0 (0)	1*
I degree, *n* (%)	3 (7.4)	4 (12)	0.7624*
II degree, *n* (%)	12 (29.2)	12 (36)	0.6904*
III degree, *n* (%)	26 (63.4)	17 (52)	0.4270*
Time of activity, Me (quartiles)	30 (20–60)	15 (10–30)	*0.0187***
3rd day			
0 degree, *n* (%)	0 (0)	0 (0)	1*
I degree, *n* (%)	0 (0)	1 (3)	0.9128*
II degree, *n* (%)	4 (10)	4 (12)	0.9594*
III degree, *n* (%)	37 (90)	28 (85)	0.7278*
Time of activity, Me (quartiles)	60 (40–90)	45 (20–60)	*0.043***
4th day			
0 degree, *n* (%)	0 (0)	0 (0)	1*
I degree, *n* (%)	0 (0)	0 (0)	1*
II degree, *n* (%)	1 (2)	0 (0)	0.9128*
III degree, *n* (%)	40 (98)	33 (100)	0.9128*
Time of activity, Me (quartiles)	60 (60–120)	60 (30–60)	0.11**

Notes: * — Pearson χ^2 test with Yates correction; ** — Mann–Whitney test

main group exceeded the corresponding indicators in the comparison group on the 2nd and 3rd days by 15 minutes, which may also have a certain clinical significance, given the generally low indicators of patients' mobility.

Table 4 shows the frequency of nausea, vomiting and parameters of intestinal activity recovery (gas passage and stool appearance). As can be seen from the table, according to these parameters, both groups did not differ statistically significantly throughout the entire postoperative period.

The time of restoration of natural food intake in the main group did not statistically significantly differ from those in the comparison group on the 2nd (23 versus 14 patients, respectively; $p = 0.35$), 3rd (37 and 28 patients; $p = 0.73$) and 4th day (38 and 32 patients, $p = 0.77$) (Fig. 3).

Table 4

Incidence of postoperative nausea, vomiting and bowel recovery parameters

Indicators	Main group (*n*=41)	Comparison group (*n*=33)	*P**
1st day			
Nausea, *n* (%)	11 (26.8)	15 (45.5)	0.16
Vomiting, *n* (%)	8 (19.5)	9 (27.3)	0.61
2nd day			
Nausea, *n* (%)	8 (19.5)	3 (9)	0.36
Vomiting, *n* (%)	1 (2.4)	0 (0)	0.91
Gas emission, *n* (%)	32 (78)	23 (70)	0.58
Stool, *n* (%)	12 (29)	5 (15)	0.25
3rd day			
Nausea, *n* (%)	3 (7.3)	1 (3)	0.77
Vomiting, *n* (%)	1 (2.4)	0 (0)	0.91
Gas discharge *n* (%)	39 (95)	29 (88)	0.48
Stool, *n* (%)	27 (66)	17 (52)	0.31
4th day			
Nausea, *n* (%)	3 (7.3)	1 (3)	0.73
Vomiting, *n* (%)	1 (2.4)	0 (0)	0.93
Gas discharge, *n* (%)	38 (92)	30 (91)	0.49
Stool, *n* (%)	35 (85)	27 (82)	0.53

Note: * — χ^2-Pearson test with Yates correction

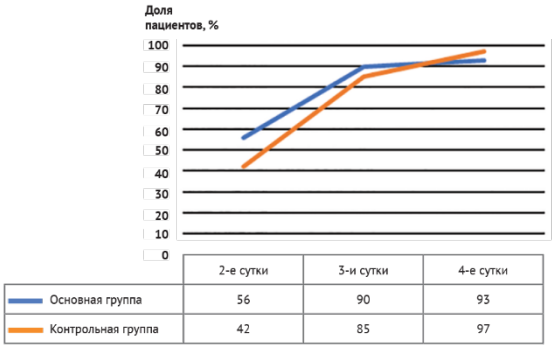

Fig. 3. Percentage of patients who regained adequate nutrition

Urinary retention in the postoperative period occurred mainly on the 2nd day of the postoperative period, 2 cases in each group (4.9% and 6.5%, respectively ($p = 0.77$). On the 3rd day, this complication occurred in 1 patient in the main group

(2.4%), and did not occur at all in the comparison group (p = 0.91)

The postoperative hospital stay between the groups did not differ statistically significantly: 6 (4–7) in the main group and 5 (5–7) in the comparison group (p = 0.31).

DISCUSSION

There are a number of studies in the medical scientific literature proving the effectiveness of prolonged TAB after operations to close double-barreled intestinal stomas from local access. In the study by *Nair A. et al*., a single unilateral double subcostal and posterior block of the transverse abdominis space was used in comparison with placebo [5]. The result of the study was a significant statistically significant reduction in the dose of opioids on the 1st day (3.29±2.78 mg and 9.23±2.94 mg of morphine, p = 0.001) and a tendency to a decrease in the frequency of postoperative nausea and vomiting in the transverse abdominis space block group.

In the study *by P. Morarach et al., the analgesic efficacy of the modified prolonged TAB (MPTAB)* was compared with opioid-based analgesia in patients after intestinal loop stoma closure surgery [8]. The peculiarity of using the modified extended TAB was that surgeons directly visualized the process of catheter placement. This slightly increased the size of the wound surface and, perhaps, was redundant with the increasing availability of ultrasound navigation. In this study, a continuous infusion of a local anesthetic solution was used. Opioid (morphine) consumption, numerical pain scores during the first three postoperative days, and the timing of bowel function recovery were recorded. Total morphine consumption in patients with MPTAB was significantly lower than in patients in the group without the regional technique (7.4 and 19.59 mg of morphine, respectively, $p \leqslant 0.005$), no statistically significant differences in the level of pain syndrome were found. The authors concluded that the MPTAB with a low dose of local anesthetics is effective analgesia for local access loop ostomy closure procedures.

In the work of *A. Maeda et al*., a different type of surgical intervention was chosen, significantly larger in volume — living liver donation [9]. During the study, in one of the groups of patients, the authors used bilateral block of the transverse space of the abdomen for the purpose of postoperative analgesia. As a basic method of pain relief, patients in both groups received a continuous infusion of fentanyl solution with the possibility of controlled bolus administration. In the extended block group, a significant decrease in fentanyl consumption was found within 48 hours (5.5 (0–11.9) μg/kg and 18.0 (13.2–20.5) μg/kg, p <0.01), and there was also an almost complete refusal of bolus administration (0 (0–0.7) μg/kg and 0.9 (0–2.7) μg/kg, p =0.04).

The results of the presented studies showed that the use of prolonged TAB, regardless of the volume of surgical intervention, entails a significant reduction in the consumption of opioid analgesics.

In our prospective randomized study, the use of prolonged TAB also significantly reduced the consumption of intravenous painkillers: opioids (tramadol) and NSAIDs (ketoprofen). We believe that this indicator more clearly demonstrates the advantage of the prolonged TAB technique than assessing the level of pain syndrome using subjective criteria such as a digital rating scale or visual analog scale.

Our clinical study also established that prolonged TAB does not lead to a decrease in the level of pain syndrome according to the NRS, either at rest or in motion. Similar data are presented in a number of foreign publications [5, 7–10]. However, compared to foreign studies, our study used tramadol, which has less analgesic activity than morphine and fentanyl.

At the same time, statistically significant differences in the duration of daily activity of patients were revealed in favor of patients in the main group. Considering the revealed low indicators of patient mobility in the early stages of the postoperative period, the median of daily activity in both groups (30 minutes in the main group and 15 minutes in the comparison group on the 2nd day (p = 0.0187) and 60 and 45 minutes (p = 0.043) on the 3rd day, respectively), it can be assumed that the difference of 15 minutes has a certain clinical significance, contributing to faster rehabilitation of patients.

Reducing opioid analgesic consumption and increasing activity time has a beneficial effect on postoperative recovery of patients and is in line with current trends in enhanced recovery programs in surgery [11].

Analyzing such indicators as the start of fluid intake, time until the onset of bowel activity, the incidence of postoperative nausea and vomiting, and the duration of the postoperative period (number of

postoperative hospital days), we paid attention to some publications. Thus, *R. Tikuisis et al*. [10] in laparoscopically assisted colon surgeries noted a statistically significant difference between the groups (patients with transverse abdominis muscle block and with intravenous postoperative analgesia) in the following parameters: earlier start of fluid intake (26.81 ± 5.21 hours and 31.09 ± 2.69 hours, $p < 0.0001$), time to restore a full diet (34.13 ± 3.88 hours and 38.41 ± 3.82 hours, $p < 0.0001$), bowel activity (27.69 ± 3.70 hours and 33.34 ± 3.32 hours, $p < 0.0001$) and hospital stay (5.34 ± 2.54 days and 7.50 ± 3.03 days, $p = 0.001$) in the group of patients who underwent prolonged TAB. In the study *by A. Maeda et al*. [9] it was also noted that the recovery of patients after surgery was more effective in such parameters as the number of missed meals (7 (7–7) and 7 (7–8); $p=0.02$)), postoperative nausea and vomiting between 24 and 48 hours (2 cases out of 16 and 9 cases out of 16; $p<0.01$) in the group of patients with the regional technique. In the publication by *P. Morarach et al*., when comparing groups of patients who underwent prolonged block of the transverse abdominis muscle and intravenous analgesia with opioids, it was also noted that in the first group postoperative rehabilitation occurs earlier in such parameters as the first passage of gases (after 35 and 42 hours, $p<0.05$), the time interval before the first intake of liquid (41 and 46.5 hours, $p<0.05$). In addition, the length of hospital stay after surgery is statistically significantly reduced (85 and 96 hours, $p<0.01$) [8].

According to the results of our study, no advantage of the regional technique over intravenous anesthesia was found in terms of the parameters of restoration of physiological functions such as the time to restore adequate nutrition, bowel function, frequency of urinary retention, and the duration of postoperative hospital stay.

It is worth noting that for safe puncture and subsequent catheterization of the transverse abdominal space using one of the accepted methods, confident skills in ultrasound navigation by the anesthesiologist-resuscitator are required, which requires certain skills and may somewhat limit the use of this method at the stages of its development.

CONCLUSION

Prolonged transverse abdominal block during operations for closing double-barreled intestinal stomas from local access in the postoperative period significantly reduces the frequency of use and dose of ketoprofen and tramadol, increases the duration of daily patient activity. Thus, prolonged block of the transverse space of the abdomen is preferable to pain relief based only on nonsteroidal anti-inflammatory drugs and opioids and can be included in multimodal analgesia schemes for these operations.

The study is currently recruiting patients. The final results will be published later.

1. Prolonged block of the transverse space of the abdomen allows to reduce the need for the maximum daily dose of ketoprofen on the 2nd day by 40% ($p = 0.0004$), on the 3rd day by 39.4% ($p = 0.0018$) and on the 4th day by 33% ($p = 0.0081$).

2. The use of prolonged transverse abdominis block allows for a reduction in the overall frequency of tramadol use on the day of surgery by 40.6% ($p = 0.0007$), and the frequency of its use in a submaximal daily dosage by 24.2% ($p = 0.003$).

3. The duration of motor activity of patients in the group of prolonged transverse abdominis block was 15 minutes longer on the 2nd ($p = 0.0187$) and 3rd days ($p = 0.043$).

LIMITATIONS OF THE STUDY

The study was not blinded. However, given the design chosen, conducting a blinded study was not possible.

REFERENCES

1. Achkasov SI, Kalashnikova I, Starodubov V, Shelygin Yu. *Intestinal stomy*. Moscow: GEOTAR-Media Publ.; 2021. (In Russ.)
2. Ovechkin AM, Bayalieva AZ, Ezhevskaya AA, Eremenko AA, Zabolotskij DV, Zabolotskikh I, et al. Postoperative analgesia. Guidelines. *Annals of Critical Care.* 2019;(4):9–33. (In Russ.) https://doi.org/10.21320/1818-474X-2019-4-9-33.
3. D'Andrea R, Gambetti G, Querci L, Amodei B, Bianchini A. Ultrasound-guided thoracic paravertebral block for closed loop ileostomy repair in severe COPD: a case report. *Brazil J Anestesiol*. 2018;68(6):650–652. PMID: 29983183 https://doi.org/10.1016/j.bjan.2018.02.005
4. Hamid HK, Marc-Hernández A, Saber AA. Transversus abdominis plane block versus thoracic epidural analgesia in colorectal surgery: a systematic review and meta-analysis. *Langenbeck's Arch Surg*. 2021;406(2):273–282. PMID: 32974803 https://doi.org/10.1007/s00423-020-01995-9
5. Nair A, Amula VE, Naik V, Kodisharapu PK, Poornachand A, Prasad MS, et al. Comparison of Postoperative Analgesia in Patients Undergoing Ileostomy Closure with and Without Dual Transversus Abdominis Plane (TAP) Block: A Randomized Controlled Trial. *Rambam Maimonides Med J.* 2019;10(1):e0004. PMID: 30304665 https://doi.org/10.5041/RMMJ.10356

6. Lapkina IV, Alekseeva TM, Khalikova EYu, Ali SKh, Sukhanov RB, Slusarenko RI, et al. Paravertebral block in fast track urology. *Russian Journal of Anaesthesiology and Reanimatology.* 2020;(4):87–92. (In Russ.). https://doi.org/10.17116/anaesthesiology202004187
7. Liu X, Ou C, Peng F, Mu G. Comparison of analgesic efficacy of continuous transversus abdominis plane block with continuous epidural analgesia in patients undergoing abdominal surgery: a systematic review and meta-analysis. *J Int Med Res*. 2020;48(6):300060520922691. PMID: 32485123 https://doi.org/10.1177/0300060520922691
8. Morarach P. Analgesic effectiveness of modified continuous transversus abdominis plane block with low dose of Local anesthetic continuous infusion in closure loop stoma. *Thai Journal of Anesthesiology*. 2018;44(2):79–84. https://he02.tci-thaijo.org/index.php/anesthai/article/download/121118/92417 [Accessed May 15, 2024]
9. Maeda A, Shibata SC, Wada H, Marubashi S, Kamibayashi T, Eguchi H, et al. The efficacy of continuous subcostal transversus abdominis plane block for analgesia after living liver donation: a retrospective study. *J Anesthesia*. 2016;30(1):39–46. PMID: 26511998 https://doi.org/10.1007/s00540-015-2085-x
10. Tikuisis R, Miliauskas P, Lukoseviciene V, Samalavicius N, Dulskas A, Zabuliene L, et al. Transversus abdominis plane block for postoperative pain relief after hand-assisted laparoscopic colon surgery: a randomized, placebo-controlled clinical trial. *Tech Coloproctol*. 2016;20(12):835–844. PMID: 27896461 https://doi.org/10.1007/s10151-016-1550-3
11. Achkasov SI, Surovegin ES, Sushkov OI, Lukashevych IV, Savushkin AV. Results of the Implementation of the Enhanced Recovery Program in Coloproctology. *Koloproktologia*. 2018;(2):32–38. (In Russ.) https://doi.org/10.33878/2073-7556-2018-0-2-32-38

Received on 01/06/2023
Review completed on 08/10/2023
Accepted on 26/03/2024