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Functional results of surgical treatment of anal fistulas in patients with Crohn's disease

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ABSTRACT AIM: to assess the functional outcomes following management of perianal fistulizing Crohn's disease.

PATIENTS AND METHODS: a retrospective study was done from April 2018 to September 2024, comparing continence function before and after surgery (median follow-up 4.2 months) in 150 patients with perianal Crohn's disease (pCD). Sphincter function was assessed before and after surgery using the Wexner scale and anorectal manometry. Uni- and multivariate binary logistic regression analyses were performed to identify risk factors for clinical anal incontinence (AI).

RESULTS: the incidence of clinical anal incontinence (AI), defined as a Wexner score of ≥ 2 , was assessed in non-stoma patients and was 90/132 (68%) preoperatively and 84/119 (71%) postoperatively. No significant differences in frequency were observed ($p = 0.84$). However, a significant increase in Wexner scale scores was noted in the late postoperative period (preoperative median: 3 points [Q1; Q3: 1; 7]; postoperative median: 5 points [Q1; Q3: 1; 9]; $p = 0.007$). Univariate analysis identified factors associated with an increased risk of clinical AI after surgery: longer duration of perianal CD symptoms (OR = 1.17; 95% CI: 1.01–1.38; $p = 0.04$), a history of surgery for anal fistulas (OR = 0.33; 95% CI: 0.15–0.75; $p = 0.008$), a higher number of previous operations (OR = 2.16; 95% CI: 1.01–4.6; $p = 0.046$), including a greater number of previous incision and drainage procedures for perianal abscesses (OR = 1.85; 95% CI: 1.12–3.08; $p = 0.017$), and a higher number of rectal fistulas (OR = 2.25; 95% CI: 1.04–4.87; $p = 0.039$). However, multivariate analysis failed to confirm the statistical significance of these factors. The manometric incidence of AI was 120/150 (80%) preoperatively and 137/150 (91%) postoperatively ($p = 0.0004$). Patients with normal preoperative manometry had a higher incidence of postoperative AI ($p = 0.02$). The Average Anal Resting Pressure was below the reference range in 116 (77%) cases preoperatively and in 137 (91%) cases postoperatively, indicating a significant decrease after surgery ($p = 0.001$). No factors predisposing to an increased risk of manometric AI were identified.

CONCLUSION: the results obtained showed an increase in the rate of postoperative anal incontinence in patients with perianal Crohn's disease. It is necessary to apply an individual approach to surgery, taking into account the patient's medical history and current condition.

KEYWORDS: Crohn's disease, anal sphincter dysfunction, anal incontinence, anorectal manometry, perianal Crohn's disease, pCD

CONFLICT OF INTEREST: the authors declare no conflict of interest

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INTRODUCTION

Surgery for perianal Crohn's disease (pCD), especially in the presence of complex anal fistulas, remains an integral part of comprehensive approach to the treatment of patients in order to obtain adequate conservative treatment and stabilize the

underlying disease in remission [1–3]. Recently, there are very few works in the world literature devoted to the instrumental assessment of the continence before and after surgery for fistulas in patients with inflammatory bowel diseases (IBD). Most studies are limited to a subjective assessment of symptoms according to Wexner and/

or Vaizey's scales, while an objective assessment using anorectal manometry (sphincterometry) makes it possible to identify occult functional disorders of sphincter and a decrease in parameters and personalize surgical approach. Taking into account anal re-operations for pCD, this cohort of patients initially has a high risk of anal incontinence (AI) [4–6]. Thus, a long history of perianal lesions, the presence of 2 or more purulent leaks, as well as previous surgeries for rectal fistulas increase the chance of anal incontinence [7]. So, the aim of this study is evaluating changes in anorectal manometry and clinical manifestations of AI in patients with Crohn's disease after surgery for anal fistulas.

PATIENTS AND METHODS

From April 2018 to September 2024, a retrospective study assessed the functional results of surgical treatment of patients with pCD. The study included 150 patients with anal fistulas of varying degrees of complexity and a confirmed diagnosis of Crohn's disease. Patients with complex fistulas according to Parks' classification prevailed [8]. Thus, the study included 88/150 (59%) patients with transsphincteric (through superficial and deep portions) and extrasphincteric fistulas, in 127/150 (85%) cases, leaks were detected. It is worth noting the significant heterogeneity in the clinical characteristics of the patients included in the study in terms of the history of Crohn's disease and its form, as well as the conservative treatment received. Only 41/150 (27%) patients had remission of the disease. The duration of the pCD history ranged from 2 months to 19 years, while the majority of patients (57.3%) had previously undergone various types of surgeries for perianal manifestations. Detailed clinical and history features are shown in Table 1.

The patients were check-up in Gastroenterology Unit: colonoscopy and gastroscopy, abdominal ultrasound, computed (CT) enterography. Transrectal ultrasound (TRUS) was used to identify the fistula site, its location relative to the

Table 1. Clinical and anamnestic characteristic of patients

Parameters	Patients, N = 150
Median age (quartiles)	31 (24;41)
Median BMI, kg/m ² (quartiles)	22.45 (20;25.3)
Gender, n (%)	
Female	77 (51.3)
Male	73 (48.7)
Smoking, n (%)	
Yes	46 (31)
No	104 (69)
Comorbidities, n (%)	
Yes	102 (68)
No	48 (32)
Stoma, n (%)	
Yes	18 (12)
Ileostomy	11/18
Colostomy	7/18
No	132 (88)
Duration of the history of perianal fistulas, years (quartiles) (min.-max.)	2 (1;5) (0.25-19)
Duration of CD history, years (quartiles) (min.-max.)	4 (2;8) (0.16-32)
Operations for perianal manifestations in the history, n (%)	
Yes	86 (57.3)
No	64 (42.7)
Surgery type, n (%)	
Abscess opening	47 (31)
Fistulectomy	20 (13)
Seton	25 (17)
Separate suturing of the rectovaginal fistula	1 (1)
Laser thermal obliteration of the fistula	1 (1)
No	56 (37)
The form of Crohn's disease by colonoscopy, n (%)	
Ileitis	22 (15)
Ileocolitis	66 (44)
Colitis	62 (41)
Crohn's disease activity (by colonoscopy), n (%)	
Yes	109 (73)
No	41 (27)
Proctitis (as per colonoscopy), n (%)	
Yes	55 (37)
No	95 (63)
Location of the fistula, n (%)	
Anterior	40 (27)
Posterior	70 (47)
Lateral	9 (6)
More than 1 fistula	31 (20)
Fistula course, n (%)	
Intrasphincteric	22 (15)
Transsphincteric	44 (29)
Subcutaneous portion	21/44
Superficial portion	18/44
Deep portion	5/44
Extrasphincteric	65 (43)
Rectovaginal	19 (13)
Additional tracks and cavities, (%)	
Yes	127 (85)
No	23 (15)
Number of cavities (quartiles) (min.-max.)	1 (1;2) (0-4)

Table 2. The frequency of clinical AI

Clinical AI		After surgery (N = 117)		p
		Yes	No	
Before surgery (N = 117)	Yes	69	12	0.84
	No	14	22	

external sphincter, and the presence and location of additional cavities. Clinical manifestations of anal incontinence were assessed by Wexner's scale (0 points — absence of clinical incontinence of the anal sphincter, 20 points — complete incontinence). The clinical AI was established in the presence of 2 or more points on Wexner's scale. For an objective assessment of the sphincter function, patients underwent sphincterometry with an assessment of the values of the average anal resting pressure (AARP) and the maximum absolute anal squeeze pressure (MAASP). Due to the retrospective nature of the study, only a part of the patients had their maximum absolute anal squeeze pressure (MAASP) and maximum absolute anal cough pressure (MAACP) analyzed. The grading of AI in patients was carried out in accordance with the values established in the Center [9]. When analyzing the data, sphincterometry values exceeding the normal values were classified as normal. The surgery volume was determined individually depending on the clinical situation. Thus, after check-up, 75/150 (50%) patients underwent fistulectomy, opening and drainage of the cavities with latex seton as the first stage. The other half of the patients (75/150) underwent one-stage radical surgery. Among them: fistulectomy/fistulectomy and opening of the cavities (44% — 66/150), rectal advancement flap (2% — 3/150), invagination of rectovaginal fistula (2% — 3/150) and in one patient (1/150) — laser thermal obliteration of the fistula. The median follow-up period was 4.2 (3.1; 6) (3–6) months. The number of patients with stoma before surgery was 18/150 (12%), after surgery, another 20 patients had a stoma. After healing of postoperative wounds, reconstructive surgery was performed in 7/38 (18%) patients. After surgery treatment (3–6 months), patients underwent TRUS and sphincterometry to

assess the symptoms of anal incontinence according to Wexner's scale.

Statistical Analysis

The data for the analysis was entered into an Excel spreadsheet (Microsoft Office 2019). Quantitative data is represented by the median (Me), the lower and upper quartiles (Q1; Q3), as well as the minimum and maximum values (min-max).

The differences at the level of $p < 0.05$ were considered statistically significant. McNemar's test was used to compare the incidence of AI before surgery and in the late postoperative period. The comparison of quantitative variables was performed using the nonparametric Wilcoxon's T-test for related samples. The analysis of clinical and history risk factors was performed using binary logistic regression, the results are presented by the odds ratio (OR) and the 95% coincidence interval calculated using Wald's method. With a statistically significant level of differences ($p < 0.05$), these parameters were included in the multivariate analysis. Statistical data analysis was performed in the Statistica 13.3 program (TIBCO Software Inc., USA).

RESULTS

The incidence of clinical AI was assessed in patients without a stoma (117/150) and was 81/117 (69%) before surgery, 83/117 (71%) after surgery. There were no significant differences either before or after surgery ($p = 0.84$) (Table 2).

The median number of points on Wexner's scale was 3 (1;7) (0–18) — before surgery, 5 (1;9) (0–18) — after surgery. The data analysis revealed an increase in the number of points on Wexner's scale in the long-term postoperative period ($p = 0.007$) (Fig. 1).

Significant risk factors for clinical AI, according to the results of the univariate analysis, were: duration of history of pCD ($OR = 1.17$; $95\% CI: 1.01-1.38$; $p = 0.04$) history of surgery for pCD ($OR = 0.33$; $95\% CI: 0.15-0.75$; $p = 0.008$), the number of perianal abscess openings ($OR = 1.85$; $95\% CI: 1.12-3.08$, $p = 0.017$), the number of operations for pCD ($OR = 2.16$; $95\% CI: 1.01-4.6$; $p = 0.046$) and the number of fistulas ($OR = 2.25$; $95\% CI: 1.04-4.87$; $p = 0.039$) (Table 3).

The multivariate analysis did not confirm a significant effect of any of the suspected risk factors on clinical AI (Table 4).

It was noted that the parameters of the mean pressure in the anal canal, both at rest and with volitional efforts, were slightly reduced according to the reference values (Table 5). The maximum pressure with volitional contraction and coughing were within the normal range.

The incidence of AI detected by sphincterometry in 120/150 (80%) patients before surgery and in 137/150 (91%) after surgery. A cumulative assessment of all available sphincterometry values showed a significant increase in the number of patients with AI after surgery ($p = 0.0004$) (Table 6). The AARP was initially reduced in 116 (77%), after surgery — in 137 (91%), which indicates a decrease in this parameter after surgery ($p = 0.0003$). There

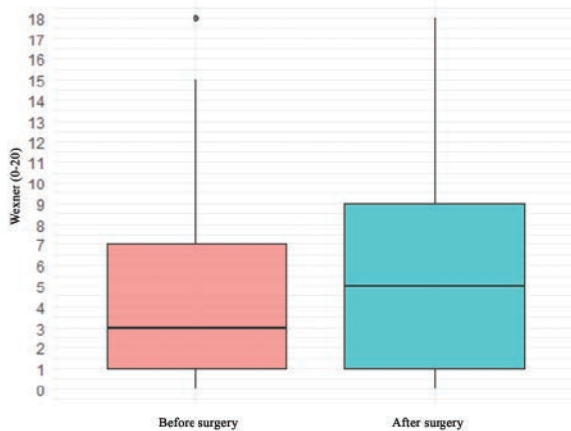


Figure 1. Dynamics of Wexner score changes before and after surgery

Table 3. Univariate analysis of parameters affecting clinical AI after surgery

Factors	OR (95% CI)	p
Age (years)	0.99 (0.96;1.02)	0.56
Gender		0.46
Female	1	
Male	0.74 (0.34;1.64)	
BMI (kg/m ²)	1.05 (0.95;1.15)	0.34
Yes	1	0.53
No	0.76 (0.32;1.79)	
Comorbidities		0.1
Yes	1	
No	0.45 (0.18;1.15)	
Stoma before surgery		0.53
Yes	1	
No	2.44 (0.15;40.2)	
Duration of pCD history (years)	1.17 (1.01;1.38)	0.04
Duration of CD history (years)	1.07 (0.98;1.16)	0.14
Crohn's disease activity by colonoscopy		0.75
Remission	1	
Yes	0.86 (0.32;2.26)	
Proctitis by colonoscopy		0.1
No	1	
Yes	2.06 (0.86;4.94)	
Incidence of stool per day	1.22 (0.99;1.51)	0.06
Steroids		0.15
No	1	
Yes	0.5 (0.19;1.29)	
Operations for perianal manifestations in history		0.008
No	1	
Yes	0.33 (0.15;0.75)	
Opening of perianal abscess (number)	1.85 (1.12;3.08)	0.017
Operations for pCD (number)	2.16 (1.01;4.6)	0.046
Radical operations		0.2
Yes	1	
No	0.47 (0.15;1.52)	
Proctitis by TRUS		0.35
Yes	1	
No	0.69 (0.31;1.52)	
Number of fistulas	2.25 (1.04;4.87)	0.039
Fistula course		0.52
Transsphincteric	1	
Intrasphincteric	0.55 (0.17;1.77)	
Extrasphincteric	1.35 (0.54;3.34)	
Additional cavities		0.8
No	1	
Yes	0.86 (0.25;2.9)	
Number of cavities	0.95 (0.67;1.36)	0.79
Seton		0.31
Yes	1	
No	0.66 (0.3;1.46)	

Table 4. Multivariate analysis of parameters affecting clinical AI

Factors	OR (95% CI)	p
Duration of the history of perianal fistulas (years)	1.12 (0.95;1.31)	0.18
Operations for pCD in history	1	0.86
Yes		
No	0.89 (0.24;3.32)	
Perianal abscess opening in history (number)	1.45 (0.68;3.12)	0.34
Operations pCD in history (number)	1.66 (0.71;3.87)	0.24
Number of fistulas	2.05 (0.88;4.77)	0.096

Table 5. Sphincterometry

Parameters	Before surgery Me (Q1;Q3) (min-max)	After surgery Me (Q1;Q3) (min-max)	Norm	p-value
AARP, N = 150	38 (36;41) (18-76)	37.5 (32;39) (18-55)	41-63 (Female) 43-61 (Male)	1
MAASP, N = 150	133 (109;155) (39-312)	138.5 (105;170) (44-279)	110.0-178.0 (Female) 121-227 (Male)	0.26
AAASP, N = 39	84 (69;94) (37-132)	80 (65;96) (35-159)	88-146 (Female) 106-190 (Male)	0.18
MAACP, N = 75	80 (67;108) (10-174)	80 (60;115) (41-260)	76-126 (Female) 45-175 (Male)	0.4

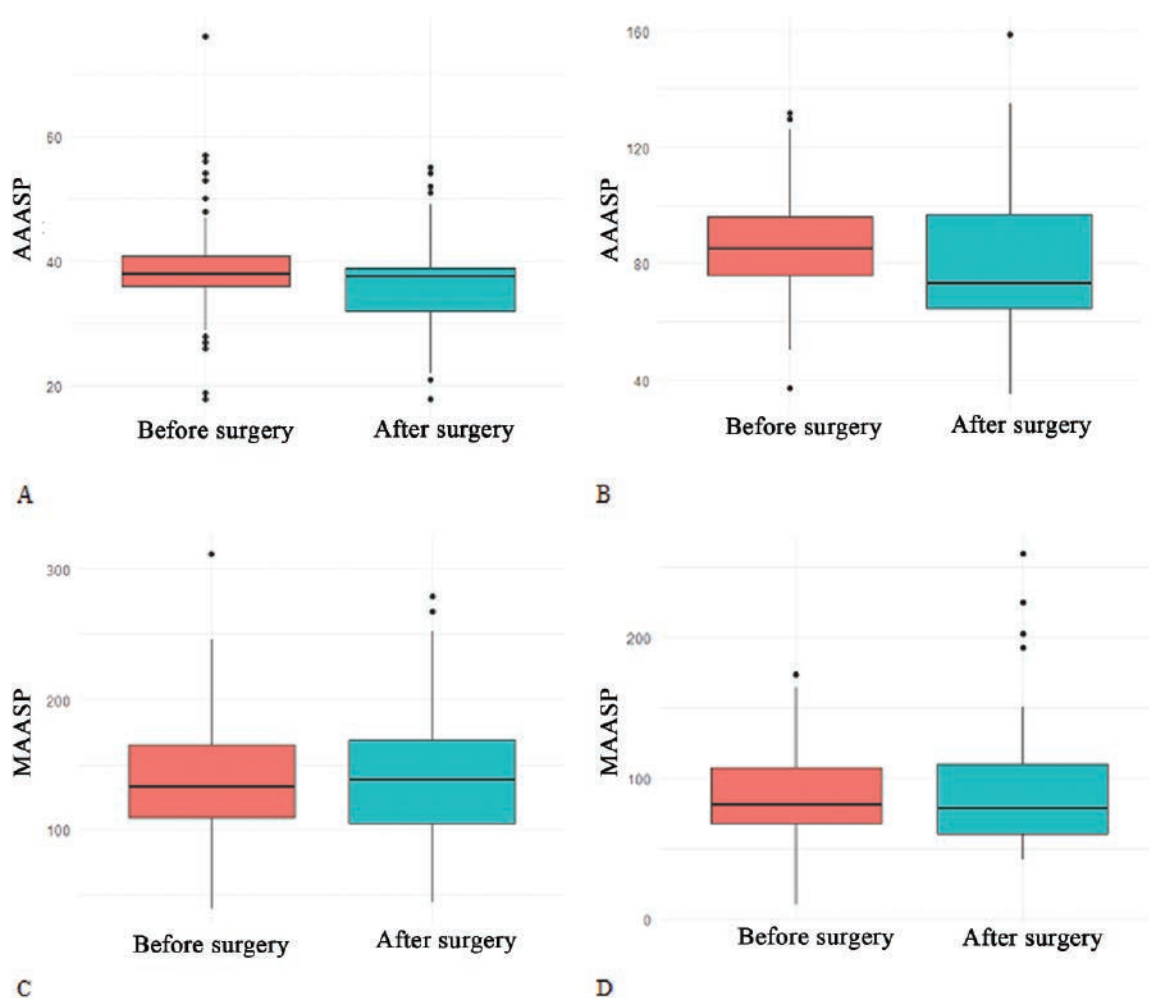
**Figure 2.** Sphincterometry before and after surgery: A — average anal resting pressure (AARP); B — average absolute anal squeeze pressure (AAASP); C — maximum absolute anal squeeze pressure (MAASP); D — maximum absolute anal cough pressure (MAACP)

Table 6. The incidence of objective AI

Objective AI		After surgery (N = 150)		p-value
		Yes	No	
Before surgery (N = 150)	Yes	118	2	0.0004
	No	19	11	

Table 7. Average anal resting pressure (AARP)

AARP		After surgery (N = 150)		p-value
		Below	Norm	
Before surgery (N = 150)	Below	111	5	0.0003
	Norm	26	8	

Table 8. Absolute anal squeeze pressure (AAASP)

AAASP		After surgery (N = 39)		p-value
		Below	Norm	
Before surgery (N = 39)	Below	229	2	0.2
	Norm	7	8	

Table 9. Maximum absolute anal squeeze pressure (MAASP)

MAASP		After surgery (N = 150)		p-value
		Below	Norm	
Before surgery (N = 150)	Below	32	18	1.0
	Norm	17	83	

Table 10. Maximum absolute anal cough pressure (MAACP)

MAACP		After surgery (N = 75)		p-value
		Below	Norm	
Before surgery (N = 75)	Below	10	7	0.6
	Norm	10	48	

Table 11. Anal incontinence before and after surgery

AI grade	Before surgery (N = 150)	After surgery (N = 150)	P
0	30 (20)	13 (9)	0.02
1	78 (52)	82 (54)	0.84
2	38 (25)	51 (34)	0.23
3	4 (3)	4 (3)	1

was no significant change in the remaining values (Tables 7–10) (Fig. 2).

According to the data obtained, before the surgery, AI grade 1 was detected in 78/150 (52%) patients, AI grade 2 in 38/150 (25%) patients, and in 4/150 (3%) patients, AI grade 3 (Table 11).

A significant increase in the incidence of AI occurred in the group of patients with initially asymptomatic AI before surgery ($p = 0.02$).

A univariant analysis of the factors affecting the AI was performed, detected by sphincterometry (Table 12). No significant correlations were found.

Table 12. *Univariate analysis of parameters affecting objective AI after surgery*

Factors	OR (95% CI)	p
Age (years)	1.02 (0.97;1.08)	0.39
Gender		0.69
Female	1	
Male	0.79 (0.25;2.49)	
BMI (kg/m ²)	1.09 (0.95;1.25)	0.23
Smoking		0.53
Yes	1	
No	1.46 (0.45;4.74)	
Comorbidities		0.19
Yes	1	
No	0.36 (0.08;1.69)	
Stoma before surgery		0.62
Yes	1	
No	0.59 (0.07;4.81)	
Duration of pCD history (years)	1.1 (0.89;1.37)	0.34
Duration of CD history (years)	0.95 (0.88;1.02)	0.17
Crohn's disease activity by colonoscopy		0.77
Remission	1	
Yes	1.2 (0.35;4.14)	
Proctitis by colonoscopy		0.29
Yes	1	
No	2.04 (0.54;7.75)	
Stool per day	0.98 (0.76;1.27)	0.87
Steroids		0.47
Yes	1	
No	0.61 (0.16;2.34)	
History of pCD surgery		0.053
Yes	1	
No	0.29 (0.09;1.02)	
Perianal abscess opening (number)	1.36 (0.71;2.62)	0.36
History of pCD surgery (number)	1.75 (0.65;4.74)	0.27
Radical operations		0.27
Yes	1	
No	0.31 (0.04;2.49)	
Proctitis by TRUS		0.2
Yes	1	
No	0.47 (0.15;1.52)	
Fistula track		0.49
Transsphincteric	1	
Intrasphincteric	0.81 (0.18;3.76)	
Extrasphincteric	2.03 (0.55;7.41)	
Additional cavities		0.99
No	1	
Yes	1.004 (0.21;4.86)	
Number of cavities	0.84 (1.59;0.64)	0.68
Stoma after surgery		0.84
Yes	1	
No	0.87 (0.23;3.36)	
Seton		0.39
Yes	1	
No	0.59 (0.19;1.92)	

Table 13. Univariate analysis of parameters affecting AARP decrease

Factors	OR (95% CI)	p
Age (years)	1.02 (0.97;1.08)	0.42
Gender		0.69
Female	1	
Male	0.79 (0.25;2.49)	
BMI (kg/m ²)	1.05 (0.92;1.19)	0.48
Smoking		0.99
Yes	1	
No	1.005 (0.29;3.45)	
Comorbidities		0.92
Yes	1	
No	0.94 (0.27;3.22)	
Stoma before surgery		0.62
Yes	1	
No	0.59 (0.07;4.81)	
Duration of pCD history (years)	1.16 (0.91;1.49)	0.23
Duration of CD history (years)	0.94 (0.87;1.007)	0.07
Crohn's disease activity by colonoscopy		0.77
Remission	1	
Yes	1.2 (0.35;4.14)	
Proctitis by colonoscopy		0.65
No	1	
Yes	1.33 (0.39;4.59)	
Stool per day	0.96 (0.75;1.24)	0.77
Steroids		0.92
Yes	1	
No	0.94 (0.27;3.22)	
History of pCD surgery		0.053
Yes	1	
No	0.3 (0.09;1.02)	
Perianal abscess opening (number)	1.54 (0.74;3.19)	0.24
History of pCD surgery (number)	2.43 (0.68;8.66)	0.17
Proctitis by transrectal ultrasound		0.2
Yes	1	
No	0.47 (0.15;1.52)	
Fistula track		0.69
Transsphincteric	1	
Intrasphincteric	0.63 (0.13;3.12)	
Extrasphincteric	1.3 (0.35;4.87)	
Additional cavities		0.44
Yes	1	
No	0.44 (0.05;3.52)	
Number of cavities	0.96 (0.58;1.61)	0.89
Stoma after surgery		0.64
Yes	1	
No	1.35 (0.39;4.65)	
Seton		0.39
Yes	1	
No	0.59 (0.19;1.92)	

Taking into account the statistically significant decrease in the AARP, the univariate analysis for this parameter was performed separately (Table 13).

DISCUSSION

According to literature, patients with CD are at increased risk of AI [5,6,10]. The reasons for it are different: thus, there is evidence of the age affect, a long history of Crohn's disease, and multiple operations for its perianal manifestations [11,12], and the relationship between CD activity and stool incidence with a higher occurrence of AI [13–15].

In this study, despite the heterogeneous nature of operations, we analyzed their effect on the function of the anal sphincter. There were no significant differences in the incidence of clinical manifestations of AI both before and after surgery ($p = 0.84$). Nevertheless, even within the framework of a single surgery, there is a trend to worsen the subjective symptoms of AI, which is confirmed by an increase in the median score on Wexner's scale from 3 to 5 ($p = 0.007$).

The sphincterometry revealed a significant increase in the incidence of AI after surgery ($p = 0.0004$). At the same time, in an isolated analysis of individual values of anorectal manometry, the results obtained were mainly due to a decrease in the average pressure in the anal canal at rest, reflecting the tone of the internal anal sphincter ($p = 0.001$). Interestingly that in patients with initially normal sphincterometry, a decrease in manometric parameters was detected after surgery ($p = 0.02$), while in patients with pre-existing anal incontinence of 1–3 grade, surgery did not lead to a significant deterioration of the sphincter function ($p = 0.23$ –1).

Thus, a discrepancy was revealed between the subjective assessment of the continence by patients and objective manometric values, which confirms the role of instrumental diagnostics in studying the sphincter function and planning the surgery in patients with pCD.

The study did not establish significant predictors of AI, both subjective clinical (according to Wexner's scale) and objective instrumental (according to sphincterometry). The risk factors identified in the univariate analysis for the AI after surgery may collectively play a role in exacerbating the symptoms of anal incontinence, but they are not independent. It is likely that the fact of surgery against the background of active inflammation and scarring in the rectum and anal canal increases the risk of sphincter functional disorders, but this assumption requires further confirmation.

The data obtained emphasize the need for an individual approach to the choice of surgical approach in pCD. To ensure effective treatment strategy, it is important to conduct a comprehensive check-up, adequate anti-recurrence therapy, and timely opening and drainage of purulent tracks. It should be remembered that the causes of AI in this cohort of patients are multifaceted and none of the surgical methods can guarantee an "ideal" functional result. The study has a number of rather significant limitations that cast doubt on the results obtained: the retrospective nature of the data and their incomplete description; significant heterogeneity of the patients included in the study in terms of the form and CD activity, conservative treatment received, history of perianal manifestations and the type of surgery; the presence of patients with stoma; the study of postoperative AI in patients both after radical surgery and with the presence of a draining latex ligature.

CONCLUSION

Patients with anal fistulas in Crohn's disease represent an extremely complex cohort of patients due to the high risk of postoperative AI. It is necessary to apply an individual surgical approach, taking into account the patient's medical history and current condition, as well as to discuss at the preoperative stage the likelihood of a decrease in the function of the anal sphincter after surgery, including the possible need for further

correction. The problem under study remains open and requires further study on both the subjective assessment of the sphincter function and instrumental methods of check-up.

AUTHORS CONTRIBUTION

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