

## USE OF STAPLED T-SHAPED SMALL INTESTINAL ANASTOMOSIS

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К ВОПРОСУ О ПРИМЕНЕНИИ АППАРАТНОГО Т-ОБРАЗНОГО  
ТОНКОКИШЕЧНОГО АНАСТОМОЗА

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In order to assess the effectiveness of the use of stapled T-shaped small intestinal anastomosis, a one-center retrospective analysis of the results of treatment of 53 patients with preventive ileostomies was carried out. They were treated in 2015-2020 for malignant neoplasms (MNO) of the colon and pelvic organs. According to the type of anastomosis applied, the group of 53 (100.0%) patients was divided into main and control. To assess the possibility of comparative analysis, these groups were compared by sex, age, severity of comorbid pathology, and average BMI. When analyzing the results of using a stapled T-shaped anastomosis method, it was found that the method allows to reduce the duration of reconstructive intervention from 70 (55; 120) to 45 (30; 65) minutes, to reduce the number of postoperative complications from 36.0% to 14.3 %, to reduce the time spent by patients in the hospital from 11 (9; 13) to 7 (6; 9) days.

**Keywords:** *ileostomy, T-shaped anastomosis, intestinal continuity restoration, stapled anastomosis*

Для оценки эффективности применения аппаратного Т-образного тонкокишечного анастомоза проведен одноцентровой ретроспективный анализ результатов лечения 53 пациентов с превентивными илеостомами. Они были пролечены в период 2015-2020 гг. по поводу злокачественных новообразований толстой кишки и органов малого таза. По типу накладываемого анастомоза 53 (100,0%) пациента были разделены на основную и контрольную группы. Для оценки возможности проведения сравнительного анализа эти группы были сопоставлены по полу, возрасту, тяжести коморбидной патологии, среднему ИМТ. При анализе результатов применения аппаратного Т-образного анастомоза было установлено, что метод позволяет сократить продолжительность реконструктивно-восстановительного вмешательства с 70 (55;120) до 45 (30;65) минут, снизить число послеоперационных осложнений с 36,0% до 14,3%, уменьшить сроки нахождения пациентов в стационаре с 11 (9;13) до 7 (6;9) суток.

**Ключевые слова:** *илеостома, Т-образный анастомоз, восстановление непрерывности кишечника, аппаратный анастомоз*

**Purpose:** to evaluate the effectiveness of the use of a stapled T-shaped small intestinal anastomosis when performing reconstructive interventions in patients with ileostomies.

## Relevance

The imposition of a preventive loop ileostomy helps to avoid the development of severe complications from the formed colorectal and coloanal anastomoses, primarily anastomotic leakage (AL). According to Russian and foreign publications, the frequency of its development varies from 0.6% to 4.7% [1,2].

The principal difference when performing reconstructive interventions of small bowel stomas is the types of superimposed joints between the segments of the small intestine [1-14]. By the types of means used for suturing, they can be divided into manual (handsewn) and mechanical (stapled) [5,6,9,12,14]. Each of the methods of imposing the small bowel anastomosis mentioned above has its own advantages and disadvantages: when applying the anastomosis manually, the duration of the operation increases and there is also the impossibility of uniform compression of the layers of the walls of the connected segments of the intestine, and equal distances

between the sutures [9,12,14]. The publications devoted to the comparison of various techniques indicate that the manual suture causes prolonged edema of the intestinal wall and the phenomenon of anastomosis, which can lead to impaired intestinal patency [1,2]. The use of a stapled suture is not without its drawbacks — a decrease in blood flow in the area of application of metal staples by 40% was experimentally revealed (when a manual anastomosis was applied, it was no more than 10%) [3-6,7]. In the postoperative period, this leads to more frequent formation of fibrosis and strictures in the area of the anastomosis. Thus, the technique of forming an anastomosis depends on the preference of the operating surgeon and the material and technical provision of the operating room [3].

## Materials and methods

A one-center retrospective analysis of the treatment results of 53 patients with preventive ileostomas was carried out. All of them were treated in the surgical and coloproctological departments of the Surgut Regional Clinical Hospital in the period of 2015-2020. Previous surgical interventions were caused by malignant neoplasms (MN) of the colon and pelvic organs. The

inclusion criteria for patients were the presence of an ileostomy, the absence or compensation of comorbid pathology, the absence of progression of malignant tumors, and the patient's willingness for surgery. The exclusion criteria for the study were verified signs of continued growth of malignant neoplasms (MN), the presence of its regional or distant metastases, or the identification of a new focus of cancer, concomitant pathology in the stage of sub- or decompensation, and the patient's unwillingness.

The total group of 53 (100.0%) patients was divided into the main and control group according to the type of superimposed ileo-ileoanastomosis (IIA). The main group included 28 (52.8%) patients who underwent reconstructive surgery with antiperistaltic stapled T-shaped anastomosis and resection of the segment of the small intestine carrying the stoma [3-6]. This technique has been used by us from 2016 to the present. In our opinion, in the formation of IIA, preference should be given to antiperistaltic stapled anastomosis of the side-to-side type as the fastest way of imposing an interintestinal fistula and shortening the duration of the operation, which reduces intraoperative trauma and corresponds to the Fast Track principles in surgery for patients with an ostomy [8,14]. The control group consisted of 25 (47.2%) patients who were manually anastomotic. With the preserved posterior wall of the small intestine, a manual  $\frac{3}{4}$  method by Melnikov was used in 14 (26.4%) patients, in 9 (17.0%) patients, the interintestinal fistula was imposed using the "side to side" method, in 2 (4.0%), the manual "end-to-end" method was used to form the anastomosis (Table 1).

Table 1  
Types of ileo-ileoanastomoses

Type of IIA	Quantity, abs	Quantity, %
Manual $\frac{3}{4}$ method by Melnikov	14	26,4
Manual "side-to-side"	9	17,0
Manual "end-to-end"	2	3,8
T-shaped stapled anastomosis	28	52,8
Total	53	100,0

There were no statistically significant differences between the number of patients between the patients of the main and control groups,  $p = 0.23$ . To assess the possibility of conducting a comparative analysis, the groups were also compared in terms of age and sex indicators, the severity of comorbid pathology, as well as the average body mass index. For the distribution of patients by age, the classification of the World Health Organization is adopted. According to this classification, persons from 25 to 44 years old belong to the category of young age, from 45 to 59 years old – to the middle age category, from 60 to 74 years old – elderly age. Patients over 75 years old belong to the category of senile age, but in the study there were no persons of this category. In order to assess the severity of the existing comorbidities, the Charlson index was used [15]. The results are shown in Table 2.

Table 2

Basic comparison parameters

Parameter	Main group ( <i>n</i> = 28)		Control group ( <i>n</i> = 25)		p*
	abs.	%	abs.	%	
Sex					
Male	13	46,4	12	48,0	0,36
Female	15	53,6	13	52,0	0,44
Age					
Young	1	3,6	1	4,0	0,42
Middle	13	46,4	11	44,0	0,39
Elderly	14	50,0	13	52,0	0,57
Average, years	54,9±11,0		54,2±11,2		0,29
Charlson Index					
Middle	5 (3;8)		6 (3;9)		0,11
BMI, kg/m <sup>2</sup>					
Middle	28,0±4,5		27,4±3,6		0,37

$p^*$  — statistical significance coefficient

In 48 (90.6%) patients, reconstructive interventions were performed using a local parastomal approach. When mobilizing a segment of the stoma intestine from the tissues of the anterior abdominal wall to the free abdominal cavity, we encountered an adhesive process in the vast majority of patients. It was not possible to visually assess the severity of the adhesions in the abdominal cavity as a whole due to the small size of the access from which the intervention was performed. Median laparotomy was used in the presence of a large hernia of the anterior abdominal wall, requiring plastic mesh implant surgery, in 5 (9.4%) patients.

Based on the foregoing, the main and control groups are comparable in terms of the number, sex and age of the subjects, as well as the severity of the comorbidity background, BMI ( $p > 0.05$ ). This allows us to evaluate the effectiveness of the use of antiperistaltic stapled T-shaped small intestinal anastomosis when performing reconstructive interventions in patients with ileostomies.

## Results and discussion

In order to assess the effectiveness of the use of a stapled T-shaped anastomosis, we determined the key criteria: the duration of the operation, the time of onset of peristalsis, the period from the end of the intervention to the passage of gases, the time from the operation to the appearance of the first independent stool, the presence and severity of complications, as well as the duration of the hospitalization.

Analysis of the results of surgical rehabilitation of patients with ileostomies showed a statistically significant reduction in the operation time. This is due to the use of staplers for the imposition of the interintestinal fistula and the formation of IIA. We define the duration of the operation as the time from the moment of the circular incision of the skin around the stoma to the end of the closure of the postoperative wound of the anterior

abdominal wall. This parameter was recorded by the anesthesiologist in the patient's anesthetic card. The median duration of surgical intervention with manual anastomosis was 70 (50; 120) minutes; with hardware anastomosis, its value was 45 (30; 60) minutes,  $p = 0.003$ . The obtained data coincide with those published in the actual literary sources [1-14,16].

Table 3  
The main criteria for evaluating the effectiveness of the use of various types of IIA

Parameter	Main group ( $n = 28$ )	Control group ( $n = 25$ )	$p^*$
Operation duration, min	45 (30;65)	70 (55;120)	0,003
Onset of peristalsis, day	1 (1;2)	1 (1;2)	0,7
Passing of flatus, day	1 (1;2)	2 (1;3)	0,023
First stool, day	3 (2;4)	5 (4;6)	0,014
The number of complications abs.,%	4 (14,3%)	9 (36,0%)	0,039
Duration of hospitalization, days	7 (6;9)	11 (9;13)	0,003

$p^*$  — statistical significance coefficient

After restorative surgery, all patients, after awakening and short observation in the operating room, were transferred to a specialized surgical or coloproctological department and were under the supervision of the surgical team on duty during the first day. Therefore, the need for patients to stay in the department of anesthesiology and resuscitation was not noted,  $p = 0.8$ . There were no significant differences in the rate of the onset of peristalsis in the group with manual (handsewn) and mechanical (stapled) anastomoses — in all patients in the postoperative period it recovered within 24 hours after the operation,  $p = 0.7$ . In the main group, the median time of gas passage was 1 (1; 2) day, while in the control group it was 2 (1; 3) days,  $p = 0.023$ . The first stool in patients after the imposition of an stapled anastomosis was observed by 3 (2; 4) days after reconstructive surgery. In the group of patients, after the formation of a manual anastomosis, the stool appeared on the 5th (4; 6) day,  $p = 0.014$  (Table 3).

Literature data indicate that there were no significant differences in the development of complications in the postoperative period between manual and mechanical types of anastomoses [2,9-14]. When analyzing the results of surgical treatment, a complicated course of the postoperative period was recorded in 9 (36.0%) patients in the control group; in the control group complications were noted in 4 (14.3%) people,  $p = 0.039$ . Surgical site infection (SSI) was recorded in 5 (20.0%) patients with manual anastomosis; it was stopped by a course of antibiotic therapy, taking into account the sensitivity of the discharge obtained during bacteriological examination of the wound discharge. In the main group, 1 (3.6%) local purulent-infectious complication developed. On days 2-3 after surgery, acute intestinal obstruction (AIO) developed in 2

(8.0%) patients of the control group. When using the antiperistaltic stapled T-shaped anastomosis method, the postoperative period became more complicated in 1 (3.6%) patient,  $p = 0.041$ . These complications have undergone conservative treatment with a positive effect. Failure of the ileo-ileoanastomosis (IIAF), which required repeated surgical intervention, developed on days 2-4 in 2 (8.0%) patients after manual anastomosis, in 1 (3.6%) patient after an mechanical intestinal anastomosis ( $p = 0.041$ ) (Table 4).

Table 4  
Characteristics of the resulting complications

Complication type	Main group ( $n = 28$ )		Control group ( $n = 25$ )		$p^*$
	abs.	%	abs.	%	
SSI <sup>1</sup>	2	7,1	5	20,0	0,0355
AIO <sup>2</sup>	1	3,6	2	8,0	0,041
IIAF <sup>3</sup>	1	3,6	2	8,0	0,041

SSI<sup>1</sup> — surgical site infection; AIO<sup>2</sup> — acute intestinal obstruction; IIAF<sup>3</sup> — ileo-ileoanastomosis failure

In the main and control groups, the median duration of hospitalization after the reconstructive intervention with the elimination of the loop ileostomy had statistically significant differences and was 7 (6; 9) days and 11 (9; 13) days, respectively,  $p = 0.003$  (Table 3).

After analyzing the effectiveness of the use of a stapled T-shaped small intestinal anastomosis when performing reconstructive and restorative interventions in patients with ileostomies, it is fair to say that this technique can shorten the duration of reconstructive intervention, accelerate the restoration of bowel function, and also reduce the number of postoperative complications and the length of stay of patients in the hospital.

### Conclusion

The search for the most optimal way of ileo-ileoanastomosis formation remains open for further study [1,2,4,10,14]. In order to prevent the development of postoperative complications associated with the formation of ileo-ileoanastomosis (IIA), in our opinion, it is advisable to perform a resection of the portion of the small intestine carrying the stoma. We believe that resection of the intestinal section bearing the ileostomy reduces the risk of developing in the postoperative period a violation of the patency of the small intestine and the development of intestinal obstruction associated with the adhesiolysis process ( $p = 0.041$ ).

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