

БИОМЕДИЦИНА ВА АМАЛИЁТ ЖУРНАЛИ

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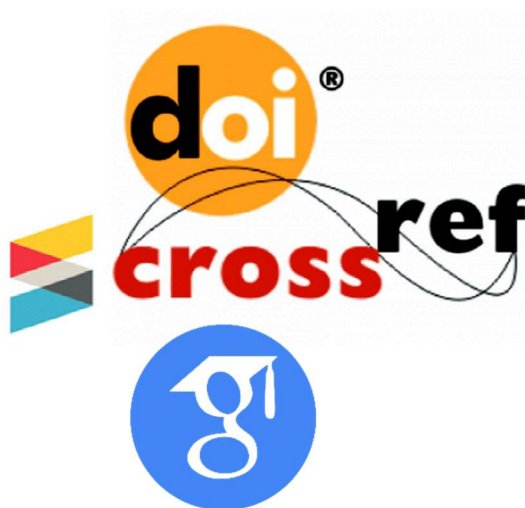
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ANNOTATION

This article provides an extensive analysis of the evolution of minimally invasive colorectal surgery and modern approaches to the surgical management of ulcerative colitis (UC). Beginning with the first laparoscopic-assisted right hemicolectomy performed by Jacobs et al. in 1990, the authors highlight the substantial progress in video-endoscopic technologies while emphasizing persistent limitations, including the lack of tactile feedback, loss of three-dimensional perception, and technical challenges in obese patients, those with prior abdominal surgery, or those with locally advanced disease. The introduction of hand-assisted laparoscopic surgery (HALS) has expanded the applicability of minimally invasive techniques by improving intraoperative control, reducing conversion rates, and shortening operative time. The paper reviews the current landscape of UC surgery, noting that despite advances in medical therapy, up to 50% of patients require surgical intervention. The major factors contributing to poor outcomes include delayed surgery, absence of unified criteria for medical treatment resistance, high systemic toxicity, and severe metabolic disturbances. Persistent difficulties involve the absence of a universally accepted “gold standard” for restorative surgery in UC, the high rate of functional complications after IPAA, and ongoing debate regarding optimal reconstructive strategies. Modern trends in minimally invasive surgery including total laparoscopic IPAA, transanal approaches (ta-IPAA), and robotic techniques are examined. Literature data demonstrate benefits such as improved quality of life, reduced adhesion formation, better fertility outcomes, and fewer postoperative complications. The review concludes that optimization of UC treatment requires refined patient selection, improved perioperative management, and integration of innovative technologies while maintaining strict surgical and oncological principles.

Keywords: ulcerative colitis, surgery, laparoscopy

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АННОТАЦИЯ

В статье представлен расширенный анализ эволюции миниинвазивной колоректальной хирургии и современных подходов к хирургическому лечению язвенного колита (ЯК). Начиная с первой лапароскопически-ассистированной правосторонней гемиколэктомии (Jacobs et al., 1990), авторы отмечают значительный прогресс видеозендоскопических технологий, однако подчеркивают сохраняющиеся ограничения метода, связанные с отсутствием тактильных ощущений, потерей трехмерной визуализации, техническими трудностями при ожирении, спаечном процессе и местно-распространенных опухолях. Анализируется современное состояние хирургии ЯК, где несмотря на рост эффективности медикаментозной терапии, до 50% пациентов в течение жизни нуждаются в операции. Рассматриваются проблемы отсутствия «золотого стандарта» реконструктивной хирургии ЯК, высокая частота функциональных нарушений после IPAA и дискуссионность методов восстановления анальной дефекации. Обобщены современные тренды развития малоинвазивной хирургии: тотальная лапароскопическая IPAA, трансанальные техники (ta-IPAA), робот-ассистированные методы, а также использование ручной ассистенции при технически сложных ситуациях. Представлены данные литературы о влиянии MIS на частоту осложнений, репродуктивную функцию и качество жизни. Делается вывод о необходимости совершенствования критериев отбора пациентов, оптимизации до- и послеоперационного ведения, а также интеграции новых технологий с соблюдением принципов онкологической и проктологической абластики.

Ключевые слова: неспецифический язвенный колит, хирургия, лапароскопия

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АННОТАЦИЯ

Ушбу мақолада колоректал жарроҳликда миниинвазив технологияларнинг ривожланиши ва ярим аср давомида уларнинг ярим аср давомида яратилган замонавий ёндашувлари, хусусан, ярали колитни (ЯК) жарроҳлик йўли билан даволашдаги ўрни кенг таҳлил қилинади. Jacobs ва ҳаммуаллифлар томонидан 1990 йилда бажарилган биринчи лапароскопик-ассистенсияли гемиколектомиядан бошлаб видеозендоскопик техникаларнинг сезиларли тараққиёти қайд этилади. Шу билан бирга, тактил сезгининг йўқлиги, уч ўлчамли фазовий кўришнинг йўқолиши, семизлик, илгари қилинган жарроҳликлар ва тарқалган шишларда техник мураккабликлар каби чекловлар ҳам таъкидланади. HALS техникасининг жорий этилиши интраоперацион назоратни яхшилаб, конверсия эҳтиёжини камайтириб ва операция вақтини қисқартириб миниинвазив имкониятларни кенгайтиради. Мақолада замонавий миниинвазив ёндашувлар — тўлиқ лапароскопик IPAA, трансанал IPAA (ta-IPAA), робот-ассистенсияли техникалар ва уларнинг афзалликлари ёритилган. Адабиётлар натижалари туғруқдан кейинги унумдорликнинг яхшиланиши, функционал кўрсаткичларнинг яхшиланиши, камроқ спайкалар ривожланиши ва пастроқ асоратлар билан боғлиқ. Хулоса сифатида ЁКни оптимал жарроҳлик билан даволаш беморларни эҳтиёткорлик билан саралаш, периператсион даврни

яхшилаш ва инновацион технологияларни жарроҳлик мезонларига қатъий амал қилган ҳолда интеграция қилишни талаб қилади.

Калит сўзлар: носпесифик яроли колит, жарроҳлик, лапароскопия

Introduction. Laparoscopic-assisted right-sided hemicolectomy performed by M. Jacobs et al. in June 1990 [13] marked the beginning of the introduction of videoendoscopic surgeries into colorectal surgery. Over the next two decades, this method has become widespread in many clinics worldwide. However, until now, the active use of laparoscopic surgeries in the treatment of colon cancer has been restrained by the skeptical attitude of a number of oncologists due to doubts about compliance with the principles of ablative surgery. In addition, such shortcomings of laparoscopic-assisted interventions as the absence of tactile sensations and the loss of three-dimensional perception of space significantly limit the use of minimally invasive techniques in complex situations - in patients with excess body weight, in patients who have previously undergone surgery on abdominal organs, as well as in locally spread tumors. In a number of observations, the use of laparoscopic techniques significantly increases the duration of operations on the colon and, in addition, requires the surgeon to master special skills for a long time. To overcome the above-mentioned limitations, since the beginning of the 90s of the last century, the method of laparoscopic operations with manual assistance (in English-language literature - "hand-assisted laparoscopic surgery") has been used, which implies the use, along with endoscopic instruments, of the surgeon's hand inserted into the abdominal cavity [5]. To assess the possibilities of using this method in patients with colon cancer, we analyzed our own experience in performing such operations.

Surgical treatment of ulcerative colitis (UL) can still be considered one of the dramatic branches of surgical gastroenterology and coloproctology. The increase in the prevalence of inflammatory diseases of the colon is currently ahead of the development and improvement of specialized care for this category of patients. Statistical studies indicate an avalanche-like increase in the prevalence of ulcerative colitis - in industrial regions, it ranges from 40 to 60% every decade.

At the same time, among the population of UC patients, the need for surgical treatment does not decrease and is observed throughout life, according to Keswani R.N. Cohen R.D. (2022) - 10-30% of patients, and according to Ruf G. (2022) - up to 50%. Therefore, an increase in the incidence of ulcerative colitis inevitably leads to an increase in the absolute number of patients requiring surgery.

"Medication resistance," which is observed in various nonspecific inflammatory diseases with an autoimmune component, can have fatal consequences in patients with ulcerative colitis. Uncontrolled inflammatory process with conservative therapy leads to the progression of systemic toxic reactions and the development of intestinal complications of the disease: bleeding - in 1.5-4%, toxic dilatation and perforation - in 5-6%.

The unpredictable progression of ulcerative colitis, severity of systemic disorders, unclear indications for surgery, and inevitable surgical trauma during extensive colon resection contribute to the preservation of mortality rates in the group of patients operated on for ulcerative colitis from 8-12 to 50-60%.

Unsatisfactory treatment outcomes for patients with YAK complications are explained, on the one hand, by the development of irreversible changes in homeostasis in severe YAK (metabolic disorders, cachexia, sepsis, coagulopathy), and on the other hand, by the absence of "precursors" of these complications, which can serve as indications for surgery before the development of terminal manifestations.

The criteria for resistance to conservative therapy are still interpreted contradictorily, therefore, at the present stage, there is no accepted system for evaluating or classifying patients with UC according to the severity of clinical manifestations, in which patients with indications for surgery would be distinguished.

The widespread nature of colon damage in severe burns necessitates a large volume of surgical interventions, which, according to the absolute majority of authors, should be no less than subtotal resection of the colon.

At the same time, the authors acknowledge that to date, the combination of radical surgical treatment with the restoration of anal defecation has not been achieved, therefore, the "gold standard" for surgical treatment of UC has not yet been found (Huetting W.E. Buskens E., 2022).

Improving surgical treatment outcomes, reducing postoperative complications and mortality rates plays a significant role in improving surgical intervention techniques and optimal selection of its type, along with intensive pathogenetic and replacement therapy in the pre- and postoperative periods.

This is facilitated, in particular, by the development in recent years of minimally invasive technologies for surgical intervention on the colon, such as laparoscopic (Maskin S.S., 2019) and laparoscopic manual assistance (Frolov S.A., 2020).

Another direction in improving the treatment outcomes of patients with severe forms of colon inflammatory diseases is the progressive methods of managing the postoperative period, including endolymphatic antibiotic therapy for Crohn's disease (Yusupov I.A., 2023).

Variants for restoring anal defecation after resection of the colon due to UC are the formation of an ileorectal or ileoanal anastomosis. In the first case, there is no consensus on the optimal boundaries of rectal resection (Kanshin N.N., 2020; Mortier P.E. et al., 2022), and in the second case, reconstruction is associated with a high (35% higher) level of postoperative functional complications (Shen B., Fazio V.W., 2022). These circumstances led to the fact that currently, the share of reconstructive surgeries in UC surgery in the USA is no more than 25%, with the remaining patients, coloproctomy ends with the formation of a permanent ileostomy (Bach S.P., Mortensen N.J., 2021).

All the listed problems dictate the need to improve treatment tactics for the severe form of ulcerative colitis, combining the timely use of conservative and surgical treatment methods, the development of minimally invasive diagnostic methods, the management of pre- and postoperative periods in patients with metabolic disorders, minimally invasive surgical techniques, as well as the search for factors predicting the need for surgery and the possibility of performing the reconstructive stage.

To date, significant experience has been accumulated in several clinics in the use of manual assistance during laparoscopic resections of the colon. Thus, in an article published this year from the Mayo Clinic, the experience of performing 1103 such operations is presented [8]. The place of laparoscopic operations with manual assistance in colorectal surgery remains a subject of debate. When compared with open interventions, manual assistance surgeries demonstrate all the advantages of minimally invasive surgery characteristic of laparoscopic-assisted surgeries [7, 14, 17]. Furthermore, the use of manual assistance during laparoscopic resection of the colon allows for a reduction in the duration of the intervention and a decrease in the frequency of conversions [15, 16, 22].

As shown by the meta-analysis of comparative studies conducted by A. Aalbers et al. [4], the immediate results of laparoscopic-assisted interventions and laparoscopic operations with manual assistance do not have significant differences. According to a number of authors, manual assistance allows for wider application of laparoscopic technologies in the treatment of colon cancer due to technically complex situations - obesity, abdominal adhesions, and large tumors [11, 12, 21, 22].

In the literature, little attention is paid to assessing the oncological results of laparoscopic resections of the colon with manual assistance. C. Ringley et al. [19] note a larger number of removed lymph nodes compared to laparoscopic-assisted resections. R. Pendlimari et al. [18] provide data on 79% of recurrence-free 3-year survival in a group of 194 patients after laparoscopic resection of the colon with manual assistance. The results of the studies conducted at the State Center for Coloproctology generally correlate with the literature data. Thus, G.I. Vorobev et al. [1] when comparing with laparoscopic-assisted operations, no differences were found in the course of the postoperative period when analyzing the intensity of postoperative pain syndrome, the consumption of analgesics, the need for parenteral administration of medications, the timing of intestinal peristalsis restoration, and self-care capability. At the same time, manual assistance allows for laparoscopic resection of the colon in patients with excess body weight, adhesions in the abdominal cavity, and large-sized tumors without significantly increasing the duration of the intervention and the risk of

intraoperative complications. Due to "laparolifting," this method provides comfortable conditions for performing operations and at low gas pressure in the abdominal cavity [1], which allows for the use of the advantages of minimally invasive surgery in patients with reduced functional reserves of the respiratory and cardiovascular systems. Thus, the use of manual assistance during laparoscopic resection of the colon increases the possibilities of intraoperative revision and improves the conditions for performing the operation due to good coordination of movements and orientation of the surgeon. This method can be recommended for use in patients with colon cancer with technical difficulties, such as excess body weight, adhesions after previous interventions on abdominal organs, and contraindications for tense carboxyperitoneum. The method of performing laparoscopic surgery with manual assistance demonstrates all the advantages of laparoscopic surgery, while having a low level of conversion into open operations, which expands the indications for the use of minimally invasive interventions in patients with colon cancer. Despite the numerous advantages of HALS, bone valve limitations prohibited the use of HALS in proctoectomy, and consequently, HALS remained a hybrid laparoscopic open surgery for IPAA. With the growth of experience in the MIS field, many surgeons have switched to a total laparoscopic approach using multiple access ports, with sample extraction and bag creation often performed through a Pfannenstiel incision or ileostomy area. For many surgeons, HALS remained a useful tool and bridge to laparotomy during complex operations. Total laparoscopic IPAA studies demonstrated feasibility and safety (15-18). In one of the technical and economic studies, it was reported that 82 patients underwent total laparoscopic IPAA with a conversion rate of 11% and a significant reduction in surgery time after the first 40 cases. Functional results for one year showed 4.7 ± 1.9 defecation per day and 1.0 ± 1.2 defecation per night (18). Compared to open surgery, total laparoscopic IPAA allows for a reduction in surgical blood loss and the use of analgesics, a reduction in hospital stay, and a decrease in the number of injection, abdominal, and adnexal adhesions (16,19,20). While initial data in the early stages of minimally invasive colectomy showed similar clinical results with HALS and total laparoscopic colectomy (21), later data indicate improvement in total laparoscopic access results, including a decrease in the frequency of surface infection of the surgical site and postoperative ileoid (22). Since full laparoscopic IPAA involves laparoscopic proctoectomy, its impact on sexual function must also be assessed. A study comparing male and female body images and sexual function after laparoscopic or open IPAA revealed slight improvement in body image in women who underwent laparoscopic treatment but had similar sexual function (23), while another study comparing laparoscopic and open rectal incision during IPAA revealed open surgery as a risk factor for erectile dysfunction [negative ratio (OR) =4.16, 95% confidence interval (CI): 1.62-10.65, P=0.003]. In female patients, it was also shown that total laparoscopic IPAA contributes to female fertility and fertility, presumably due to the reduction of adhesions in the pelvic region (24,25). Expanding the laparoscopic approach, successful results of single-port (SP) IPAA with access through the future ileostomy site in the right lower quadrant (26) were also reported, but no advantages in clinical results compared to multi-port laparoscopy were identified. Multiport laparoscopic IPAA is usually performed through 5 port areas with a chamber port at the navel and extraction through a Pfannenstiel incision. Alternatively, to minimize abdominal incisions, specimen extraction can be performed through the future ileostomy site or trans-anal in cases of rectal mucosectomy. In our experiment, for laparoscopic TAS, a 3-port technique (1-rasm) can be used with a 10-mm periumbilical chamber port, a 12-mm working port at the site of the future ileostomy in the right lower quadrant, and a 5-mm suprapubic port. This allows for the mobilization of the entire colon using a 10-mm blunt end Ligasure™ (Medtronic Inc., Dublin, Ireland) through a 12-mm port at the ileostomy site. The lateral approach to the medial approach, operating from right to left, begins with a rectosigmoid intersection, where the disintegration is spliced using a 60-mm laparoscopic staple. The preparation is extracted through the ileostomy site, and the incision of the iliac gland is performed extracorporeally to prevent the expulsion of the staple line during extraction through the relatively small ileostomy opening.

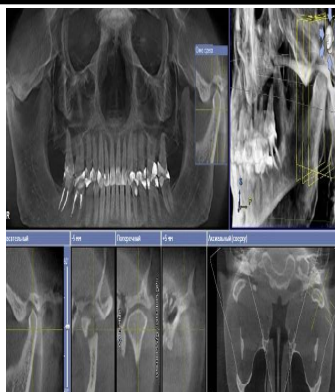


Figure 1 Triple access for laparoscopic total abdominal colectomy.

In stepwise IPAA, the second stage begins with the mobilization of the ileostomy, followed by abdominal insufflation and SP laparoscopy using GelPOINT® Mini Advanced Access Platform (Applied Medical Resources, Rancho Santa Margarita, CA, USA), placed across the ileostomy area (Figure 2). The iliac mesentery is mobilized along the duodenum, and the length of the pouch can be assessed intra- and extracorporeally. Then, proctoectomy is performed laparoscopically via GelPOINT® Mini, and if necessary, additional trocars can be placed in the left lower quadrant and the navel for visualization and retraction. The superior hemorrhoidal artery is divided close to the intestine to minimize damage to the hypogastric nerve, and dissection is performed in the plane of the common mesorectal resection posteriorly and near the rectum laterally and anteriorly to minimize damage to the autonomic nerves and urogenital structures. When rectal mobilization reaches the anorectal ring, the laparoscopic staple is placed perpendicular to the rectum and the corresponding level of intersection is confirmed by digital examination or flexible sigmoidoscopy before the staple shot. This is an important step, as one of the main limitations of laparoscopic IPAA associated with follicular insufficiency is the excessive length of the rectal cuff (27). Another limitation at this stage of laparoscopic IPAA is the need to perform multiple staple burns to achieve a perpendicular rectal incision due to limitations in staple articulation in the narrow space in the bone marrow. Limiting staple burns to 2 or less is crucial for minimizing the complications of anastomosis leakage (28). In our experience, if this stage cannot be performed using 2 or fewer staple burns, a Pfannenstiel incision can facilitate rectal transection using a TATM (Medtronic Inc., Dublin, Ireland) or Echelon CONTOUR stapler (Ethicon Inc., Raritan, NJ, USA). In our practice, bag construction is performed extracorporeally through the ileostomy area, and a two-stage anastomosis can be achieved through laparoscopic imaging.

Achievements in the field of natural openings and transanal MIS have generated significant interest in transanal proctoectomy in the last decade. Similar to transanal total mesorectal excision (TTME) for rectal cancer, TAIPAA for PC is ideal for patients with a narrow and deep body part, where traditional direct laparoscopic instruments can be difficult to access and visualize. The potential advantages of the transanal approach in CC include direct linear access to the lower rectum, sequential rectal intersection at the anorectal junction, leaving a limited rectal cuff, and the absence of multiple staple burns with a single-staple anastomosis (29,30). Studies comparing taIPAA and transabdominal IPAA demonstrated the safety of taIPAA with short-term (31,32) and long-term (33,34) results comparable to transabdominal access. However, in our experiment, taIPA has a higher frequency of anastomosis leakage compared to transabdominal IPAA (11% versus 2%; $P=0.03$), although this may be related to the very low leakage frequency in traditional transabdominal IPAA (35,36), as the leakage frequency of taIPAA reflects the indicators of other published literature sources. Our opinion is that transanal IPAA refers to the instrumental basis for approaches to IPAA and can be especially useful in patients with particularly narrow and difficult pelvic cavities or in patients with rectal cancer under conditions of PCI.

With clear advantages in short-term surgical outcomes, including pain reduction, shorter hospital stays, faster bowel function recovery, improved cosmetics, and some potential long-term benefits in bowel function, female fertility, and male sexual function, it is clear that MIS for CC

remains here. Even in an emergency situation with lightning-fast colitis, laparoscopy is safe and should be preferable to moderate laparotomy, except for an unstable patient. As we continue to advance in the field of minimally invasive colorectal surgery, we must continue to implement innovations, especially in cases that carry the highest morbidity and require the highest technical skills. Ongoing research in single-profile robotic surgery, TAIPAA, and robotics will help our patient move forward. It also emphasizes the need to improve preparation both in domestic programs and in global UC centers. In IPAA surgery, the surgeon's expertise and preferences may dictate a minimally invasive approach from laparoscopic, hybrid, transanal, and robotic surgery, as studies show similar results in various modifications. The main principles of high-quality intestinal sinus surgery must always be observed regardless of the minimally invasive approach, including evaluating access to the intestinal sinus before proctectomy, cutting near the rectum to prevent nerve injury, minimizing the length of the cuff to <2 cm, avoiding multiple distal rectal shearing operations, maneuvers to achieve access to the intestinal sinus with minimal tension, and constructing a reliable anastomosis. Compliance with these principles during minimally invasive IPAA is of paramount importance, as constructing a poorly functioning sac can ultimately impair the patient's quality of life, lead to sac failure, and ultimately to persistent ileostomy. Considering the relatively young age of patients with IPAA, factors such as fertility, sexual function, and cosmetics remain the main factors in their quality of life, satisfaction, and overall well-being, and attention should be paid to the methods and techniques for optimizing these results. As innovations continue to advance MIS, surgeons must prioritize safe saccular surgery, mastering the approach, and continuing to implement innovations to improve long-term outcomes and the quality of life of patients who have undergone surgery for CC.

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