

# Dynamics of the Wound Process After Hemorrhoidectomy

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**Abstract** 224 patients with chronic internal and combined hemorrhoids were included in this study. The main group included 122 patients. The correction of chronic hemorrhoids in them was performed in a minimally invasive way using a hardware-controlled bipolar electrosurgical LigaSure unit. The control group consisted of 102 patients operated on by the traditional Milligan-Morgan surgical method. The use of bipolar vascular electrocoagulation "LigaSure" in the treatment of chronic hemorrhoids makes it possible to achieve rapid wound repair, compared with traditional hemorrhoidectomy, as a result of which the rehabilitation period is shortened.

**Keywords** Chronic hemorrhoids, Surgical treatment, Wound repair

## 1. Introduction

The treatment of patients with hemorrhoids remains one of the most urgent problems of coloproctology. For centuries, surgeons have been working on the problem of treating chronic hemorrhoids [1,6]. To date, the most common operation remains aimed at excision of three hemorrhoids, proposed by E. Milligan and G. Morgan back in 1937. In the world proctological practice, there are many surgical methods for the treatment of chronic hemorrhoids [3,7]. However, none of them can be considered fully optimal, devoid of the risk of developing both early and late postoperative complications. The interest of coloproctologists in new methods of hemorrhoidectomy is confirmed by the number of publications on this topic.

New technologies in recent years have significantly improved the quality of surgical methods for the treatment of hemorrhoids [2,5]. Nevertheless, the question of the most optimal variant of surgical intervention remains unresolved to date, and data on the effectiveness of various techniques are often contradictory [4,8].

In this regard, the need to develop new methods of surgical correction of chronic hemorrhoids served as the basis for this work.

**The purpose of the study.** To study the features of the course and repair of wounds after traditional methods of hemorrhoidectomy and according to the proposed technique using bipolar electrocoagulation in chronic hemorrhoids.

## 2. Research Materials and Methods

This study included 224 patients with chronic internal and combined hemorrhoids who were treated between 2018 and 2023.

All patients (n=224) were divided into two groups. The first, main (prospective) group included 122 patients. The correction of chronic hemorrhoids in them was performed in a minimally invasive way using a hardware-controlled bipolar electrosurgical LigaSure unit. The second, control (retrospective) group consisted of 102 patients with the same diagnosis, but operated on by the traditional Milligan-Morgan surgical method in the II modification of the SSC Coloproctology of the Ministry of Health of the Russian Federation.

In order to study the dynamics of the wound process, along with clinical ones, cytological and microbiological studies of the wound discharge were performed.

## 3. The Results and Their Discussion

In smears on the third day after surgery, when studying the dynamics of the wound process in 52 (60.4%) patients of the main group after performing an improved method of hemorrhoidectomy using the LigaSure device and in 12 (35.3%) patients who underwent submucosal hemorrhoidectomy with the LigaSure device, a moderately pronounced inflammatory reaction of neutrophilic character. Single nuclear histiocytes of monocytic cells (the first signs of the onset of repair) were also noticeable in 20 (23.2%) and 12 (29.4%) patients of this group, respectively. In addition, in 4 (11.7%) patients of the main group who underwent submucosal hemorrhoidectomy with the LigaSure device, large histiocytes with basophilic cytoplasm (cellular signs of active repair) are visible in the smears. At the same time, in the control group, 72 (72%) people had a pronounced inflammatory

reaction (an increase in the number of eosinophils, mononuclear lymphocytes, monocytes).

On the fifth day in 62 (72.0%) patients after performing an improved method of hemorrhoidectomy using an apparatus. LigaSure and in 24 (70.6%) submucosal hemorrhoidectomy with LigaSure apparatus of the main group, an increase in the number of eosinophils was revealed, neutrophilic leukocytes were visible, lymphocytes and monocytes were found in small numbers. At the same time, the vast majority of patients in the main groups showed a decrease in the number of neutrophils. They showed the first signs of reparation. On the seventh day after surgery, a large number of collagen fibers and an accumulation of immature epithelium were detected in smears in 44 (51.2%) and 16 (47.0%) people of the main group. Immature squamous epithelium and fibroblasts were detected in 4 patients (11.7%) after submucosal hemorrhoidectomy with LigaSure apparatus. In the control group, at the end of the first week, 78 (58%) patients showed a decrease in the number of neutrophils, only 12 (12%) showed the first signs of repair (single histiocytes are visible), and 8 (8%) patients showed signs of active repair (large histiocytes with basophilic cytoplasm). On the 10th day of the postoperative period, immature squamous epithelium and fibroblasts were detected in the field of vision in most patients of the main group, in 28 (32.5%) - mononuclear cellular elements of blood origin - lymphocytes and monocytes. In 24 (27.9%) patients after performing an improved method of hemorrhoidectomy using the LigaSure device and in 16 (47.0%) patients after submucosal hemorrhoidectomy with the LigaSure device of the main group, initial signs of granulation tissue formation appeared (single single-core histiocytes are noticeable). At

the same time, 54 (54%) patients of the control group had a large number of neutrophils, phagocytic macrophages. In 12 (12%) patients, loose fibrous connective tissue (fibrous cords) was differentiated, in 14 (14%) - a decrease in the number of neutrophils and residual elements of inflammation.

On the 14th day after surgery, elements of scar connective tissue (fibroblasts and fibrocytes) were detected in all cases in the main group. While in the control group, most patients (in 66% of cases) had a moderate amount of collagen fibers, an accumulation of immature squamous epithelium.

On day 20, in 78 (90.7%) patients of the main group, after performing an improved method of hemorrhoidectomy using the LigaSure device and in all patients after submucosal hemorrhoidectomy with the LigaSure device, loose fibrous connective tissue was detected in smears. Whereas in the control group, only 34 (34%) patients had elements of loose fibrous connective tissue, 14 (14%) had residual elements of inflammation.

The data of clinical and cytological studies were verified with the results of microbiological studies. As a result of the examination of the smear from the anal canal before the operation, various kinds of microorganisms were found. Fecal streptococci prevailed among them (in 35.7% and 22.2% of the main group and in 48% of the control group). All isolated organisms belonged to the group of episodically occurring or accidental, transient for the microflora of the surgical wound (Table 1).

After surgery, the nature of the microflora of the wound discharge changed. According to the table data, from the third to the seventh day after surgery, an increase in the frequency of occurrence of a number of microorganisms was observed in the control group, compared with the main group.

**Table 1.** The microflora of the wound discharge at various times after surgery

Microflora	The 3rd day after the operation			7th day after surgery		
	The main group		Control group n=102	The main group		Control group n=102
	*USGEsPA Ligasure n=86	*PGEA Ligasure n = 36		USGEsPA Ligasure n=86	*PGEA Ligasure n = 36	
Escherichia	20(23,2%)	10(29,4%)	32(32,0%)	8(9,3%)	4(11,7%)	12(12,0%) <sup>#</sup>
Bacteroids	14(16,3%)	4(11,7%)	-	12(13,9%)	6(17,6%)	10(10,0%)
Hemolytic	4(4,6%)	-	8(8,0%)	4(4,6%)	-	6(6,0%)
streptococci	34(39,5%)	12(35,3%)	52(52,0%)	22(25,6%)	6(17,6%)	48(48,0%)
Enterococci (fecal	-	-	105(10,0%)	-	-	16(16,0%)
streptococci)	-	-	-	-	-	-
Staphylococcus	-	-	-	-	-	6 (6,0%)
aureus	8 (9,3%)	2 (5,9%)	18 (18,0%)	2 (2,3%)	-	36 (36,0%) <sup>#</sup>
Pseudomonas	10(11,6%)	2(5,9%)	-	6(7,0%)	-	-

Note: #p<0.05 is the statistical significance of the difference in indicators compared to those in the corresponding group on the 3rd day after surgery (according to the McNemar criterion). \*USGEsPA LigaSure is an improved method of hemorrhoidectomy using the LigaSure device and \*PGEA LigaSure is a submucosal hemorrhoidectomy with the LigaSure device.

From the third to the seventh day after surgery, there was a noticeable decrease in the detection of fecal streptococcus in the main groups (from 39.5% and 35.3%) (to 26.6% and 17.6% in the main groups, respectively). *Staphylococcus aureus* and *Pseudomonas aeruginosa* were not detected in any case before surgery, whereas in the control group in the postoperative period on the 7th day, an increase in the number of *staphylococcus aureus* was detected (from 10% to 16%). In the postoperative period, on the 7th day, *proteus* was also detected in the control group (6%), whereas before surgery and on the 3rd day after surgery, this type was not present. The association of microbes on day 3 in the main group after performing an improved method of hemorrhoidectomy using the LigaSure device was found in 8 (9.3%) patients, on the seventh day the association of microbes in the first group was detected in 2 (2.3%) patients, and after submucosal hemorrhoidectomy with the LigaSure device on day 3 - in 2 (5.9%) of the patient, whereas on the seventh day it was not detected. In the control group, in the postoperative period, the association of microbes increased from 18 (18%) cases on the third day to 36 (36%) cases on the seventh.

A similar pattern indicates less microbial contamination of wounds in patients of the main group. Most likely, this is due to the absence of large postoperative wounds and sutures in the anorectal area after hemorrhoidectomy using a modified method, as well as with fewer bleeds, which are a favorable environment for the development of microorganisms.

The obtained data from microbiological studies and, as a result, a decrease in the frequency of purulent-inflammatory complications in the main groups once again confirm the pathogenetic effectiveness of the proposed methods.

Thus, the use of bipolar electrocoagulation in the treatment of chronic hemorrhoids according to the developed technique reduces the contamination of pathogenic microflora, has a beneficial effect on the course of the wound process, accelerating the granulation process, reduces postoperative complications and thereby shortens the rehabilitation period.

## 4. Conclusions

1. Improved methods of hemorrhoidectomy using "LigaSure" at the stages of surgery for chronic hemorrhoids are highly effective, pathogenetically sound and radical methods that can improve both the immediate and long-term results of the operation.
2. The use of bipolar vascular electrocoagulation "LigaSure" in the treatment of chronic hemorrhoids makes it possible to achieve rapid wound repair, compared with traditional hemorrhoidectomy, as a result of which the rehabilitation period is shortened.

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