Current State of the Problem of Surgical Treatment of Non-Tumor Colon Urgent Diseases

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ABSTRACT

Based on the analysis of recent literature data, the authors note that urgent complications in volvulus of the sigmoid colon, Payr's disease, cicatricial adhesive disease, diverticular disease of the left half of the colon remain extremely relevant, due to the high incidence of postoperative complications and mortality during the formation of primary anastomoses, which due to the lack of optimal treatment and diagnostic algorithms and omissions in surgical tactics, as well as long-term disability in colostomy patients. Summing up, the authors note that one of the main ways to prevent suture failure of interintestinal anastomoses is the choice of the optimal method of anastomosis formation, as well as the development of a primary delayed "U-shaped" end-to-side colonic anastomosis, which allows to reduce the time and improve the results of recovery operations.

Keywords :

According to recent decades of research in the surgical treatment of urgent complications in volvulus of the sigmoid colon, Payr's disease, cicatricial adhesive disease, diverticular disease of the left half of the colon, many issues in determining surgical tactics remain complex and debatable. There is no unity of views on the radical nature of the operation in urgent complications of non-tumor diseases of the left half of the colon [6;47]. According to a number of researchers, in patients with urgent complications of non-tumor diseases of the left half of the colon, surgical tactics are determined by the general condition, the presence of peritonitis, intoxication of the body and the degree of metabolic disorders [47]. Disagreements among surgeons arise when choosing the scope of the operation, the expediency of one-, two- and many moment operations. The performance of simultaneous surgical interventions by surgeons is associated with the desire for early restoration of normal life, however, the high risk of life-threatening complications forces in 2/3 of patients to resort to the formation of colonic stomas [20].

The choice of the optimal surgical tactics for CBD presents significant difficulties. Rare reports of resolution of volvulus with siphon enemas only confirmed the main surgical focus of treatment [29].

In recent years, endoscopic methods have become widely used for the treatment of patients with CBD. According to Dotsenko A.P. (1994), attempts to eliminate CBD using enemas and through an endoscope are only permissible in the early stages from the onset of the disease in patients with severe concomitant diseases and in senile patients [12].

One of the formidable complications of the elimination of volvulus through the endoscope is perforation of the intestine. If the ZSK managed to deploy, then further tactics

may be different. The effectiveness of torsion deployment through the endoscope is reduced by the frequent development of relapse. Surgical treatment should be considered as the main method of treatment of CBD. There are many different operations that can be divided into two large groups: palliative and radical [27]. The safest way is to remove the feces through a thick rubber tube inserted through the rectum. Recommended at one time by Grekov I.I. (1928) this method was then abandoned, but recently it has been used again [29]. However, after the torsion is straightened, the highly toxic content of the CC passes into the distal sections, where it is intensively absorbed, leading to the development of a "turnstile" shock. An unambiguous tactic is chosen with a gangrenous-altered intestine - it must be removed. With a viable sigmoid colon, two types of surgical interventions can be used - straightening of the volvulus with various additional interventions on the intestine and its mesentery or resection of the viable intestine [23].

After straightening of the CBD, its relapses are quite often observed. In this regard, a large number of various additional interventions have been proposed aimed at fixing the CC or shortening its mesentery according to Hagen-Thorn I.E. [23;27]. The second group of surgeries for CC is a radical intervention and consists of resection of the intestine in various modifications [Rivkin V.L. et al., 2004].

There are several ways of resection of viable CC with primary anastomosis. Many surgeons consider it expedient to impose a proximal intestinal fistula to prevent anastomotic failure [40].

According to the combined statistics of domestic and foreign authors, the proportion of CC resection with anastomosis among all radical operations is 36.7%. Recurrences after CC resections are rare [27]. The basic principles of intestinal anastomosis were laid down a hundred years ago by such surgeons as Travers, Lambert, and Halsted [42]. Nevertheless, new surgical techniques for applying anastomoses are constantly emerging: new types of stapling devices, suture material are being created, including in laparoscopic operations, despite this, the manual method of forming anastomoses in surgical practice is significant to this day [8;22].

A good result of surgical intervention largely depends on the details of the formation of the anastomosis and, above all, on the technique of the intestinal suture [26]. Currently, the formation of the interintestinal anastomosis is carried out by the traditional method of manual stitching and using hardware techniques [49]. When evaluating postoperative complications, there were no significant differences in the frequency of their occurrence [35]. The use of modern staplers reduced the time of the operation, but did not significantly reduce the number of postoperative complications: for example, suture failure ranges from 3.5% to 6.4%, and mortality from 2.2% to 6.9% [31]. Despite the improvement of the technique of applying manual and mechanical small-colonic anastomoses, the high quality of modern suture materials and stapling devices, today it is not possible to overcome the negative aspects of these anastomosis methods: the presence of foreign inclusions in the area of tissue connection prolongs the regeneration time, the formation of wound channels promotes penetration endogenous microflora into the deep structures of the anastomosis and causes the development of an inflammatory reaction, followed by cicatricial deformity of the anastomosis [31].

The average mortality rate in patients operated on the colon with manual anastomosis is 8-10%, while its fluctuations, according to different authors, range from 0.5 to 40% [51]. After surgical interventions on the left half of the colon, mortality is higher than on the right half [4].

With a two-row "classic" suture used in elective colon surgery, the level of insolvency is on average 5-17%. With a complicated course of the disease, the frequency of complications associated with the imposition of anastomosis increases significantly and fluctuates at the level of 19-25%. According to a number of foreign authors, the failure rate in the

formation of an anastomosis with a single-row suture is 0.47-2.6% [8].

Among manual sutures, most researchers recognize the single-row precision serous-muscular-submucosal suture as the most physiological, which does not injure the mucous membrane and provides a layer-by-layer comparison of the wound surfaces of the intestinal wall. Due to this, the tightness of the suture increases, microbial contamination of the wound of the intestine and abdominal cavity decreases, which contributes to a smoother course of the wound process [8]. The use of an invaginated anastomosis significantly reduces the likelihood of insolvency [37]. This type of anastomosis is reliable due to the large area of contact between the serous membranes, physiological, since the isoperistaltic wave of the intestine is preserved, and most importantly, it is easy to perform, does not require complex technical skills, as a result of which the operation time is reduced [13].

The principle of compression of hardware compression anastomoses (ACA), magnetic compression devices, staple staplers equipped with special inserts for tissue compression. Further development of this direction led to the creation of compression devices from absorbable material [18].

The discovery of the shape memory phenomenon led to the creation of metal implants based on titanium nickelide. These devices make it possible to create dosed compression on living tissues and avoid many complications [10]. However, despite the ever-improving quality of stapling devices, most surgeons now prefer to use manual anastomoses, since the use of stapling devices in the presence of an altered bowel wall often leads to the development of anastomotic suture failure, anastomositis and anastomotic stricture [55]. It is believed that two diametrically opposite processes take place in the anastomotic zone. The first, determined by the mechanical strength of the seam and having a maximum at the time of application, depends to a greater extent on the row of superimposed seams. On the following day, the mechanical strength and tightness are steadily falling, reaching a maximum decrease in these properties on the 4-7th day. This type of weld strength, according to the authors, reaches a maximum by 10-12 days. The second process is the biological strength of the seam, which is determined by the processes of collagenogenesis. Collagen lysis also reaches its maximum by 4-7 days. The combination of these two factors is fraught with the threat of failure of the seam [44]. Another important factor that reduces the strength of intestinal anastomoses is the infection of the anastomosed tissue zone itself. Infection occurs as a result of contact of suture channels and suture material (ligature infection) with the lumen of the organ and its contents, which leads to the penetration of microflora into the thickness of stitched tissues with the subsequent development of inflammatory and necrotic processes in them [LiZ., 2019].

In the zone of a freshly applied anastomosis, there are always favorable conditions for the development of microflora - the presence of ischemia, a nutrient medium in the form of blood residues, changes in pH, redox potentials, etc. Therefore, infection of the anastomotic zone is a natural process and depends on the type of intestinal suture and the concentration of microbes in the lumen of the organ [48].

Among the techniques for the formation of an interintestinal anastomosis, the most common is a two-row intestinal suture. The authors, comparing the incidence of AN with the use of a double-row and a single-row intestinal suture, did not come to a consensus on the advantage of one or another method. The search for new methods for the formation of intestinal anastomoses, which can reduce the incidence of AN, continues [5]. In the conditions of urgent surgery, the primary task is always to save lives, as well as to resolve the issue of the possibility of radical removal of a cancerous lesion of the colon segment [25].

In emergency surgery, resection of the left half of the colon is a difficult task in case of volvulus of the sigmoid with necrosis, perforation or injury, as well as a number of inflammatory diseases leading to the development of fecal peritonitis [39]. Primary

anastomosis under these conditions is doomed to suture failure, so surgeons limit themselves to the formation of a colonic stoma [11]. Naturally, the above leaves a negative imprint on the behavior of the patient, significantly worsens the quality of his life, both socially and in terms of work. Unfortunately, this problem, according to WHO, has been exacerbating in all countries of the world over the past decades [11].

The risk of anastomotic suture failure has led some surgeons to abandon the anastomosis during CC resection. The most common among these methods is the Hartmann operation. Its disadvantage is the formation of a colostomy, but it always remains possible to eliminate it at the second stage [29].

Three types of operations are currently used for CC gangrene: resection with anastomosis, Grekov-P type operation, and Hartmann type operation. Also, interventions such as the Mikulich and Grekov-II operations are very rarely used at present, in which the gangrenous-altered CC is removed in the left iliac region and remains connected with the rest of the intestine for several days, which causes intoxication of the body. This leads to high postoperative mortality, which is 58.1%. It should be noted that Grekov I.I. considered it acceptable to use his 2nd method only in the absence of CC gangrene. In some cases, after resection of the gangrenous CC, the operation is completed with the removal of both ends of the intestine [27].

Due to the continuing growth of intestinal diseases, the number of stoma operations is increasing, amounting to 100–150 patients with intestinal stoma per 100,000 population [33]. According to the WHO, more than 50% of them are able-bodied population [9]. Dentistry negatively affects the patient's behavior, worsens the quality of his life in social and labor terms. In this regard, in order to restore a full-fledged life of patients, there is an urgent need for the recovery stage of the operation, which occupies a leading place in the medical rehabilitation of this group of patients [21]. Tomnyuk N.D. et al. (2021) note that recovery operations after surgical interventions such as Hartmann are necessary and at the same time difficult in technical execution. At the same time, the timing and methods of restoring the continuity of the colon depend on the cause of the disease, the timing of stoma [35].

To determine the type and method of performing RRO, it is necessary to take into account: the nature of the underlying disease; the type of existing stoma and the presence of parastomal complications; the presence of previous surgical interventions and their volume; age; accompanying illnesses; risks of anesthesia, etc. [11]. When determining the timing of the RO, an individual and differentiated approach is required [3]. Despite initial intentions, in reality, some temporary diverting stomas become permanent stomas in 6-32% of patients. Risk factors for permanent ileostomy include advanced age, development of anastomotic leaks, metastatic disease, and adjuvant chemotherapy [50].

According to WHO, over the past decades, this problem, unfortunately, has been exacerbating in all countries of the world. There is a trend towards an increase in the number of ostomy patients for various reasons, and in many of them this volume of surgery remains for life [41]. It is important to note that to this day, the problem of surgical rehabilitation of colostomy patients is still unresolved and relevant, due to the fact that these surgical interventions are no less complicated than primary operations [2]. According to Yargunin S.A. et al. (2003), restoration of intestinal continuity becomes impossible in 40-72% of cases [45]. Only after the restoration of the natural passage, the psychological status and labor activity are restored, which ensures a healthy lifestyle [17]. Another likely risk factor for postoperative complications is the timing of recovery operations, which can be performed up to 3 months, more than 3 months, after 6 months, and also for more than 1 year or more [6]. However, after RRO, the frequency of postoperative complications ranges from 18-20% of cases, purulent-inflammatory complications - 22-26%, and mortality - 3-7% [11]. Tomnyuk N.D., et al. (2023) note that the question of the timing and method of restoring the continuity of the colon, as a rule, should be

decided depending on the cause of the disease, the timing of the stoma. It can fluctuate both in the direction of decreasing the term and increasing it [34].

In connection with the development of medical science and technology in recent years, individual reports of surgeons on the use of laparoscopic operations began to appear [32]. It should be noted that laparoscopic surgical interventions are just beginning to be introduced into clinical practice, and only a few specialized clinics own these technologies [53]. The robotic approach, with its advantages, can potentially overcome the technical complexity of laparoscopy, but the excessive cost of equipment currently limits the application of this approach in many countries around the world. Noteworthy is the multicenter study by Richards C. et al. (2015), where the authors conclude that to date, open-ended reconstructive surgeries significantly prevail over laparoscopic ones. The conversion rate of laparoscopic interventions remains high, which hinders the widespread use of minimally invasive technologies [2015].

Under conditions of intestinal obstruction, bowel resection with the formation of a primary colonic anastomosis is associated with a greater degree of risk, primarily due to the likelihood of colonic anastomosis failure and the resulting serious consequences [42]. Literature data indicate that in the case of urgent complications of non-tumor diseases of the left half of the colon, surgical interventions in the vast majority of cases today end with the Hartmann operation [19]. The frequency of its implementation ranges from 37% to 62% [6;53], and also requires the recovery phase of the operation, which is often accompanied by the development of life-threatening postoperative complications (up to 25-60%) and high mortality (6-35%) [17] . At the same time, without a downward trend [8;22]. The highest lethality is observed after surgery for "black sigma" - up to 50-80% of lethality [27].

The issues of surgical rehabilitation of colostomy patients by closing the colostomy are far from their final decision, due to the fact that these surgical interventions are no less complicated than primary operations, and restoration of intestinal continuity in 40-72% of cases is impossible. When performing the final stage of the operation, according to the same authors, there are serious postoperative complications, high mortality (up to 19.4%) is noted [45]. Some surgeons, in order to avoid repeated and recovery stages after Hartmann's operation, reduce the frequency of intra- and postoperative complications in the squeegee half of the OK, recommend a one-stage left-sided hemicolectomy with primary restoration of intestinal continuity and the formation of a Y-shaped anastomosis (in the literature it is called differently - U-shaped, Y-shaped, T-shaped). In elective surgery for cancer of the left half of the colon, there is a technique for resection of the intestine with the primary restoration of intestinal continuity using a T-shaped terminal anastomosis. Some surgeons, in the 80s of the last century, in order to avoid the problems of reconstructive surgery, proposed T-shaped anastomoses according to the “end-to-side” principle, which, however, did not receive wide practical application [22].

The consequences of changes in dietary norms and lifestyle of modern man, the development of industry in recent years have led to an increase in diseases of the gastrointestinal tract, such as diverticular disease of the colon (DCDC) and dolichocolon [43]. Among non-tumor diseases of the colon, BD is a widespread disease with a high probability of developing complications requiring surgical correction [Zemlyanoy V.P., 2017]. The incidence of diverticular disease is up to 24%. At the same time, about 30% of patients are aged 50 years and 70% - 75–80 years. There is an increase in the incidence in economically developed countries, which is associated with a decrease in the consumption of plant foods, an increase in life expectancy and high psychoemotional stress [58]. In the last 20 years, there has been a clear trend towards the “rejuvenation” of this disease [56]. In the age group over 80 years, the frequency of diverticular disease reaches 70%. In Europe, diverticula in 90% of cases are diagnosed in the sigmoid colon. In people under 30 years of age, diverticulosis is very rare, but its frequency

increases with age, and by the age of 50, up to 30% of the population has colonic diverticula. Only 20% of individuals with diverticulosis develop clinical symptoms of the disease [52]. The constant interest in inflammatory bowel diseases is primarily due to the fact that, despite a long history of study, their etiology remains unknown [54]. The number of "pseudo-diverticula" increases throughout a person's life. The diameter of the diverticula themselves, as a rule, ranges from 3 to 8 mm. The reason for the formation of diverticula is the loss of elastic properties of the connective tissue [64].

One of the recently discovered mechanisms of the pathogenesis of diverticula is a violation of the process of relaxation of the oblong fibers of the smooth muscles of the colon, mainly in its left half [28]. At the same time, changes in the functions of circular fibers were not found, which very well explains the shortening of the section length and thickening of the intestinal wall during periods of acute or recurrent inflammation [43]. The pathogenic platform for diverticulitis is an element of inflammation in the wall of the saccular protrusion of the colon [16].

Colon perforation is rare, accounting for less than 3% of the causes of peritonitis in the structure of emergency surgical diseases of the abdominal cavity. Colon perforations are more common in CC and in more than 60% of cases are complicated by the development of widespread fibrinous-purulent peritonitis [14].

Most often (90.7% of patients) diverticula are localized in the left half of the colon, and only in the sigmoid colon (in 80-85%). With age, the incidence increases. People under 40 suffer from colonic diverticulosis in 10% of cases. After age 70, diverticula occur in more than half of the population. The complications of diverticulosis are usually most pronounced. Perforation of the diverticulum leads to the development of rapidly progressive peritonitis, the clinical manifestations of which do not differ from those in other forms of acute inflammation of the peritoneum. Intestinal obstruction in colonic diverticulosis is obstructive in nature. Intestinal bleeding, as a rule, does not have a profuse character [30].

The spectrum of clinical manifestations of DCDC ranges from asymptomatic diverticulosis to acute inflammatory complications or profuse colonic bleeding. Acute diverticulitis, as a stage of diverticular disease, can occur as a mild uncomplicated form of the disease, and with the development of potentially fatal complications. These include perforation into the free abdominal cavity, intestinal obstruction, and profuse arterial bleeding [56]. Complicated forms of acute diverticulitis accompanied by covered perforation of the intestinal wall are of the greatest interest to surgeons all over the world [1]. According to the world literature, septic complications and recurrence of the disease are observed in 47% of patients who underwent acute diverticulitis complicated by covered perforation, which is an indication for their surgical treatment on a delayed basis [36]. At the same time, up to 30% of patients admitted to a hospital with a clinic of complicated diverticulitis need surgical treatment already at admission, and mortality can reach 18-23% [59].

Complicated forms of diverticulitis are the most common indications for colon surgery. However, resecting colorectal interventions are quite often associated with the occurrence of postoperative complications of a general and surgical nature [7]. Anastomotic insufficiency is the most formidable of them [24].

According to the national clinical guidelines of the Russian Gastroenterological Association and the Association of Coloproctologists of Russia for diagnosis and treatment, the main method of surgical treatment of complications of DCDC remains resection of the colon in a different volume with the imposition of a primary anastomosis or removal of the stoma with its subsequent closure [16]. When performing both urgent surgical interventions with primary anastomosis, as well as delayed and planned operations, the stage of anastomosis formation deserves special attention. During urgent intervention, there is not enough information about the extent of intestinal damage by diverticula, and during planned primary or reconstructive operations, the highest

concentration of diverticula is removed, while individual diverticula in the proximal parts of the intestine are not considered as a reason for expanding this volume [57], which, of course, increases the risk of anastomotic failure as a result of the possible entry of the diverticulum into the zone of its formation [62]. In this regard, measures aimed at preventing anastomotic failure are of great interest.

The results of experiments on animals showed that the bacterium Enterococcus faecalis, having the ability to activate metalloprotease-9 of the tissue matrix in the intestine and destroy collagen, significantly contributes to the development of insufficiency of colonic anastomoses [46]. Beltzer et al. in 2019 demonstrated the benefits of topical antibiotics on opportunistic bacteria when performing colorectal anastomoses in elective oncological surgery [47].

The choice of the method of surgery in each case is determined by the nature of the complications and the prevalence of the process, changes in the diverticula themselves, the intestinal wall and surrounding tissues, the presence or absence of perifocal inflammation or peritonitis. In the surgical treatment of complicated diverticulosis, preference should be given to multi-stage operations [40].

Based on the analysis of the literature, it can be concluded that the most optimal time for performing RRO is 5-6 months after the operation to remove the stoma. During this period, the surgeon determines the further tactics of treating the patient, taking into account the prognosis. Measures aimed at surgical rehabilitation help to accelerate the medical and social adaptation of patients [38].

Conclusion. Thus, urgent complications in volvulus of the sigmoid colon, Payr's disease, cicatricial adhesive disease, diverticular disease of the left half of the colon remain extremely relevant due to the high incidence of postoperative complications and mortality during the formation of primary anastomoses, which is due to the lack of optimal treatment and diagnostic algorithms and omissions in surgical tactics, as well as long-term disability of colostomy patients. One of the main ways to prevent suture failure of interintestinal anastomoses is to choose the optimal method of anastomosis formation, as well as to develop a primary delayed "U-shaped" end-to-side colon anastomosis, which allows to reduce the time and improve the results of recovery operations.

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