

Modern methods of surgical treatment of anal canal and rectum combined pathology

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Сучасні методи хірургічного лікування поєднаної патології анального каналу і прямої кишки

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Abstract

Objective. To evaluate the effectiveness of surgical treatment of anal canal and rectum combined pathology, through combined surgical interventions using modern electro- and radiosurgical technologies.

Materials and methods. A comparative evaluation of the results of surgical treatment of 681 patients with combined pathology of the anal canal and rectum, who underwent combined single-stage operations using high-frequency electrosurgery and radio-wave surgery.

Results. In case of application the device for radio-wave surgery "Surgitron", and also devices of high-frequency electrosurgery "ERBE ICC 200", "EFA", "KLS Martin" duration of operation is reduced to (15 – 25 ± 3) minutes, volume of blood loss decreases to (15 ± 6) ml, the need for narcotic analgesics decreases up to (2 ± 1) ml, the duration of inpatient treatment was reduced up to (4 ± 1) days.

Conclusions. The use of modern radio- and electrosurgical technologies for the treatment of combined anorectal pathology prevents the occurrence of anal canal strictures and scarring of the perianal areas, causing the cosmeticity of combined operations.

Keywords: combined pathology of the anal canal and rectum; combined operations; apparatus of radio wave surgery "Surgitron"; high-frequency electrosurgery devices "ERBE ICC 200", "EFA", "KLS Martin".

Реферат

Мета. Оцінка ефективності хірургічного лікування поєднаної патології анального каналу і прямої кишки, яке полягало у виконанні комбінованих оперативних втручань з використанням сучасних електро- та радіохірургічних технологій.

Матеріали і методи. Проведена порівняльна оцінка результатів хірургічного лікування 681 пацієнта з поєднаною патологією анального каналу і прямої кишки, якому були виконані комбіновані одноетапні операції з використанням апаратів високочастотної електрохірургії та апарата радіохвильової хірургії.

Результати. У разі застосування апарата радіохвильової хірургії «Surgitron», а також апаратів високочастотної електрохірургії «ERBE ICC 200», «ЕФА», «KLS Martin» скорочується тривалість операції до (15 ± 3) хв, зменшуються об'єм крововтрати до (15 – 20 ± 6) мл, потреба у наркотичних аналгетиках до (2 ± 1) мл, тривалість стаціонарного лікування до (4 ± 1) доба.

Висновки. Застосування сучасних радіо- та електрохірургічних технологій для лікування поєднаної аноректальної патології запобігає виникненню стриктур анального каналу та рубцевих деформацій періанальних ділянок, обумовлюючи косметичність комбінованих операцій.

Ключові слова: поєднана патологія анального каналу і прямої кишки; комбіновані операції; апарат радіохвильової хірургії «Surgitron»; апарати високочастотної електрохірургії «ERBE ICC 200», «ЕФА», «KLS Martin».

To date, there is no single approach to surgical treatment of combined pathology of the anal canal and rectum. In addition, a rather small number of scientific studies are dedicated to this problem [1]. Thus, some authors consider combined procedures for combined anorectal pathology acceptable, as they reduce the length of hospital stay and prevent re-operation [2], while others believe that this approach significantly increases the number of complications and should be performed only in selected cases. However, most authors are convinced that combined procedures have undeniable advantages: radical surgical treatment of 2–3 ano-

rectal pathologies, no need for re-anesthesia, prevention of complications, reduction of hospital stay and decrease the cost of treatment [3].

The choice of strategy and method of surgical treatment of combined pathology of the anal canal and rectum, which provide minimal impact on the tissues to prevent postoperative complications, requires a special approach [4].

Over the last decade, laser technologies have been widely used in the treatment of various anorectal pathology due to their advantages: low trauma, laser destruction within the submucosal layer, no intraoperative bleeding, short oper-

ations, no inflammatory complications and postoperative scars in the affected area, shortening of terms of treatment [5]. But laser technology, unfortunately, has a number of disadvantages: postoperative bleeding (1.97–2.2%), emerging of hemorrhoids (2.2 – 18.9%), postoperative edema in the coagulation zone (6.2 – 33.1%), recurrence of diseases (5.42 – 41.7%), the formation of residual hemorrhoidal skin marks (14.5%), long-term healing of anal canal wounds (5.6%) [6 – 11].

Thus, the high relevance of the problem of combined pathology of the anal canal and rectum dictates the need to develop new highly effective methods of surgical treatment using modern technologies that would provide less postoperative complications, prevent recurrences in the postoperative period and thus contribute to rapid social and rehabilitation of patients.

The aim of the study: to evaluate the effectiveness of surgical treatment of combined pathology of the anal canal and rectum, which consisted of performing combined surgical interventions using modern electrosurgical and radio-surgical technologies.

Materials and methods

In the period from January 2007 to April 2021 in the proctology department of Khmelnytsky Regional Hospital 681 patients underwent surgical treatment of combined pathology of the anal canal and rectum using the device of radio-wave surgery "Surgitron", as well as devices of high-frequency electrosurgery "ERBE ICA 200", «KLS Martin».

There were 378 men (55.5%) and 303 women (44.5%). The age of patients ranged from 18 to 76 years.

The first group included 245 (35.9%) patients who were treated using a radio-wave surgery device "Surgitron", the second group – 169 (24.8%) patients who underwent surgery with a high-frequency electrosurgery device "ERBE ICC 200", in the 3rd group – 114 (16.7%) patients – with the device of high-frequency electrosurgery "EFA", in the 4th group – 153 (22.5%) patients – using a high-frequency electrosurgery device "KLS Martin".

The control group consisted of 112 patients with combined pathology of the anal canal and rectum, who underwent standard procedure using a metal scalpel. All surgeries were performed under spinal anesthesia.

After surgical interventions using the device of radiowave surgery "Surgitron", as well as devices of high-frequency electrosurgery "ERBE ICC 200", "EFA", "KLS Martin", morphological examination of tissues was performed to study the depth of their necrosis. The thickness of the coagulation necrosis layer was measured using an eyepiece-micrometer scale.

The operating material was fixed in 10% neutral formalin solution. Next, the material was processed in a carousel-type STP-120 histoprocessor, the EC-350 station was used to fill paraffin blocks, a rotary microtome of the HM-340E series was used to cut paraffin blocks, and a Robot-Stainer HMS-740 machine was used for staining histological specimens (all machines manufactured by Karl Zeiss MICROM International GmbH, Germany). The drugs were stained with hematoxylin and eosin. An Axioskop 40 microscope with an Axio Cam MRc5 camera (Karl Zeiss) was used.

SPSS software was used for statistical analysis of the obtained data. The distribution for normality was checked using the Kolmogorov-Smirnov criteria with the Lilliefors and Shapiro-Wilk corrections. The equality of variances was checked using the Livin test. The critical level of statistical significance was 0.05.

In groups with homogeneous variances, where the values of the indicators were distributed normally, one-way analysis of variance was used for comparison, and for pairwise comparison – Bonferoni test. In groups with homogeneous variances, where the values of the indicators were not normally distributed, the Kraskel-Wallis test was used for comparison, and the Mann-Whitney test was used for pairwise comparison.

For pairwise comparison of groups, the adjusted critical significance level was defined as 0.0050–05/10, because 5 groups were compared and 10 pairwise comparisons were performed.

Results

The distribution of patients in groups by the number of combined diseases is presented in *Table 1*.

The most common variants of combined pathology of the anal canal and rectum, which occurred in all study groups and the type of the performed surgical interventions are presented in *Table 2*.

Table 1. Distribution of patients in the study groups by number

Study groups	Number of combined diseases							
	two		three		four		five	
	n	%	n	%	n	%	n.	%
1st (n=245)	188	76,7	51	20,8	6	2,4	-	-
2nd (n=169)	132	78,1	35	20,7	2	1,2	-	-
3rd (n=114)	85	74,6	26	22,8	3	2,6	-	-
4th (n=153)	97	63,4	48	31,4	6	3,9	2	1,3

Table 2. **The most common variants of combined pathology in the studied groups and the nature of the performed surgical interventions in them**

Option of combined pathology	The nature of the performed surgical interventions	Number of patients	
		n	%
Chronic anal fissure and anal polyp	Excision of the anal fissure and polypectomy	115	16,9
Chronic anal fissure and combined hemorrhoids	Hemorrhoidectomy and excision of the anal fissure	84	12,3
Combined hemorrhoids and chronic paraproctitis	Hemorrhoidectomy and excision of the anal fistula	62	9,1
Combined hemorrhoids and anal polyp	Hemorrhoidectomy and polypectomy	61	9,0
Chronic anal fissure, anal polyp and hypertrophied perianal skin marks	Excision of the anal fissure, polypectomy and electroexcision of hypertrophied perianal skin marks	40	5,9
Combined hemorrhoids, chronic anal fissure and anal polyp	Hemorrhoidectomy, anal fissure excision and polypectomy	29	4,3
Chronic paraproctitis and anal polyp	Excision of the anal fistula and polypectomy	23	3,4
External hemorrhoids and anal polyp	Hemorrhoidectomy and polypectomy	21	3,1
External hemorrhoids and chronic paraproctitis	Hemorrhoidectomy and excision of the anal fistula	21	3,1
External hemorrhoids and chronic anal fissure	Hemorrhoidectomy and excision of the anal fissure	20	2,9
Chronic anterior anal fissure, chronic posterior anal fissure and anal polyp	Excision of anal fissures and polypectomy	18	2,6
Anal polyp and hypertrophied perianal skin marks	Polypectomy and electroexcision of hypertrophied perianal skin marks	16	2,3
External hemorrhoids, chronic anal fissure and anal polyp	Hemorrhoidectomy, anal fissure excision and polypectomy	12	1,8
Chronic anal fissure, anal polyp and chronic paraproctitis	Excision of the anal fissure, polypectomy and excision of the anal fistula	11	1,6
Combined hemorrhoids and acute paraproctiti	Hemorrhoidectomy, excision of the abscess	11	1,6

Comparative characteristics of high–frequency electrosurgical devices "ERBE ICC 200", "EFA", "KLS Martin", radio–wave surgery "Surgitron", as well as a metal surgical scalpel in the surgical treatment of patients with combined pathology of the anal canal and rectum are presented in *Table 3*.

Comparison of groups by the Kraskel–Wallis test revealed a statistically significant difference between them with a significance level of $p < 0.001$ for all indicators. In a pairwise comparison of groups according to the Mann–Whitney test, no statistically significant difference was found in the indicator "Duration of the operation" between the 3rd and 4th groups; according to the indicator "Volume of blood loss" between the 1st and 3rd, 1st and 4th, 2nd and 3rd, 2nd and 4th, 3rd and 4th groups; according to the indicator "Severity of pain" between the 3rd and 4th groups; according to the indicator "Duration hospital stay" between the 3rd and 4th groups; according to the indicator "Depth of the coagulation necrosis layer" between the 2nd and 3rd, 2nd and 4th, 3rd and 4th groups. Among other pairs of groups, statistically significant differences were found at the level of significance $p < 0.001$. Comparison of all groups with the control group showed statistically significant differences between them in all indicators.

In the postoperative period, there were no patients with scar stricture of the anal canal, while in the control group in

2 (1.8%) patients scar stricture of the anal canal developed, which required conservative (1 patient) and surgical (1 patient) treatment to eliminate them.

Discussion

The use of Surgitron radiosurgery device for the treatment of patients with combined pathology of the anal canal and rectum was associated with the formation of the thinnest layer of coagulation necrosis in the tissues, the depth of which ranged from 0.085 to 0.211 mm, thus patients in the 1st study group had less pain, postoperative wounds healed faster and the duration of hospital stay was reduced by 3–4 days. In addition, the duration of procedure, as well as the amount of blood loss, were half that of the control group, who underwent surgery with a metal scalpel.

The use of KLS Martin high–frequency electrosurgery device was also associated with the formation of a thin layer of coagulation tissue necrosis with a depth of 0.116 to 0.286 mm, so that in patients of the 4th study group the intensity of postoperative pain was also insignificant and twice less than in the control group. The terms of wound healing and hospital stay were the same as in patients of the 1st study group. The duration of the procedure, as well as the volume of blood loss in patients of group 4 were also the same as in patients of group 1, and twice less than in patients of the control group.

Table 3. Comparative characteristics of modern and standard surgical technologies used in the treatment of combined pathology of the anal canal and rectum

Comparison criteria	Surgical technologies				
	«Surgitron» (n=245)	«ERBE ICC 200» (n=169)	«EFA» (n=114)	«KLS Martin» (n=153)	metal surgical scalpel (n=112)
Duration of operation, min	15±3	20±3	25±3	15±3	29±3
Blood loss, ml	20±6	15±6	20±3	20±6	40±6
The severity of the pain syndrome - the need for narcotic analgesics, ml	2±1	3±1	2±1	2±1	4±1
Duration of inpatient treatment, days	4±1	6±1	5±1	4±1	7±1
Depth of coagulation necrosis layer, mm	0,148±0,063	0,291±0,099	0,229±0,105	0,201±0,085	-
<i>Note.</i>	Indicators are presented as $\bar{x} \pm SD$, where \bar{x} is the arithmetic mean, S is the standard deviation, and 95% of the confidence interval of the mean.				

The effect of the high–frequency electrosurgery device "EFA" on the tissues was slightly deeper than the devices "Surgitron" and "KLS Martin", the depth of coagulation necrosis ranged from 0.124 to 0.334 mm, accompanied by a slight increase in the intensity of postoperative pain, slightly increased the terms of wound healing and hospital stay. The duration of the operation was longer than in the 1st and 4th study groups, and the volume of blood loss in patients of the 3rd group was the same as in the patients of the 1st and 4th groups, and twice less than in the patients control group.

The use of high–frequency electrosurgery device "ERBE ICC 200" was associated with the least blood loss, but also the deepest impact on tissues, the layer of coagulation necrosis ranged from 0.192 to 0.39 mm, causing the most severe pain in the postoperative period and increase in hospital stay, although still less compared to the control group.

The use of a surgical metal scalpel was associated with formation of hemorrhages in the tissues, which led to their greater trauma and, accordingly, the longest duration of operations, the greatest intraoperative blood loss, the most severe pain in control group patients, and the longest duration of hospital stay.

The minimal impact on the tissue of the radio–surgical device "Surgitron" and high–frequency electrosurgical devices "KLS Martin", "EFA" and "ERBE ICC 200" contributed to the formation of cosmetic postoperative scar, prevented scar strictures of the anal canal, thereby reducing the wound healing time with faster rehabilitation of patients in the study groups. In addition, the use of these modern radio– and electrosurgical technologies was not accompanied by such a variety of complications as after the use of laser technology [9 – 11], which gives them significant advantages in the treatment of this category of patients.

Conclusions

1. One–stage combined surgical interventions using modern radiosurgical and high–frequency electrosurgical technologies for the treatment of combined pathology of the anal canal and rectum in comparison with standard methods contributes to a significant reduction in the duration of operations, volume of intraoperative blood loss,

postoperative intensity of pain, and also the duration of hospital stay.

2. The use of modern radio– and electrosurgical technologies for the treatment of combined anorectal pathology, which is accompanied by a small depth of tissue necrosis (from 0.085 to 0.39 mm), prevents strictures of the anal canal and scarring of the perianal areas, contributes to a good cosmetic result.

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