

Keywords

rectal fistulas, complex forms, surgical treatment, pararectal fistulas, complex anal fistula, surgical treatment, transsphincteric fistula, extrasphincteric fistula.

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Surgical Treatment Outcomes for Complex Rectal Fistulas.

Abstract

This study included 119 patients with high transsphincteric and extrasphincteric pararectal fistulas operated at the coloproctology department of the Samarkand State Medical University clinic. The application of a new surgical technique reduces the intensity of pain syndrome in patients at rest by 10% and after defecation by 20%, and decreases the rate of postoperative complications by 16.8% compared with the rectal mucosal advancement flap procedure in the early postoperative period. Furthermore, the new method reduces the rate of anal incontinence by 5.7% at 3 months and by 8.4% at 1 year postoperatively compared with the traditional method. Compared with the rectal mucosal advancement flap procedure, the new surgical technique decreases the recurrence rate by 10.3% at 1 year and by 12.4% at 3 years of follow-up.

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INTRODUCTION

Relevance of the Research Topic

Pararectal fistulas are a common condition, accounting for 20–40% of all anorectal diseases. Up to 15% of patients admitted to coloproctology departments present with this pathology. One of the causes of pararectal fistula formation is delayed and/or inadequate treatment of patients with acute paraproctitis [1, 3].

Complex forms of chronic paraproctitis include transsphincteric fistulas penetrating the deep portion of the external anal sphincter, anterior transsphincteric fistulas in women, horseshoe-shaped and repeatedly recurring fistulas accompanied by anal sphincter insufficiency, as well as all extrasphincteric pararectal fistulas. Complex forms of chronic paraproctitis account for 30–45% of the total number, and their treatment represents a serious surgical challenge [2, 4].

Following surgical intervention for chronic paraproctitis, the risk of disease recurrence ranges from 4.7% to 53%. This is attributed to the difficulty of identifying the internal opening of the fistula, cicatricial and inflammatory changes in the perirectal and rectal tissues, the presence of hidden additional fistulous tracts and purous cavities, and the specifics of the surgical technique employed. Following surgery, the degree of anal incontinence can reach up to 83%. This is due to the fact that radical surgery involving the elimination of the fistulous tract and its internal opening inevitably affects the fibers of the anal sphincter.

All of the above underscores the relevance of this problem and necessitates the search for new surgical treatment methods for patients with complex forms of pararectal fistulas.

MATERIALS AND METHODS

The study included 119 patients with high transsphincteric and extrasphincteric pararectal fistulas operated on at the

coloproctology department of the Samarkand State Medical University (SamSMU) clinic.

As a surgical treatment method, 55 patients in the control group underwent advancement of a full-thickness rectal segment with subsequent fixation of the flap and closure of the perineal wound, following the method of the State Scientific Center of Coloproctology of the Russian Federation.

The main group consisted of 64 patients who underwent our modified surgical technique for the treatment of transsphincteric and extrasphincteric rectal fistulas.

The mean age of patients in the main and control groups was 42 ± 12.94 and 41 ± 12.8 years, respectively (Student's t -test = 0.087, $p > 0.05$). The predominant number of patients fell into two age groups: from 20 to 39 years and from 40 to 59 years. Men accounted for 83 (69.7%) and women for 36 (30.3%).

The majority of patients reported the onset of the first symptoms of chronic paraproctitis from 1 to 5 years — 75 (63.1%) such patients. The duration of the disease up to 1 year was observed in 21 (17.6%), and more than 5 years — in 19 (15.9%) patients. Most rarely, the anamnesis of the disease reached 20 years, which was recorded in 4 patients (3.4%).

In the anamnesis, 32 (26.9%) patients had a spontaneously opened acute paraproctitis. The remaining 87 (73.1%) patients had previously undergone surgical treatment — incision of acute paraproctitis under local or general anesthesia.

To determine the clinical form of fistulas, we used the classification of paraproctitis developed at the Research Institute of Coloproctology of the Ministry of Health of the Russian Federation (2020). Of the 119 patients, 83 (69.7%) had high transsphincteric and 36 (30.3%) had extrasphincteric rectal fistulas. The distribution of patients by fistula form is presented in Table 1.

Table 1 Distribution of patients in the comparison groups by clinical form of fistula (n=119)

Fistula form	Main group (n=64)		Control group (n=55)		Total (n=119)	
	ađc.	%	Ađc.	%	ađc.	%
Extrasphincteric fistula	21	32,8	15	27,2	36	30,3
High transsphincteric fistula	43	67,2	40	72,8	83	69,7
Total	64	100	55	100	119	100

The leading complaints in patients with chronic paraproctitis were the visual presence of an external fistulous opening in the perianal region (92.4%) and purulent discharge from it (87.4%). Less common were complaints of pain sensations in the perianal region and anal canal (42.9%) and periodic temperature rise to subfebrile values (30.3%).

During standard examination of the perianal region, the number of external fistulous openings, their location and distance from the edge of the anal canal, the nature of the discharge, and the condition of the skin were assessed. In all 119 patients of the comparison groups, the complex pararectal fistulas had an external fistulous opening. The external opening located at the 5–7 o'clock position of the

conventional clock face was found in 74 (62.2%) patients, at the 11–1 o'clock position in 18 (15.1%), and lateral location in 26 (21.8%).

A single external opening of the pararectal fistula was identified in 88 (73.9%) of the examined patients, and two external openings in 31 (26.1%). The distance from the external fistulous opening to the anal canal was measured in all patients of the comparison groups.

Cicatricial changes in the wall of the rectum or anal canal were detected in 33 (27.7%) patients. During digital examination, this was determined as tissue induration, reduced mobility of the mucosa, and, in some cases, tenderness on palpation.

During digital examination, it is not always possible to identify the internal fistulous opening — this was achievable in 46 (38.6%) patients. In the remaining 73 (61.3%) patients, the localization of the internal opening was determined intraoperatively by "indirect signs" (10.9%) or by probing the fistulous tract before surgery or directly in the operating room (48.7%).

A dye test to determine the patency of the pararectal fistula and to identify the localization of the internal opening was performed in 119 (100%) patients. The efficacy of the test was 65.5% and depended on the closure of the internal fistulous opening, cicatricial changes in the lumen of the pararectal fistula, or compression of the lumen by an inflammatory infiltrate.

Ultrasound was not the main diagnostic criterion for pararectal fistulas and was used by us only in cases of pronounced cicatricial changes in the region of the internal opening of the rectum.

The study was conducted in 36 (30.1%) patients with extrasphincteric and high transsphincteric pararectal fistulas. To increase the effectiveness of the examination, we also used the introduction of a 3% hydrogen peroxide solution into the fistulous tract in 21 patients. In all cases, ultrasound allowed clear determination of the localization of the internal fistulous opening, visualization of the course of the pararectal fistula relative to the sphincter fibers, and identification of additional branches in complex forms of chronic proctitis (Figs. 1, 2).



Figure 1 — Sonogram of patient X., 49 years old, diagnosis: Chronic paraproctitis, complete transsphincteric pararectal fistula. Peripheral part of an extrasphincteric pararectal fistula (transperineal examination).

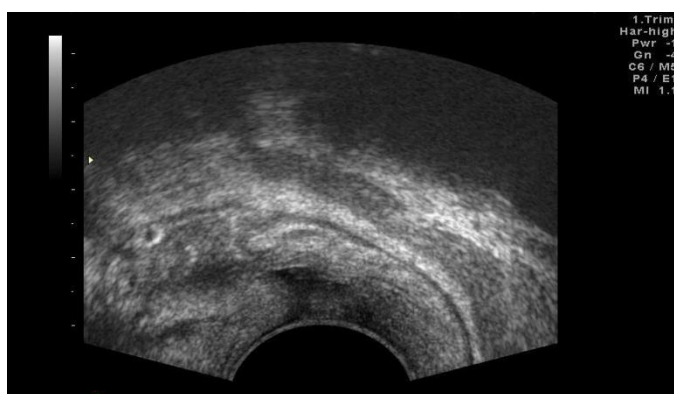


Figure 2 — Sonogram of patient Z., 48 years old, with diagnosis: Chronic paraproctitis, complete transsphincteric pararectal fistula. Transrectal ultrasound examination.

For additional assessment of sphincter function, we used the Cleveland Clinic Fecal Incontinence Score questionnaires. This questionnaire was administered before surgery and at 3 months and 1 year after the surgical treatment.

To investigate the anal sphincter function, patients underwent sphincterometry using the Sphinctometer msmProMedico device (Germany).

Modified surgical technique for patients with complex pararectal fistulas

All patients underwent spinal anesthesia. The dural puncture was performed at one of the levels L3–L4, L4–L5, or L5–S1 with the patient in the lateral or sitting position. We used 1–2 mL of 0.5% bupivacaine solution or 2–3 mL of 2% lidocaine solution. The exposure time was 5 minutes. The upper level of sensory blockade was L2–L3.

The operation was performed with the patient in the lithotomy position. After preparation of the surgical field and rectum, staining of the fistulous tract was performed by injecting a 1% alcoholic solution of brilliant green together with a 3% hydrogen peroxide solution in a 2:1 ratio through the external fistulous opening. The criterion for fistulous tract patency was the passage of contrast through the internal fistulous opening.

Using monopolar coagulation, the pararectal fistula with the external fistulous opening was excised directly to the rectal wall.

The dissected fistulous tract was transected at the muscular wall of the rectum. The stump was then curetted with a Volkmann spoon and treated with a 5% alcoholic solution of iodine.

In the region of the internal fistulous opening, hydrodissection was performed by injecting 20–30 mL of 0.25% novocaine solution or 0.9% sodium chloride solution into the submucosal space of the rectum.

An arcuate incision of the perianal skin was made 2–3 mm below the transitional anodermal line, 1–1.5 cm in length, with dissection of the mucosal-submucosal layer of the rectum corresponding to the location of the internal fistulous opening and 1 cm above the fistulous tract, followed by its transection (Figure 3).

The dissected flap has the shape of an isosceles triangle with a base length of 1–1.5 cm and an apex angle of 20°. The internal fistulous opening should be located 1 cm from the apex of the triangle (Figure 4).



Figure 3 — Dissection of the mucosal-submucosal flap of the rectum in patient D., 35 years old, with diagnosis: Chronic paraproctitis, complete transsphincteric pararectal fistula.

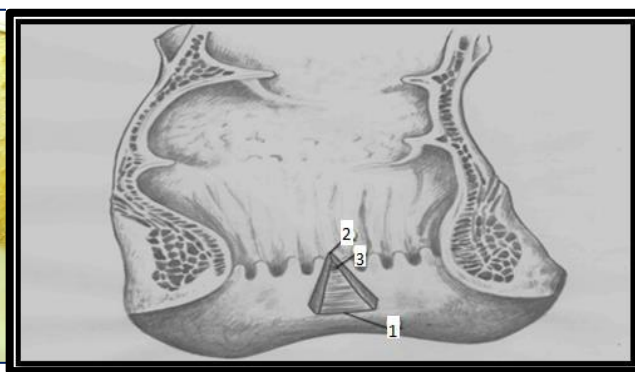


Figure 4 — Schematic representation of the anal canal and lower ampullary part of the rectum. 1 — base of the isosceles triangle; 2 — apex of the isosceles triangle; 3 — localization of the internal fistulous opening.

The dissected mucosal-submucosal flap was also excised in the shape of an isosceles triangle within the boundaries of its mobilization, so that the apex of the triangle was located 0.5 cm above the internal fistulous opening.

Thus, together with the excised flap, we performed the removal of the internal fistulous opening and the cicatricial changes of the mucosa surrounding it.

The internal fistulous opening was sutured in the muscular layer of the rectum with a two-layer interrupted suture using 3-0 synthetic absorbable suture material (Figures 5, 6).



Figure 5 — Suturing of the muscular layer of the rectum with the internal fistulous opening in patient D., 35 years old, with diagnosis: Chronic paraproctitis, complete transsphincteric pararectal fistula.

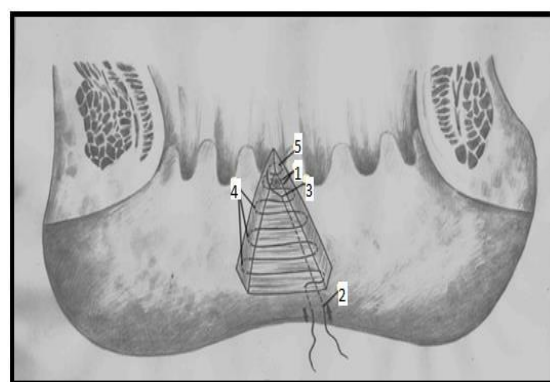


Figure 6 — Schematic representation of the formation of a continuous suture. 1 — sutured internal fistulous opening; 2 — site of the beginning of suture formation; 3 — site of needle exit in the wound below the sutured internal fistulous opening; 4 — formation of a continuous suture through the submucosal layer of the rectum; 5 — apex of the isosceles triangle.

Next, from the perineal side, a needle with a 3-0 polypropylene suture was introduced. The needle was brought out through the wound, 1 cm below the internal fistulous opening previously sutured in the muscular wall of the rectum. Using this suture, the wound was closed with a continuous stitch through the submucosal layer from top to bottom, incorporating the muscular layer of the rectum.

The initial bite grasped the angle of the wound through the submucosal layer, advancing and covering the internal fistulous opening, sutured within the muscular wall of the rectum, with healthy mucosa that had been dissected 1 cm above. The intraoperative formation of the suture is shown in Figure 7. A schematic representation of the wound after tightening the continuous suture is presented in Figure 8.

The wound, which initially had a sector-shaped configuration, acquires a linear appearance after suturing. The margins of the mucosa come into close apposition with each other. After wound closure, the polypropylene suture is brought out onto the perineum 1 cm away from the site of its introduction. Both ends of the suture are tied together over a rubber tube under slight tension (Figure 9).

The perianal wound remaining after fistula excision was closed in layers with the placement of a rubber drain, left open for healing by secondary intention, or sutured following the insertion of a through-and-through tubular drain.



Figure 7 — Formation of a continuous suture of the rectal wall in patient D., 35 years old, with diagnosis: Chronic paraproctitis, complete transsphincteric pararectal fistula.

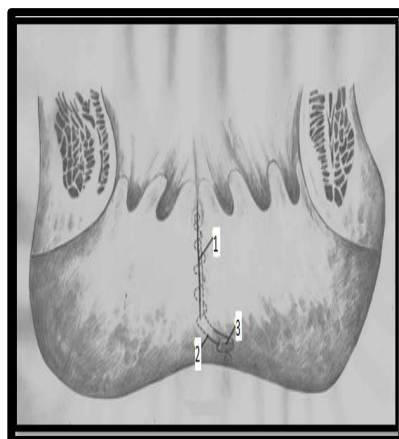


Figure 8 — Wound after tightening the continuous suture. 1 — sutured internal fistulous opening; 2 — site of needle exit of the continuous suture; 3 — tied ends of the ligature over a rubber tube.



Figure 9 — Appearance of the sutured wound of the anal canal in patient D., 35 years old, with diagnosis: Chronic paraproctitis, complete transsphincteric pararectal fistula.

A patent for the invention of the modified surgical technique for complex pararectal fistulas, developed by us, has been issued by the Republic of Uzbekistan.

In the control group, the surgical treatment method used was the advancement of a full-thickness rectal flap into the anal canal, developed by the Research Institute of Coloproctology of the Russian Federation.

The operation was also performed with the patient in the lithotomy position. After preparation of the surgical field and rectum, staining of the fistulous tract was performed by injecting a 1% alcoholic solution of brilliant green together with a 3% hydrogen peroxide solution in a 2:1 ratio through the external fistulous opening.

Using monopolar electrocoagulation, the fistulous tract was excised from the external fistulous opening to the rectal wall. Next, from the rectal side, a crescent-shaped incision of the anal canal wall was made 0.5–1.0 cm distal to the internal fistulous opening, and the rectal flap was mobilized over a length of 2–4 cm. The fistulous opening beneath the flap was sutured, and the margin of the flap was fixed to the walls of the anal canal.

RESULTS AND THEIR DISCUSSION

Assessment of treatment outcomes in the comparison groups during the early follow-up period

Patients in the comparison groups reported an uneven resolution of pain syndrome at rest, which is presented as a graph in Figure 10.

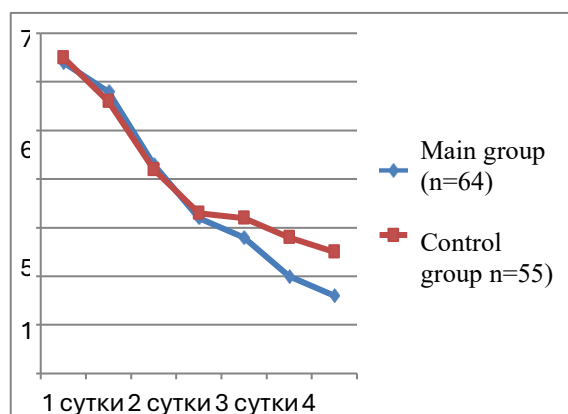


Figure 10 — Dynamics of changes in pain syndrome intensity in the postoperative period in patients of the comparison groups (n=119)

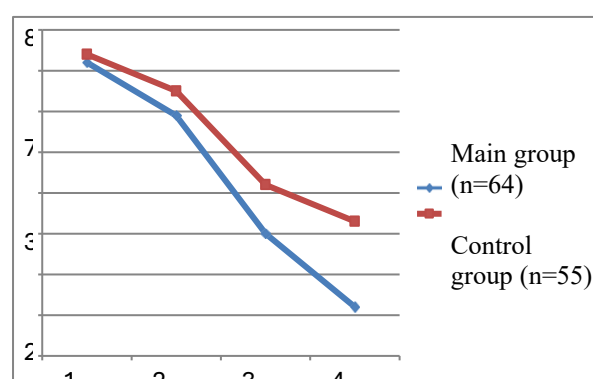


Figure 11 — Dynamics of changes in the intensity of pain syndrome after the act of defecation in patients of the comparison groups (n=119)

Patients in the main group reported a reduction in pain syndrome after defecation one week earlier than patients in the control group. The dynamics of changes in the intensity of pain syndrome are presented in Figure 11.

Postoperative complications were defined as suppuration of the postoperative perineal wound, suture dehiscence in the anal canal, and necrosis of the mobilized rectal flap. The obtained data are presented in Table 2.

In our opinion, the statistically significant reduction in the number of postoperative complications in the main group is related to the technical features of the developed surgical technique, due to proctoplasty performed without the use of mobilization of the dissected rectal flap.

Table 2 Postoperative complications in patients of the comparison groups (n=119)

Type of complications	Main group (n=64)		Control group (n=55)		Total (n=119)	
	Abs	(%)	Abs	(%)	Abs	(%)
Suppuration of the postoperative perineal wound	4	6,3	4	7,3	8	6,7
Suture dehiscence for wound closure in the anal canal	3	4,7	7	12,7	10	8,4
Necrosis of the mobilized rectal flap	0	0	4	7,3	4	3,4
Total	7	10,9	15	27,2	22	18,5

To assess sphincter function in the early postoperative period, sphincterometry was performed at a follow-up examination 3 months from the start of observation. At this examination, patient complaints related to anal incontinence were also analyzed. The obtained results are presented in Table 3.

Table 3 Comparative evaluation of sphincterometry results at 3 months from the start of observation in patients of the comparison groups (n=119), in mmHg.

Parameter	Main group (n=64)	Control group (n=55)	Student's t-test	Significance level (p)
Resting pressure (RP)	51,52±5,74	50,12±5,98	0,17	p>0,05
Squeeze pressure (SP)	110,52±18,90	111,43±17,42	0,035	p>0,05
Maximal squeeze pressure (MSP)	165,80±33,96	160,30±31,12	0,12	p>0,05

Clinical complaints consistent with anal sphincter insufficiency in the main group were identified in 1 patient (1.6%), and in the control group in 4 patients (7.3%).

When using the Cleveland Clinic Fecal Incontinence Score, the following data were obtained: 0.25±0.44 points in the main group and 1.15±1.8 points in the control group.

When assessing changes in quality of life in the comparison groups, no statistically significant differences were obtained for any parameter. At 3 months, patients cannot always objectively assess their condition after undergoing surgery.

At 3 months after the performed operation, 2 disease recurrences (3.1%) were detected in patients of the main group. Among the patients of the control group, 6 cases of disease recurrence (10.9%) were detected. These cases were identified in patients with suture dehiscence of the anal canal or necrosis of the mobilized flap in the postoperative period.

At 1 year from the start of observation, 106 patients (88.1%) presented for a follow-up examination. Of these, 58 patients were from the main group (54.7%) and 48 patients from the control group (45.3%).

At 3 years from the start of observation, 41 patients (34.5%) presented for a follow-up examination. Of these, 21 patients were from the main group and 17 patients from the control group, respectively.

When collecting anamnesis, clinical complaints consistent with anal sphincter insufficiency in the main group were also identified in 1 patient (1.7%), and in the control group in 5 patients (9.1%).

Repeat sphincterometry was performed at 1 year. In patients, complaints consistent with anal incontinence were repeatedly detected. The obtained results are presented in Table 4.

Table 4 Comparison of sphincterometry results at 1 year from the start of observation in patients of the comparison groups (n=106), in mmHg.

Parameter	Main group (n=58)	Control group (n=48)	Student's t-test	Significance level (p)
Resting pressure (RP)	52.78±3.58	50.12±5.98	0.38	p>0.05
Squeeze pressure (SP)	118.72±24.72	109.89±16.43	0.29	p>0.05
Maximal squeeze pressure (MSP)	168.42±30.18	158.30±28.53	0.24	p>0.05

When using the Cleveland Clinic Fecal Incontinence Score, the following data were obtained: in the main group — 0.25 ± 0.44 points, and in the control group — 1.27 ± 1.9 points.

Within 1 year after the operation, 5 disease recurrences (7.8%) were reliably detected in patients of the main group. Among the patients of the control group, 10 cases of disease recurrence (18.1%) were detected. These recurrence cases were predominantly identified in patients with postoperative complications in the form of suture dehiscence of the anal canal wound or necrosis of the mobilized rectal flap.

Within 3 years from the start of observation, 3 additional cases of disease recurrence were detected — 1 in the main group and 2 in the control group. The obtained data are presented in Table 5.

Table 5 Detected recurrences of chronic paraproctitis in patients of the comparison groups in the long-term period at 1 year and 3 years (n=119)

Follow-up period	Main group (n=64)		Control group (n=55)		Pearson's χ^2 test	Significance level (p)
	Aбс.	(%)	Aбс.	(%)		
Disease recurrence at 1 year	5	7,8	10	18,1	4,2	p≤0,05
Absence of disease recurrence	59	92,2	45	81,8		
Disease recurrence at 3 years	6	9,4	12	21,8	5,19	p≤0,05
Absence of disease recurrence	58	90,6	43	78,2		

Based on the results of follow-up examinations during the observation period, the patients were divided into 3 groups. A good result was considered to be the absence of recurrence and postoperative complications. This was recorded in 54 (84.4%) patients of the main group and in 36 (65.4%) patients of the control group.

In 4 (6.3%) patients of the main group and in 7 (12.7%) patients of the control group, postoperative complications without recurrence of the disease were observed, which was regarded by us as a satisfactory result.

Recurrence of the disease was detected in 6 (9.4%) patients of the main group and in 12 (21.8%) patients of the control group, which indicated an unsatisfactory result of treatment. The results of the evaluation of the effectiveness of the treatment performed are presented in Table 6.

Table 6 Results of the evaluation of treatment effectiveness in patients of the comparison groups (n=119)

Result	Main group (n=64)		Control group (n=55)		Total	
	Aбс.	(%)	Aбс.	(%)	Aбс.	(%)
Good	54	84,4	36	65,4	90	75,6
Satisfactory	4	6,3	7	12,7	11	9,2
Unsatisfactory	6	9,4	12	21,8	16	13,4
Total	64	100	55	100	119	100

CONCLUSIONS

1. The developed surgical technique for treating patients with complex pararectal fistulas consists of excising the fistulous tract and eliminating its internal opening by means of advancement and fixation of the rectal mucosa using a continuous suture, which allows for proctoplasty to be performed without mobilization of the mucosal-submucosal flap.

2. The indications for the application of the new surgical technique are complex pararectal fistulas, cicatricial changes in the region of the internal fistulous opening, and anterior localization of the fistulous tract in women. Contraindications for the application of the developed treatment method include pararectal fistulas caused by inflammatory bowel diseases (Crohn's disease),

recurrence of a pararectal fistula following proctoplasty, or seton (ligature) treatment.

3. The application of the new surgical technique reduces the intensity of pain syndrome in patients at rest by 10% and after defecation by 20%, and decreases the rate of postoperative complications by 16.8% compared with the rectal segment advancement procedure followed by flap fixation during the early follow-up period. It also reduces the rate of anal incontinence by 5.7% at 3 months and by 8.4% at 1 year postoperatively compared with the traditional method.

4. Compared with the rectal segment advancement procedure followed by flap fixation, the application of the new surgical technique decreases the recurrence rate of

the disease by 10.3% at 1 year and by 12.4% at 3 years of follow-up.

REFERENCES

- Emile, S. H., Elfeki, S., & Shalaby, A. (2022). Systematic review and meta-analysis of sphincter-preserving procedures for complex anal fistula. *Techniques in Coloproctology*, 26(3), 171–183.
- García-Félix, I. G., & Vega-Chavarría, E. I. (2025). Modified ligation of intersphincteric fistula tract versus fistulectomy with primary sphincteroplasty in complex anorectal fistulas. *International Surgery Journal*, 12(2), 115–121.
- Garg, P. (2021). Long-term outcomes of surgical management of complex anal fistula: A prospective study. *International Journal of Colorectal Disease*, 36(12), 2645–2653.
- Khujabaev, S. T., & Mukhtarov, R. I. Differentiated approach to surgical treatment of complex pararectal fistulas: Comparative analysis of methods. In *Health Horizon: Congress on Public Health and Biomedical Sciences* (pp. 1–3). euro-conferences.org.
- Khujabaev, S. T., & Mukhtarov, R. I. Results of surgical treatment of complex rectal disease. *Implementation Science*. Advance online publication. doi.org
- Khujabaev, S. T., Mukhtarov, R. I., & Dusiyarov, M. M. (2026). Improving methods for surgical treatment of extrasphincteric and high transsphincteric fistulas of the rectum. *International Journal of Integrative and Modern Medicine*, 4(5), 115–119.
- Kostarev, I. V., Zakharyan, A. V., & Kiselev, D. O. (2023). Modern methods of surgical treatment of complex rectal fistulas [Современные методы хирургического лечения сложных свищей прямой кишки]. *Coloproctology*, 22(3), 45–54.
- Liu, W., Huang, H., & Zhang, Y. (2024). Fistula occlusion with the internal sphincter flap (FOISF): A novel sphincter-sparing technique for high complex anal fistulas. *Gastroenterology Report*, 12(1), 1–8.
- Mudrov, A. A., Titov, A. Yu., & Blagodarnyy, L. A. (2022). Comparative evaluation of the results of surgical treatment of transsphincteric rectal fistulas [Сравнительная оценка результатов хирургического лечения трансфинктерных свищей прямой кишки]. *Coloproctology*, 21(2), 60–68.
- Mukhtarov, R. I., & Khujabaev, S. T. (2026). Differentiated approach to surgical treatment of complex pararectal fistulas: Comparative analysis of methods. In *International Conference on Medicine and Life Sciences* (pp. 11–13). conf.innovascience.uz
- Mukhtarov, R. I., Khujabaev, S. T., & Dusiyarov, M. M. (2026). Comparative evaluation of the results of various methods of surgical treatment of complex pararectal fistulas. *Economics and Society*, (2/141), 121–130. iupr.ru
- Mukhtarov, R. I., Khujabaev, S. T., & Dusiyarov, M. M. (2026). Improvement of methods of surgical treatment of extrasphincteric and high transsphincteric fistulas of the rectum. *Profilaktik Medicine and Health*, 5(1), 668–677. doi.org
- Mukhtarov, R. I., Khujabaev, S. T., & Dusiyarov, M. M. (2026). Optimization of surgical strategy for complex pararectal fistulas: Clinical and functional results. *Economics and Society*, (2/141), 131–138. iupr.ru
- Mukhtarov, R. I., Khujabaev, S. T., Dusiyarov, M. M., & Rustamov, I. M. (2026). Sphincter-preserving proctoplasty as a way to reduce recurrences and anal incontinence in complex pararectal fistulas. *Problems of Biology and Medicine*, (3/169), 176–180. doi.org
- Muzhir, K., Muzhir, H. K., & Al-Badri, S. G. (2025). Outcomes of modified fistulectomy under local anesthesia for anal fistula: A prospective observational study. *Al-Rafidain Journal of Medical Sciences*, 9(1), 172–177.
- Rosul, M. V., Patskan, B. M., & Skrypinets, Y. P. (2022). Optimization of pararectal fistula surgical treatment. *Wiadomości Lekarskie*, 75(10), 2412–2415.
- Khamroyeva, L., Khudoiberdieva, M., Babajanova, N., Skosireva, O., Shirinova, K., Saidova, L., Radjabova, D., Abduvaliyeva, K., Rahmatova, F., Kendjaev, B., Islamova, K., Mamadiyeva, N., & Bekchanova, M. (2025). Design and application of responsive and smart gold nanoparticles distributed on L-histidine supported on Fe₃O₄ (Au-LH-Fe₃O₄) for advanced biomedical diagnostics of breast cancer cells. *Journal of Nanostructures*, 15(3), 1428–1442. <https://doi.org/10.22052/JNS.2025.03.057>
- Nasirova, A. A., & Shirinova, K. (2026). Generation cardiovascular risk assessment through wearable digital biomarkers and explainable artificial intelligence: Toward continuous, personalized, and predictive cardiovascular medicine. *European Journal of Prosthodontics and Restorative Dentistry*, 34(Special Issue 4), 171–188.
- Turaeva, G., Nasirova, Z., Ismati, N., Norova, M., Yuldasheva, Z., Musashaykhov, U., & Khamdamova, G. (2025). The association between nocturnal blood pressure patterns and the incidence of major adverse cardiovascular events: A 5-year cohort study. *Revista Latinoamericana de Hipertensión*, 20(11), 818–824. <https://doi.org/10.5281/zenodo.18131221>