American Journal of Medicine and Medical Sciences 2024, 14(6): 1537-1542
DOI: 10.5923/j.ajmms.20241406.14

Ileostomy: A Brief History of Development, Unsolved Problems and Surgical Rehabilitation

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Abstract The authors report that despite the more than 100-year history of ileostomy, operations to close intestinal stomas are associated with a high risk of failure of the sutures of the interintestinal anastomosis, which reaches 30%, with a mortality rate of up to 4%. Thus, despite more than 100 years of history and significant successes, a number of problems associated with postoperative complications and mortality remain, which raises an urgent need for research aimed at improving the surgical rehabilitation of this group of patients.

Keywords Ileostomy, Intestinal stomas, Failure of anastomotic sutures, Surgical rehabilitation

1. Introduction

The most complete reflection of the essence of intestinal stoma (CS) was found in the definition proposed by KroeseL. F. (2016) is an unnatural opening (permanent or temporary fistula), artificially created on the anterior abdominal wall surgically. Following the removal of part of the intestine, a permanent or temporary fistula is formed on the anterior abdominal wall, through which uncontrolled release of gases and intestinal contents occurs [60].

2. Brief History of Development

Reports of the formation of intestinal stoma have been known since ancient times. There is evidence of the first attempts at colostomy in the fourth century BC by Praxagoras [72]. The first written mention of the formation of the CS belongs to the French surgeon A. Littre. During the autopsy of a corpse, the idea of removing feces by colostomy arose and suggested the use of CS for the treatment of intestinal obstruction [61]. This idea was first applied in practice in 1776 by H. Pillore [36,67], which was not sufficiently covered in the literature. In 1839, the achievement of H. Pillore was recorded by Amussat JZ [37]. In 1783, A. Dubois performed a colostomy on a 3-day-old newborn with anal atresia, but the child died on the 10th day after the operation [51]. To reduce the incidence of postoperative complications, the Danish surgeon H. Callisen in 1798 proposed forming the CS retroperitoneally [43].

In the middle of the 19th century. With the development of anesthesiology and pharmacology, the formation of a CS has become a method of successfully relieving intestinal obstruction. In the 20th century CS formation was increasingly considered as an integral part of radical operations accompanied by intestinal resection [49]. The emergence of new technologies in the production of adhesive colostomy bags has made it possible to widely use ileostomy as the first stage of treatment [49].

In 1913, surgeon JY Brown created an ileostomy for ulcerative colitis as one of the stages of therapy. Surgeon Ch. Brooke in the mid-twentieth century. developed a method for forming an ileostomy by creating a “column” from the removed section of the small intestine, protruding above the skin of the abdominal wall. He juxtaposed the serous membranes of the removed small intestine, suturing the mucosa with interrupted sutures to the skin around the stoma [42].

In 1952, Brooke B. recommended his method of creating an ileostomy, which remains the standard technique to this day [40,41], and in 1954, R. Turnbull and J. Crile [47] described a method for forming a loop ileostomy.

In 1885, the Russian surgeon Knie A. proposed a double-barreled colostomy [58]. The French surgeon Hartmann H. in 1931 published details of the operation, which consisted of resection of the intestine above the rectum, its suturing and removal of the afferent loop in the form of a stoma, indicating the possibility of performing a reconstructive operation (RO) [53].

J. von Mikulicz [75] proved the advantage of the two-stage treatment he proposed, reducing mortality from 50 to 12.5%. The high mortality rate from colon injuries made it mandatory to remove the injured colon, advocated by Major General Ogilvie WH, which significantly reduced the mortality rate of wounded soldiers [62,65].

Received: May 22, 2024; Accepted: Jun. 12, 2024; Published: Jun. 13, 2024
Published online at http://journal.sapub.org/ajmms

More than 100 years before J. von Mikulicz, back in 1798, the possibility of the formation of interintestinal anastomoses was proposed by CD Schmalkalden [69]. In those same years, Travers, Lambert and Halstead laid down the basic principles of intestinal suture and the formation of interintestinal anastomoses [4]. Since then, the technology has been improved, which is associated with the introduction into clinical practice and constant improvement of new suture materials, stitching devices, incl. and laparoscopic surgical techniques [2,24,44].

Clinical classification of intestinal stomas [7,35]. By localization: jejunostomy; ileostomy; colostomy By formation method: single-barrel; double-barreled: loop; separate; parietal. According to the method of removal to the anterior abdominal wall: transabdominal; retroperitoneal. By forming technique: “flat”; "column". In terms of surgical rehabilitation: permanent; temporary. According to the location of the stoma: abdominal; perineal. According to the presence of complications: complications of stoma; peristomal skin complications.

In addition, the name of the stoma may indicate the part of the colon that was used to form it. Thus, from the cecum (caecum - lat.) a cecostoma can be formed, from the ascending (colonascendens - lat.) - an ascendostomy, from the transverse (colontransversum - lat.) - a transverse stoma, from the descending (colondescendens - lat.) - a descendostomy, and from the sigmoid (colonsygmoideum - lat.) - sigmostoma [46].

When forming a Brooke ileostomy, a circular excision of the skin area with subcutaneous fatty tissue is performed to the level of the aponeurosis. The terminal ileum is brought out 4-5 cm above the abdominal wall and sutured to the skin through all layers of the intestine, turning the mucosa outward [41]. When single-barrel ileostomies are formed, parastomal hernias may occur, as well as peristomal dermatitis, which is due to the more aggressive nature of the contents of the small intestine [64,77].

Unsolved problems. When applying intestinal stomas, retraction can also be observed, which is observed in 0.9-4.1% of cases, the reason for its occurrence is often excessive tension of the withdrawn loop of intestine, early removal of the support tube [64]. In this case, suppuration of the peristomal area may develop with the development of a cicatricial stricture [59].

According to data from Vorobiev G.I. (2007) there are more than 200 methods of intestinal ostomy, each of them has its own advantages and disadvantages [8]. There are single-barrel and double-barrel CS [60]. An analysis of the literature shows that in Western countries surgeons prefer a double-barreled ileostomy [54,71], in the CIS countries the priority is double-barreled colostomy [8]. The main task of the CS is the prevention of incompetent intestinal anastomosis [21,39,48].

The number of people with intestinal stoma is increasing worldwide due to the continued growth of intestinal diseases [31]. In the Russian Federation alone, the number reaches 180 thousand people [26]. Data is provided that in the United States, about 100 thousand patients undergo stomy operations annually [74]. Literary sources note that for some diseases and injuries, the formation of an ileostomy is a necessary stage of treatment [3,35]. Among the causes of ileostomy formation, acute intestinal obstruction (AIO) and peritonitis dominate. Removal of a section of the intestine through ostomy can radically eliminate the cause of the progression of complications [5,16,33].

Belokonev V.I. et al. Having carried out a comparative analysis of intestinal stomas, we came to the conclusion that proboscis jejuno-, ileostomies and colostomies meet the technical requirements of simplicity in implementation, reliability, efficiency and safety [5].

The operation of terminal ileostomy is performed in severe patients with varying degrees of peritonitis, when suturing the infiltrated intestinal wall poses a real threat with high frequency. In particular, the reasons for the imposition of an intestinal stoma are benign tumors of the colon and its complications - in 12-27% of cases, with acute intestinal failure of non-tumor etiology - in 6-18% of cases, with a complicated course of inflammatory bowel diseases - in almost 10% [25,27] and intestinal injuries with violation of its integrity - 55.2% among all cases [28].

In order to increase the availability and quality of coloproctological care provided to the population of the Russian Federation, the order of the Ministry of Health and Social Development of the Russian Federation No. 206-n dated April 2, 2010 approved the regulation on the rehabilitation room for ostomy patients. According to this provision, the office is created within the structure of a medical organization providing coloproctological care and is intended to carry out diagnostic, therapeutic, preventive and rehabilitation measures for ostomy patients [19]. The ostomy colon is divided into prestomal, post-stomal sections and the stoma itself [11].

Reconstructive operations to close intestinal stomas are associated with a high risk of failure of the sutures of the interintestinal anastomosis, which reaches 30%, with a mortality rate of up to 4%. Based on the time of development, complications of ileostomy are divided into 2 groups: early (2-26 days from the moment of surgery) and late [31]. Early complications include bleeding, intestinal obstruction, ischemia and necrosis of the stoma, peristomal dermatitis, retraction and eventration, suppuration, and intestinal perforation. Late - cicatricial-atrophic changes, parastomal hernias, intestinal prolapse, formation of fistulas [64,76].

With end and loop colostomies, parastomal hernias can develop in the range of 4-48% [56,63,64,66,78]. Double-barreled ileostomy is usually performed during low anterior rectal resection [50,73]. Due to the pronounced effect of intestinal enzymes, which is more pronounced in the small intestine and the highly alkaline environment of the discharge, peristomal dermatitis develops [57].

Data on the benefits of colostomy or ileostomy are sparse. However, when an ileostomy is performed, patient care is less complex [50,1]. The formation of colo- and ileostomy in practice is more often used as a forced, temporary measure [10,20].

Ileostomy as an option to complete surgery for acute intestinal tract and peritonitis is primarily used when pathology is localized in the distal parts of the small intestine and colon. When forming an ileostomy, complications are possible that worsen the outcome of treatment. At the same time, the results of treatment are influenced by such factors as the gender and age of the patient, body weight and the condition of the abdominal cavity [30].

Ileostomy as an option to complete surgery for acute intestinal obstruction and peritonitis is primarily used when pathology is localized in the distal parts of the small intestine [68].

Currently, to reduce the impact of intestinal contents on the skin around the stoma and simplify the care of the ileostomy, new techniques for creating ileostomies are being developed [17]. One of the methods for removing a preventive ileostomy is to remove a loop of the distal small intestine in the form of a "proboscis" onto the anterior abdominal wall followed by fixation of the "proboscis" to the skin with interrupted sutures [8].

The entry of intraintestinal contents, especially during ileo- and jejunostomy, onto the skin of the abdomen near the laparotomy access, with their subsequent irritating effect, causes the development of peristomal dermatitis. For its prevention and treatment, various biological agents were proposed in the form of paraffin and petroleum jelly, bronze metal powder, egg yolk, milk powder, raw meat, bismuth paste, dry gypsum powder, Lassar paste, etc. Their effects were based either on mechanical protection of the skin , or on the absorption of juices and enzymes of the digestive tract. Physical methods are also widely used - warm baths, daily toileting of the skin around the stoma, thermal and light procedures. A significant relief for ostomy patients is the widespread use of modern colostomy bags, which prevent intestinal contents from entering the skin of the anterior abdominal wall [6,14].

It should be noted that when preparing the postostomy segment, an enema remains the only possible method of cleansing to this day. Along with enemas, mechanical cleansing of the colon with solutions of osmotic laxatives is used. Particular attention is paid to preparing the disconnected postostomal segment. Long-term exclusion of the intestine from the passage of feces leads to atrophy of the muscle layer, dystrophic changes in the mucosa and pronounced dysbiotic changes. To restore the normal state of the post-ostomal segment of the colon, hydromassage of the disconnected segment is performed before surgery, and for the purpose of sanitation, installations of chamomile decoction and a weak solution of potassium permanganate into the rectum are used [6].

Surgical rehabilitation of patients with intestinal stoma is an important part of the medical rehabilitation of ostomy patients. The timing of reconstructive and restorative operations (RVO) is determined individually and depends on the initial diagnosis, the type of intended intervention, the general condition of the patient and is classified as the most complex and should be performed exclusively by qualified surgeons.

Currently, eliminating the ileostomy and performing the recovery stage is an extremely important problem, since in most cases it is more complicated than the formation of an ileostomy and is accompanied by the development of a number of complications. In recent years, there has been a tendency towards a decrease in the period of stagnation. Thus, there are recommendations for performing surgical treatment for 1 month or more [9,22]. It is even indicated that it is possible to close a colostomy without discharge from the hospital, i.e., within 1 month after its formation [13,18]. A number of surgeons consider the optimal time frame to be 3-4 months [52], 5-6 months [3,38]. Grushko S.A. et al. [12] recommends conducting a recovery phase within a period of 6 to 12 months. The longest periods of ostomy carriage are observed in patients who have undergone surgery for nonspecific inflammatory bowel diseases. Therapy aimed at relieving inflammation increases the duration of ostomy carriage [55]. The formation of a stoma against the background of peritonitis also lengthens the period of stoma-carrying. When carrying out the recovery stage, preference is given to the intra-abdominal method [29]. However, for oncological diseases, the terms of surgical rehabilitation remain within 9-18 months [6,23]. This circumstance is associated with a possible relapse of the tumor and makes its diagnosis possible. Some surgeons attribute the delay in the recovery stage to chemotherapy [70]. For non-tumor diseases that have led to the formation of an intestinal stoma, it is possible to reduce the period of stoma-carrying to 3-4 months. Some researchers in such a situation indicate the possibility of surgical rehabilitation after 1-2 months [14]. It should be noted that in 6-32% of cases, temporary stomas may turn out to be permanent [32,45].

The key to the success of a reconstructive operation is its performance by experienced surgeons and coloproctologists [15]. In general, when performing the recovery stage, an individual and differentiated approach is required [1].

Methods of the recovery stage when eliminating ileostomy have not undergone fundamental changes over the past decades. Sections of the intestine are connected using end-to-end or side-to-side methods. The presence of aggravating factors in the form of colostomy and paracolostomy complications complicates the surgeon's task at the stage of re-intervention. There are also some disagreements when choosing an operative approach to eliminate an ileostomy and restore intestinal continuity, especially when forming ileotransverse anastomoses [5,6,23,30].

3. Conclusions

Thus, based on the analysis of the literature, we can conclude that despite more than 100 years of history, there has been a steady increase in the number of patients requiring the formation of an ileostomy and, accordingly, a recovery stage. Despite significant advances, a number of problems remain related to postoperative complications and mortality, which raises an urgent need for research aimed at improving surgical rehabilitation of this group of patients.

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