

## LIFE SCIENCES. Health Care Sciences

**ORIGINAL RESEARCH****Surgical Treatment of Rectal Fistulae Using Biowelding****Authors' Contribution:**

**A** – Study design;  
**B** – Data collection;  
**C** – Statistical analysis;  
**D** – Data interpretation;  
**E** – Manuscript preparation;  
**F** – Literature search;  
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**Background and Aim of Study:****Abstract**

Rectal fistulae make 20% of all proctologic pathology. Despite numerous methods of surgical treatment of rectal fistulae, percentage of recurrence does not tend to decrease. Complicacy of surgical correction consists in balance between radical surgery with total resection of fistulae and minimal damage of anal sphincter. Development and implementation of novel mini-invasive methods of surgical treatment remains actual in surgery.

The aim of the study: to compare and analyze results of treatment of transsphincter rectal fistulae using standard methods and using biowelding.

**Materials and Methods:**

We carried out retro- and prospective research of surgical treatment of 57 patients with transsphincter rectal fistulae. All patients were treated in surgical development during September 2018 to November 2019. All patients were divided into two groups. First group included 30 patients, treated with standard methods (resection of fistula with sphincterectomy and incision of rectal fistula with sphincteroplasty). Other group included 27 patients, who were treated with biowelding.

**Results:**

According to data, satisfactory result of treatment in first group was observed in 66.7% of cases; in second group success was in 96.3%. Usage of biowelding for removal of intrasphincter part of fistula allowed both decreasing of surgery duration and preventing damage of sphincter apparatus.

**Conclusions:**

Excision of rectal fistulae using biowelding can be effective for treatment of such patients. Usage of this method allowed avoiding damage of sphincter apparatus, shortening time of wound healing and number of hospital stay, decreasing expression of pain syndrome in postoperative period.

**Keywords:**

rectal fistulae, surgery, biowelding method, postsurgical complications.

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## Introduction

Rectal fistulae have one of leading places in structure of proctology. According to literature, frequency of this nosology is 14–19% of diseases of rectum [2, 3]. Overwhelming part of patients are at 20–60 years – able-bodied persons. Treatment of these patients is only surgical (Aboulian, Kaji, & Kumar, 2011; Alasari & Kim, 2014). Despite existence of numerous methods of surgical treatment on this pathology, seeking of more effective and mini-invasive methods is continued. Nowadays, it is indisputable to excise tract of fistula and removal of internal fistulae opening (Aboulian et al, 2011; Alasari & Kim, 2014; Amato et al, 2015; Han et al, 2013; Kryvoruchko, Firsik, & Bozhko, 2019; Limura & Giordano, 2015; Merlini, Heritier, Siproudhis, & Bessi, 2019; Rizzo, Naig, & Johnson, 2010; Sirikurnpiboon, Awapittaya, & Jivapaisarnpong, 2013; Wong, Solomon, Crowe, & Ooi, 2008). However, majority of present methods of surgical treatment of rectal fistulae has several postoperative complication as rectal sphincter insufficiency and recurrence of disease (Kryvoruchko et al, 2019; Sirikurnpiboon et al, 2013; Wallin, Mellgren, Madoff, & Goldberg, 2012).

Proposed method of surgical treatment of rectal fistulae combines main principles of radical treatment, but is characterized with minor traumatization of sphincter apparatus. Usage of biowelding method is investigated and widely used in neurosurgery, abdominal, thoracic and vascular surgery, urology and gynecology (Fomin, Kozlov, Povch, Ivanchov, & Andrusenko, 2014; Paton, 2004; Savoliuk, Horbovets, Khodos, & Herashchenko, 2017). However, there is no data of usage of this method in proctology. Actuality of this technology is confirmed both with decreased surgery duration and with rehabilitation of patients, and decreasing of amount of postsurgical complication and disease recurrence.

*The aim of the study.* To compare and analyze results of treatment of transsphincter rectal fistulae using standard methods and using biowelding.

## Materials and Methods

We conducted retro- and prospective research of surgical treatment of 57 patients with transsphincter rectal fistulae. In this research, classification of Parks (1976) was used. All patients presented in surgery department during September 2018 to November 2019. Inclusion criteria were primary revealed uncomplicated forms of transsphincter rectal fistulae.

Exclusion criteria were intrasphincter fistulae, cases of recurrent rectal fistulae, fistulae due to Crohn disease or colorectal cancer and patients with severe comorbidity.

Result of treatment was considered as satisfactory in case of complete wound healing, absence of disease recurrence and anal sphincter insufficiency.

To all patients after primary diagnosis of rectal fistulae, we performed several laboratory investigations (blood count, biochemical blood analysis, coagulation test, blood group and Rhesus factor, serology for syphilis, viral hepatitis tests, urinary test and feces investigation) according to standard methods.

To all patients anoscopy, rectoromanoscopy, fistulography and colonoscopy were performed. In 5 cases magnetic-resonance imaging was performed (Alasari & Kim, 2014; Amato et al, 2015; Chernozhukova et al, 2016). Functional state of muscles of rectal sphincter apparatus was estimated by electromyography. By intraanal electrode, conductor function of external anal sphincter and muscles of pelvic bottom was estimated (Fomenko, Shelygin, Titov, & Bulousova, 2017). Integral indices of background and voluntary bioelectrical activity of sphincter apparatus was estimated at rest, at voluntary quick contraction and relaxation of muscles, and at tests with exertion.

To characterize patients, we developed database, which included such indices: gender, age, body mass index, comorbidities, presence of diseases of colon and rectum, duration of rectal fistula, distance from outer opening of rectal fistula in relation to anus.

Results of surgery were estimated by several criteria: surgery duration, presence of postoperative complications, disease recurrence, duration of complete wound healing, percentage of success and estimation of pain level in patients.

All patients were divided into two groups. First group included 30 patients, treated with standard methods (resection of fistula with sphincterectomy and incision of rectal fistula with sphincteroplasty). Other group included 27 patients, who were treated with biowelding.

Surgery of fistula tract using biowelding consists in excision of postsphincter part of fistula by probe after contrasting through external opening. Thus, there was thrifty excision of fistula in area of healthy tissues and verification of outer opening. Internal opening of fistula was removed with damaged anal crypt. Intrasphincter part of fistula was eliminated using biowelding by described method (Patent No. 135760, Ukraine, IPC 51 (2019.01), A 61 B 17/00). To perform that we used multifunctional machine EK-300M1 (Ukraine) (Paton, 2004; Savoliuk et al, 2017). To supply the current directly to intrasphincter part of fistula we used special probes with terminal part of bipolar configuration of electrodes of olive-like shape (Paton, 2004). Diameter of probe was dependent of diameter of fistula tract.

Biowelding of fistula tract was performed in mode “manual welding” with 50% of power; speed of probe removal was 0.5 cm/sec (Paton, 2004; Savoliuk et al, 2017). Thus, there was reliable selection of epithelium of proximal part of fistula part and obturation of fistula walls. Sign of removal of intrasphincter part of fistula was impossibility of re-introduction of probe into the lumen of gut.

To estimate of significance of statistical data, we used Student *t*-test and  $\chi^2$  with 95% of significance.

## Results and Discussion

Among 57 operated patients 36 (63.1%) were males and 21 (36.9%) – females. Age of patients varied 26–72 years, with mean age of 41.3 years. Characteristics of included patients is present in Table 1.

**Table 1.** Characteristics of studied patients.

Characteristics	Total	Group 1	Group 2
Total number of patients	57	30	27
Males (people/%)	36/63.1	20	16
Females (people/%)	21/36.9	10	11
Mean age (years)	41.3	41 [36-54]	43 [41-55]
Mean body mass index (kg/m <sup>2</sup> )	25.9	25 [22-27]	26 [22-28]
Comorbidities (people/%)	32/56.1	15	17
Comorbid rectal diseases (people/%)	44/77.1	20	24
Disease duration (months)	6 [3-8]	6	6
Type of fistula	Transsphincter (100%)		
Distance between external opening and anus (cm)	4.83±1.3 (Median [upper quartile–lower quartile]; 4 [3–8])	4 [3–8])	4 [4–7]

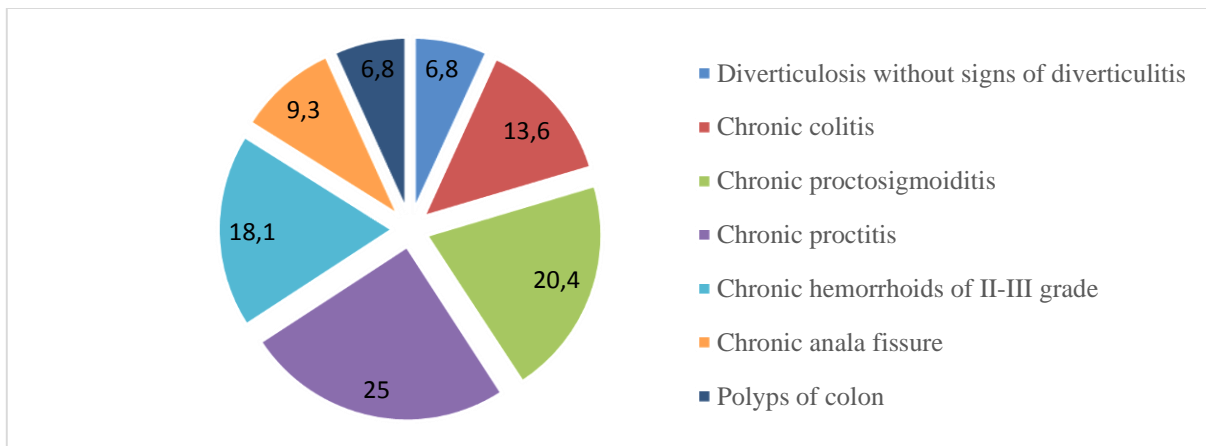
Note.  $\chi^2 = 1.203$ ;  $p=0.878$ .

According to received data mean duration of disease was 6 months. Considering that majority of patients was able-bodied, this pathology should be estimated both from economic and social point of view. Actual is decreasing of duration of treatment and rehabilitation of patients, which decreases economic burden in total. Among studied patients 32 (56.1%) had comorbid systemic diseases, including coronary arteries disease (9.3%), hypertension of II–III grade (53.1%), chronic renal disease (18.7%), type 2 diabetes mellitus (12.5%) and chronic bronchitis (6.4%). However, in our opinion, presence of those comorbidities did not significantly influence wound healing and course of postoperative period in total.

Considering duration of disease, all patients underwent several instrumental diagnostic procedures for investigation of comorbid diseases of colon. Thus, 44 (77.1%) had such diseases, shown in Figure 1.

As it can be seen, the most frequent rectal comorbidity includes chronic colitis (13.6%), chronic proctosigmoiditis (20.4%) and chronic proctitis (25.0%). This can be explained by long duration of disease, which both promotes exacerbation of chronic pathology, and promotes development of additional comorbidities. Due to rectal fistula is a focus of persistent infection, this may lead to development of pathology of urinary tract.

Results of treatment are shown in Table 2.



**Figure 1.** Comorbid diseases of colon in studied patients.

**Table 2.** Analysis of surgery results.

Results	First group (n=30)		Second group (n=27)
	Fistula excision and sphincterotomy	Fistula excision and sphincteroplasty	Fistula excision with biowelding
Number of patients	10	20	27
Surgery duration (min.)	50.7 ± 8.2 (54.5 [32-63])	51.6 ± 8.4 (54.7 [34-64])	22.8 ± 5.8 (23 [15-34])*
Anal sphincter insufficiency	4	2	0
Disease recurrence	2	2	1
Hospital stay (days)	12.3 ± 1.2 (12 [10-14])	12.1 ± 1.1 (12 [10-14])	7.9 ± 0.9 (8 [7-10])*
Pain syndrome severity (points)	1 day	5.7 ± 1.0 (6 [4-7])	3.1 ± 0.97 (3 [2-5])*
	3 day	4.3 ± 0.8 (4 [3-6])	2.6 ± 0.7 (2.5 [2-4])*
	7 day	3.5 ± 1.2 (3 [2-6])	1.5 ± 0.6 (1 [1-3])*
Duration of observation after surgery (mos.)	9.8 ± 4.8 (12 [1-15])		8.6 ± 4.6 (10 [1-14])* <i>, p=0.34</i>

Note. \* – certainty between groups ( $p < 0.05$ )

According to data, satisfactory result of treatment in first group was 66.7%, in second – 96.3%. Using of biowelding for removal of intrasphincter part of fistula allowed both decreasing of surgery duration and preventing damage of sphincter apparatus. Effect of welding of fistula tract is achieved by electrothermal denaturation and appearance of general space between protein molecules. During that, area of spreading of thermal influence is lesser than 1–2 mm. Thus, total damage of epithelial layers of fistula without excessive damage of anal sphincter is achieved.

Using of biowelding technology for treatment of transsphincter rectal fistulae led to decreased duration of complete healing of wound and duration of hospitalization.

Important is decreased severity of pain in patients in postoperative period. For estimation of this index, we used questionnaires with rating of pain from 1 to 10 points on 1, 3 and 7 day of postoperative period.

It is noteworthy that percentage of recurrence of disease in 1 group was 13.3% and 3.7% in second, which, in our opinion, is explained by expression of cicatrication of closest tissues.

### Conclusions

Excision of rectal fistulae using biowelding can be effective for treatment of this category of patients. Achieved results show 96.3% of satisfactory results, despite lack of significance with first group due to small sample size ( $\chi^2=0.009$ ;  $p=0.924$ ). Main advantages connect radical approach and mini-invasive technique of procedure. Usage of this method allowed decreasing of duration of wound healing and hospital stay, and pain severity in postoperative period ( $p<0.05$ ). Further improvement of method allows using it for treatment of more complicated types of rectal fistulae.

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## Хірургічне лікування фістул прямої кишки з використанням біозварювання

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### Анотація

**Вступ:** Нориці прямої кишки становлять майже 20% від усієї проктологічної патології. Не дивлячись на велику кількість існуючих методів хірургічного лікування фістул прямої кишки, відсоток рецидиву не має тенденції до зниження. Складність хірургічної корекції полягає у балансі між радикальністю операції з повним висіченням фістульного тракту та мінімальним пошкодженням анального сфінктера. Розробка та впровадження нових малоінвазивних методів хірургічного лікування залишається актуальною областю у хірургії.

**Мета дослідження:** порівняти і проаналізувати результати лікування транссфінктерних фістул прямої кишки шляхом використання стандартних методик та з використанням методу біозварювання.

**Матеріали і Методи:** Було проведено ретро- і проспективне дослідження хірургічного лікування 57 хворих з транссфінктерними фістулами прямої кишки. Всі пацієнти знаходилися на лікуванні у хірургічному відділенні в період з вересня 2018 р. по листопад 2019 р. Всіх пацієнтів було розділено на дві групи. В першу групу увійшло 30 пацієнтів, які були прооперовані за стандартними методиками (висічення нориці з сфінктеротомією, висічення нориці прямої кишки з виконанням сфінктеропластики). У другу групу увійшли 27 пацієнтів, які були прооперовані з використанням біозварювання.

**Результати:** Згідно отриманих даних, задовільний результат лікування у першій групі склав 66.7% випадків, тоді як у другій групі показник успішності склав 96.3%. Використання біозварювання для видалення внутрішньосфінктерної частини нориці дозволило не тільки зменшити тривалість операції, але й уникнути пошкодження сфінктерного комплексу.

**Висновки:** Висічення фістул прямої кишки з використанням методу біозварювання може бути ефективно використаним для лікування цієї категорії хворих. Використання даного методу дозволило уникнути пошкодження сфінктерного апарату, скоротити час загоєння рани та кількість ліжко-днів, зменшити вираженість больового синдрому в післяопераційному періоді.

**Ключові слова:** фістули прямої кишки, хірургічне лікування, метод біозварювання, післяопераційні ускладнення.

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