

Redo reconstruction of the digestive tract after gastric surgery

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ABSTRACT

Objective — to formulate the concept of physiological reconstruction of the digestive tract during redo gastric surgery.

Material and methods. There were 52 patients who underwent redo gastric surgery after previous resections, drainage and anti-reflux procedures in 2011—2017 at the Vishnevsky National Research Surgical Center. Redo resection of the stomach with Billroth-1 and Hofmeister reconstructions were performed in 5 (9.6%) and 1 patient (1.9%), respectively. Roux-en-Y reconstruction was performed in 4 (7.7%) patients after gastric remnant extirpation. Jejunogastroplasty was used in 30 (57.7%) patients. A segment of the transverse colon as the reconstructive material was used in 2 (3.8%) patients, left colon — in 8 (15.4%) after esophagectomy. One (1.9%) patient underwent extirpation of «small» stomach and thoracic esophagus after previous gastric bypass. Gastric remnant was used as an isoperistaltic tube for subtotal esophagoplasty. Reconstruction was not possible in only 1 (1.9%) patient after advanced visceral resection for recurrent cancer within esophagojejunostomy due to deficit of visceral material.

Results. Postoperative complications were observed in 5 (9.6%) patients. Partial failure of esophagojejunostomy and duodenojejunostomy occurred in 2 (3.8%) and 1 patient (1.9%), respectively. Colon transplant necrosis was noted in 1 (1.9%) patient that required resection followed by colo- and esophagostomy nutrition. One patient died on the 1st postoperative day from progressive multiple organ failure. At the end of the study, 44 (86.2%) out of 51 patients were under follow-up. Good results were revealed in 26 (59.9%) patients, satisfactory outcomes — in 12 (27.4%) patients. Redo surgery was not effective in only 6 (13.7%) patients.

Conclusion. Evaluation of our results demonstrates complete alleviation of pathological postoperative syndromes after gastric surgery in the majority of patients. Therefore, redo surgery with gastroplasty and restoration of duodenal passage are advisable.

Keywords: jejunocologastroplasty, postgastrectomy syndrome, recurrent cancer, redo reconstructive procedures, physiology of digestion, restoration of duodenal passage.

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TO CITE THIS ARTICLE:

Ruchkin DV, Kozlov VA, Nitkin AA, Nazariyev PI, Rymar OA, Yan MN. Redo reconstruction of the digestive tract after gastric surgery. *Pirogov Russian Journal of Surgery = Khirurgiya. Zhurnal im. N.I. Pirogova.* 2019;12:37-44. (In Russ.). <https://doi.org/10.17116/hirurgia201912137>

Background. Redo gastric surgery is traditionally a separate section of surgical gastroenterology. Currently, these open, technically difficult and often unique procedures have not lost their practical relevance. Gastric surgery is still the main method in the treatment of complicated forms of peptic ulcer, benign diseases and stomach cancer [1, 2]. Resection is generally standardized stage of such operations, while the choice of reconstruction remains debatable. Dissatisfaction with functional results of standard variants of gastric resections and gastrectomy is emphasized in the modern literature [3, 4]. Severe digestive malfunction after primary gastric surgery results permanent disability in 25% of patients. Medical rehabilitation is required in 100% of patients [5]. The pathogenesis of postgastrectomy disorders is based on the partial or total loss of the stomach followed by the absence of reservoir function, pyloric mechanism and duodenal passage. Total digestive damage exceeds compensatory capabilities

and inevitably leads to the development of pathological conditions: dumping syndrome, malabsorption syndrome, a gastric asthenia, cachexia, etc. [6—9]. Redo surgery is the only radical method of the treatment of complications after primary gastric surgery and recurrent cancer.

Objective — to formulate the concept of physiological reconstruction of the digestive tract during redo gastric surgery.

Material and methods. There were 52 patients who underwent redo gastric surgery after previous resections, drainage and anti-reflux procedures in 2011—2017 at the Vishnevsky National Research Surgical Center. Mean age of patients was 55 years. There were 30 (57.7%) men and 22 (42.3%) women.

Distribution of patients depending on primary procedure is shown in **Table 1**.

Primary surgical intervention was distal gastrectomy (Billroth II) in 21 (41.3%) patients and total gastrectomy

Table 1. Primary diseases

Disease	Number of patients	
	abs.	%
Stomach cancer	30	57,7
Peptic ulcer	18	34,6
Hiatal hernia	3	5,8
Morbid obesity	1	1,9
In all	52	100,0

(GE) in 12 (23.5%) patients. Proximal gastric resection was previously carried out in 11 (21.6%) patients. Previous gastric bypass surgery was noted in 5 (9.6%) cases, Nissen fundoplication — in 3 (5.8%) patients. Indications for redo surgery were digestive malfunction after primary surgery in 27 (51.9%) patients, cancer of the stomach stump and recurrent gastric cancer in 25 (48.1%) patients.

Complaints were variable in study patients. Weight loss, physical weakness and fatigue were predominant. All patients were comprehensively examined prior to surgery using physical, laboratory and instrumental diagnostic methods. Instrumental diagnosis included gastroscopy with biopsy, X-ray examination of esophagus and stomach and computed tomography of the abdominal cavity in accordance with indications. All patients were operated considering preoperative examination data.

Redo procedure was aimed at restoration of digestive physiology and elimination of focal lesion in some cases (tumor, ulcer, fistula, cicatricial stricture, etc.). Involvement of adjacent organs and structures was noted in 17 (36.1%) patients that required combined procedure. Resection of pancreas and colon was made in 9 (32.1%) pa-

tients, liver — in 4 (14.3%), diaphragm — in 3 (10.7%), lung — in 1 (3.6%) patient. Recurrent cancer required resection of celiac trunk in 1 (3.6%) patient, portal vein in 1 (3.6%) patient. Thus, type of resection was determined by spread of pathological process. Multivisceral resections were associated with certain difficulties at the reconstructive stage because plastic material was required to restore the continuity of the gastrointestinal tract.

We preferred Billroth I procedure after previous gastric bypass interventions or stomach stump resection as more physiological method. This method allowed preserving duodenal passage of food and proximal jejunal segments for redo reconstruction.

Reconstruction after distal resection and gastrectomy in the absence of any organic lesion implied transposition of efferent loop and anastomosis of its distal end with duodenal stump (**Fig. 1**). In this case, afferent loop was cut off near gastro(esophago)enterostomy (GES and EES), and jejunum integrity was restored by anastomosis in end-to-end fashion.

Reconstruction of the Braun loop implied dissection of enteroenterostomy and suturing jejunal defects. Further, afferent loop was intersected at a distance of 30–40 cm from the esophageal or gastric anastomosis and its distal end was anastomosed with the duodenal stump. Efferent loop was transposed to the orthotopic position after cutting off near GES or EES. Further, jejunal integrity was restored.

Gastrojejunoduodenoplasty was not difficult after previous Roux-en-Y procedure. Transection of the efferent loop immediately above enteroenterostomy with preservation of jejunal integrity was possible due to sufficient

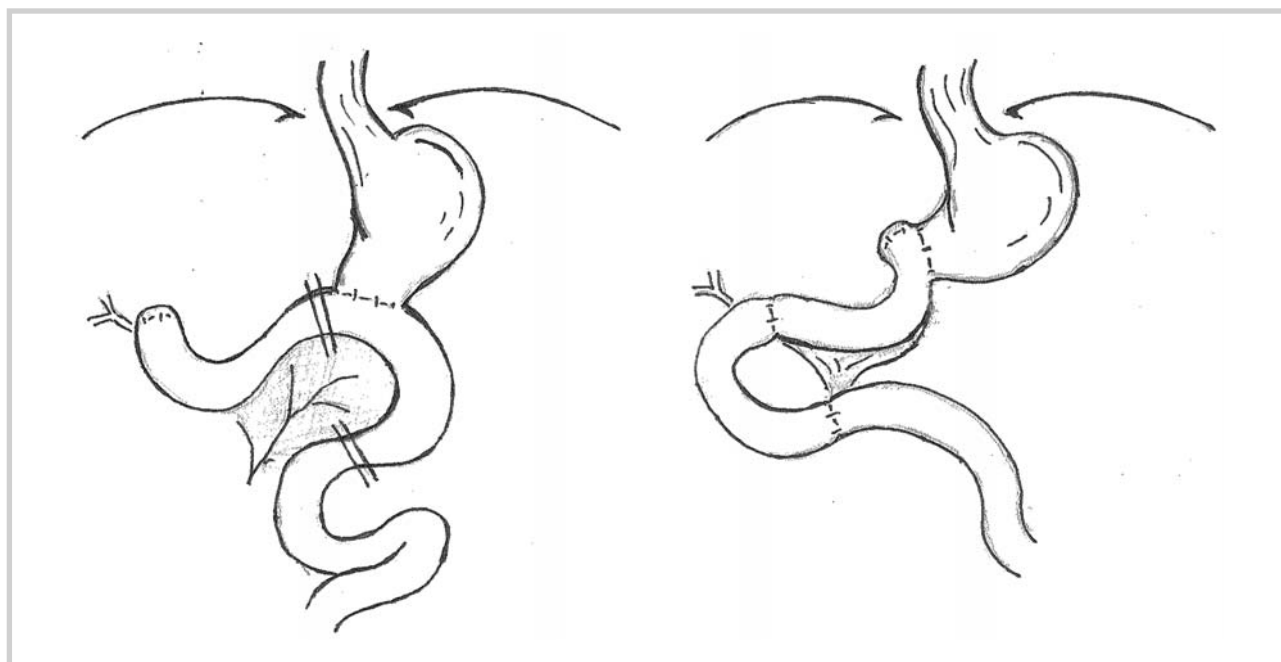


Fig. 1. Scheme of efferent loop transposition with gastrojejunoduodenoplasty.

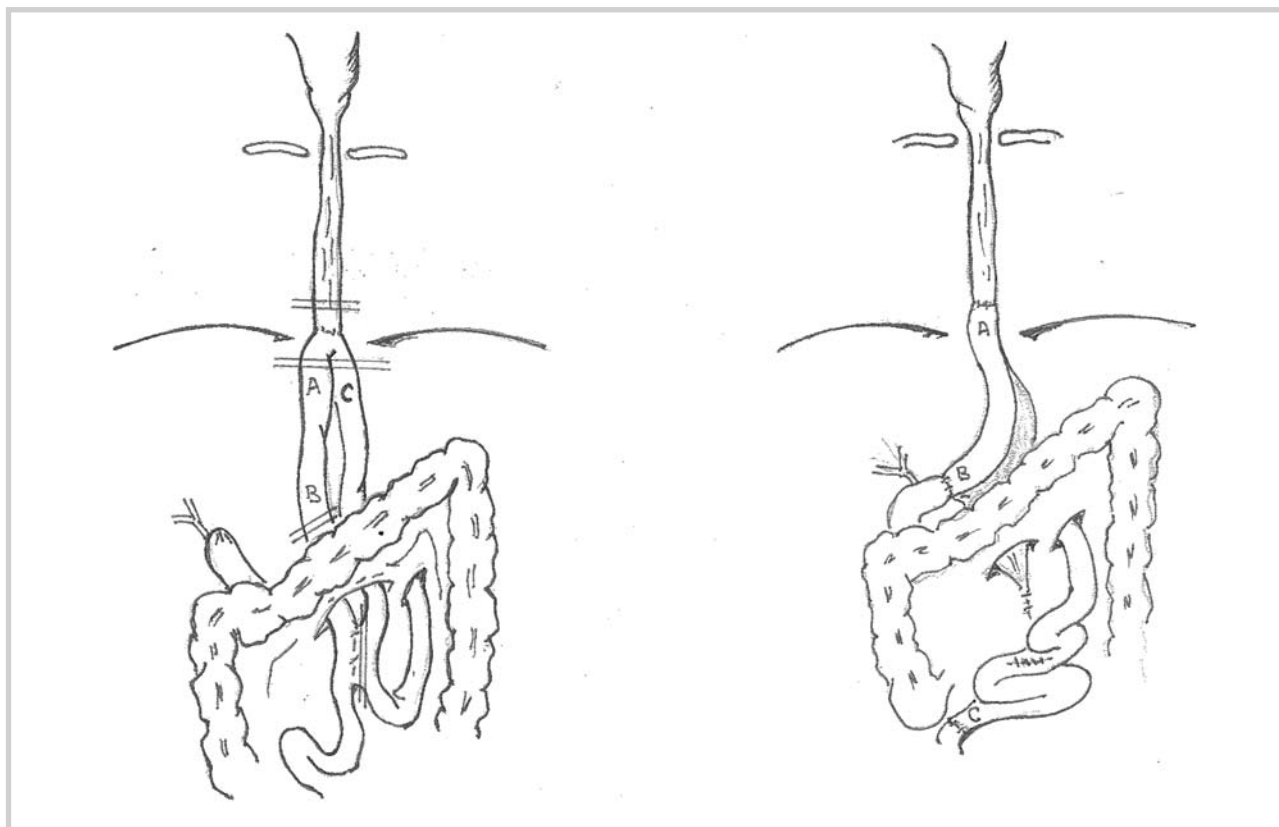


Fig. 2. Scheme of EES resection followed by reconstructive EGP.

length of the efferent loop. Free end of the jejunum was anastomosed with duodenal stump. This type of reconstruction involves only one anastomosis (jejunoduodenostomy). Enteroenterostomy may be spared if various pathological changes and cicatricial deformity are absent. It is important because these organic lesions may be followed by obstruction of the anastomosis. In the case of short efferent loop, we transected enteroenterostomy and selected the required loop length for gastrojejunoduodenoplasty.

In patients with organic lesion of EES or gastric stump, duration and complexity of Braun loop reconstruction were similar to primary EGP. Surgical dissection and analysis of resection volume were followed by intersection of enteroenterostomy, suturing of jejunal wall defects and intersection of afferent and efferent loops within intact tissues. Lesion of enteroenterostomy required complete excision of Braun loop or efferent Ru-loop.

Resection was followed by the second intersection of the efferent loop 30–40 cm distal to create isoperistaltic intestinal segment for interposition. Proximal end of this segment was anastomosed with esophagus, distal — with duodenal stump (**Fig. 2**).

We've never encountered a deficiency of length of jejunum or its mesentery and tension of vascular pedicle in case of high esophageal resection at the lower thoracic level and esophagojejunostomy via transabdominal approach. However, isoperistaltic pedicled jejunal segment

is not always possible to be used for gastroplasty. Isoperistaltic transverse colon segment was applied as a plastic material in the case of advanced resection or loose type of jejunum angioarchitectonics. If this approach was also impossible, reconstruction was completed as Roux-en-Y procedure. In our opinion, relative contraindication for gastrojejunoduodenoplasty is critical illness combined with severe anatomical changes in the abdominal cavity.

Redo operations after previous proximal stomach resection and interventions on cardia were always performed in resection fashion. Destruction of locking mechanism of cardia contributes to aggressive gastroesophageal reflux. In this regard, we believe that a short (10–15 cm) isoperistaltic jejunal segment interposed between the esophagus and gastric stump reliably performs valvular function and prevents severe reflux esophagitis (**Fig. 3**).

In the case of subtotal esophagectomy in patients without a stomach, we preferred the left half of the colon in an isoperistaltic position as a plastic material with direct distal coloduodenostomy. The arguments in favor of this position are, firstly, a favorable angioarchitectonics of the left half of the colon resulting a graft with increased blood supply and sufficient length. Secondly, direct coloduodenostomy without the threat of biliary reflux is possible considering isoperistaltic position of the graft (**Fig. 4**). In our opinion, jejunal segmental grafting (including intrapleural method) is a reserve technique after esophagogastrectomy and can be applied only in extreme

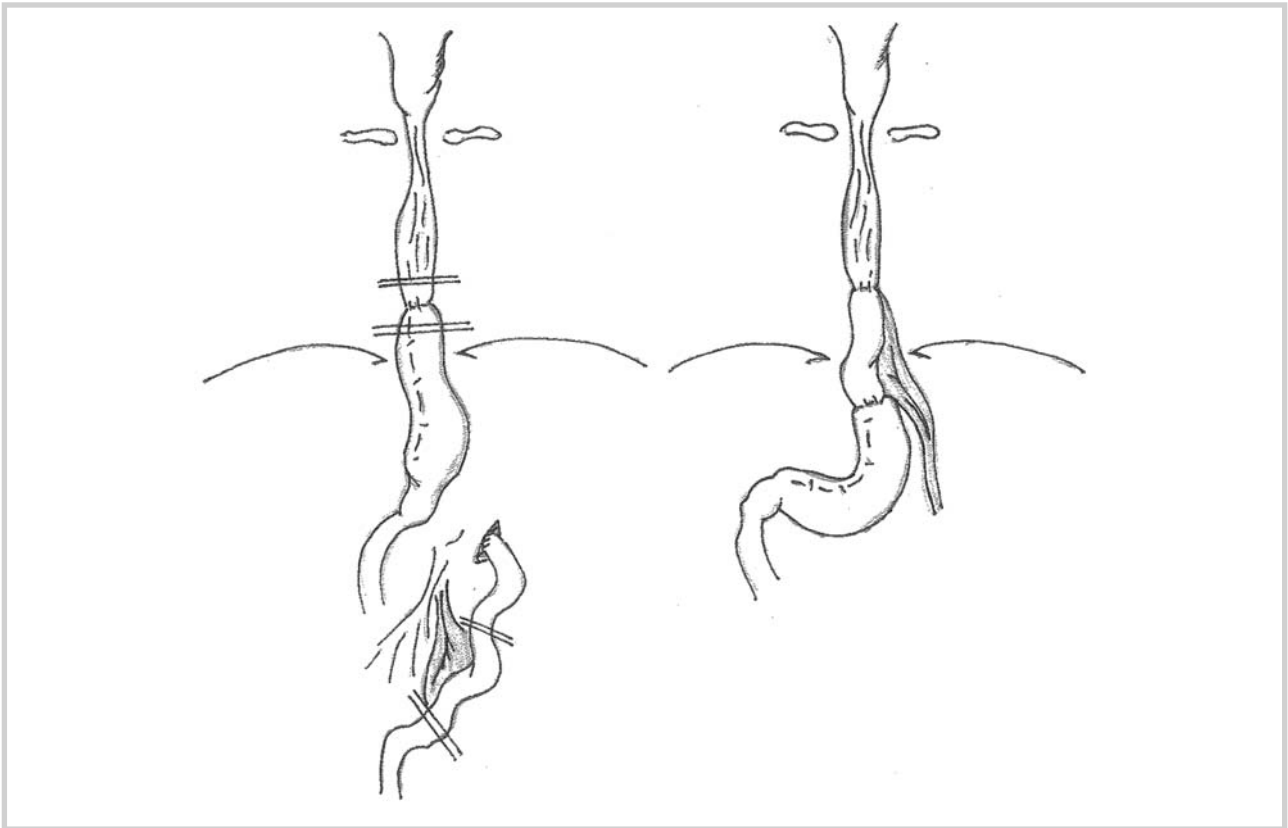


Fig. 3. Scheme of resection of esophagogastrostomy (EGS) with reconstructive EGP by Merendino—Dillard.

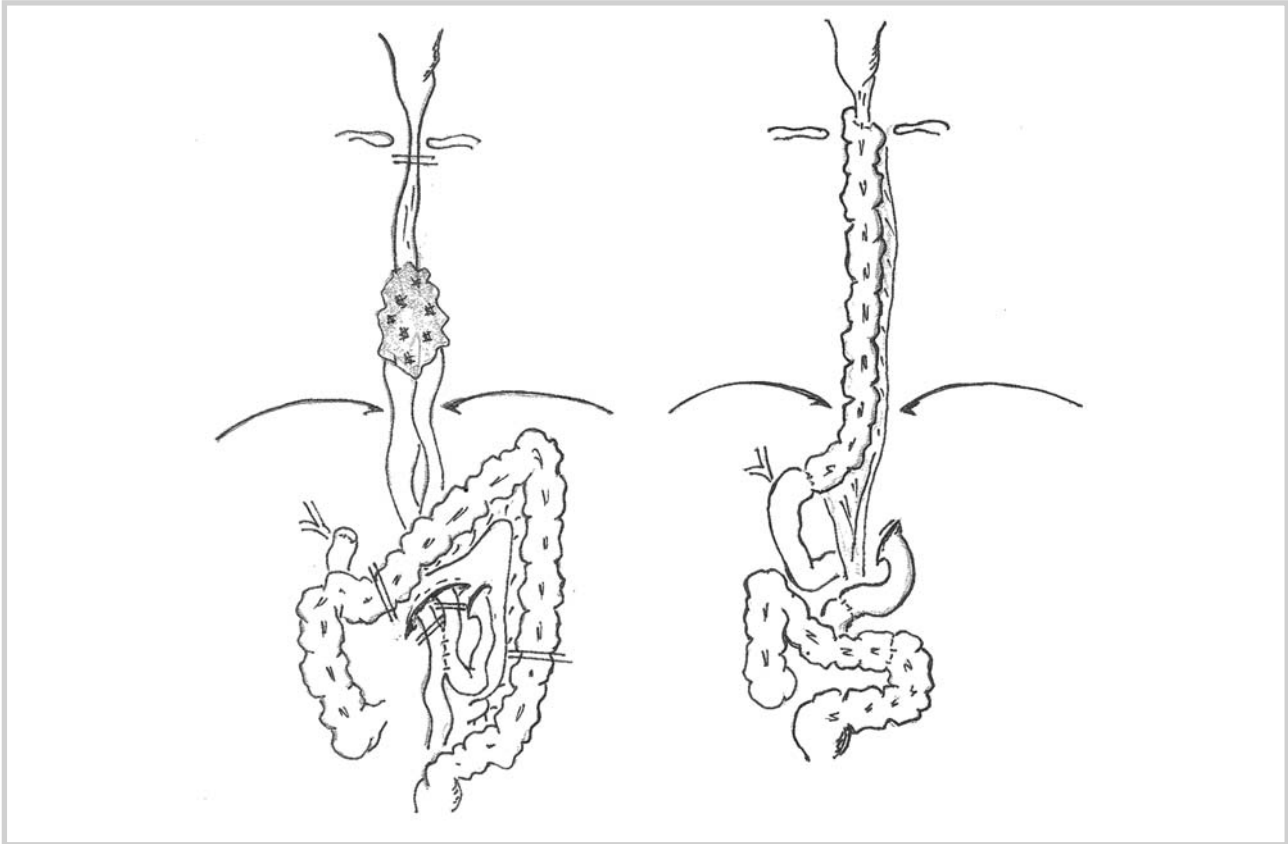


Fig. 4. Scheme of reconstructive surgery in a patient with recurrent cancer in EES after gastrectomy: esophagectomy with loop resection by Braun, esophageal reconstruction with left half of the colon in isoperistaltic position.

Table 2. Types of redo surgeries

Redo surgery	Number of patients	
	abs.	%
Efferent loop transposition to the duodenum	3	5.8
Redo Billroth I gastrectomy	5	9.6
Redo Hofmeister-Finsterer resection	1	1.9
Redo gastrectomy + EGP	8	15.4
Stomach stump extirpation, EGP (reconstruction with transverse colon in 1 case), Roux procedure in 4 cases	11	21.2
Resection of esophagojejunostomy, reconstruction with transverse colon by Roux	1	1.9
EES resection + EGP	2	3.8
Redo resection of stomach stump with EGS (proximal resection) + EGP by Merendino	11 (2)	21.2
Esophagectomy with resection of EGS + reconstruction with left half of the colon (including incomplete reconstruction)	6 (1)	11.5
Esophagectomy with stomach stump resection + reconstruction with left half of the colon	3	5.8
Esophagectomy with «small» stomach stump + esophagogastroplasty	1	1.9
In all	52	100.0

Table 3. Body weight in long-term postoperative period

Body weight dynamics	Number of patients	
	abs.	%
Continued decrease, no changes	9	25,7
Gain, kg		
1–5	19	54,2
6–10	5	14,3
over 10	2	5,8
In all	35	100,0

circumstances (for example, in case of the absence or unsuitability of any segment of the colon).

In case of insufficient length of the colon transplant or its antiperistaltic location, gastrojejunoduodenoplasty was performed using segment of the jejunum in isoperistaltic position for antireflux purpose. We avoid intrapleural anastomoses, because, in our opinion, anastomotic leakage results significant increase of the risk of mortality in this case.

Thus, types of reconstructions and plastic materials are shown in **Table 2**.

Immediate results of redo surgery were evaluated considering safety and completeness of interventions. Long-term outcomes were analyzed regarding physiological effectiveness.

Results

Early postoperative complications occurred in 5 (9.6%) patients. Leakage from EES was noted in 2 (3.8%) patients, suppuration of postoperative wound — in 1 (1.9%) case. Subdiaphragmatic abscess was diagnosed in 1 (1.9%) patient. Adequate US-assisted drainage and vacuum aspiration were effective in all cases without need for redo surgery. Re-laparotomy in 9 days after surgery was required in 1 (1.9%) patient with colonic graft necrosis. Resection followed by colo- and esophagostomy was made. One woman died on the 1st postoperative day from multiple organ failure progression. In-hospital mortality was 1.9%. A significant criterion in assessing redo procedures

was their completeness. Incomplete surgery was noted in 1 (1.9%) case after combined extirpation of the esophagus with EES resection due to total deficit of visceral plastic material. Thus, 2 (3.8%) patients were discharged after incomplete redo procedures.

Long-term follow-up enrolled 44 (86.3%) patients. Thirty-five (68.6%) patients were alive at the time of the last contact. Nine (20.5.6%) patients died in the long-term period. Seven (77.8%) out of 9 patients died from cancer progression within different terms after redo surgery. Cachexia associated with impossible oral feeding and subsequent multiple organ failure resulted unfavorable outcome in 1 (11.1%) patient. One (11.1%) patient died in long-term period from thoracic aorta rupture. Follow-up period ranged from 1 to 6 years (mean 22±2.3 months).

The following criteria were accepted to increase objectification of the efficacy of reconstructive operations: body weight, incidence and nature of pathological syndromes, long-term surgical complications (including those requiring redo surgery), X-ray characteristics of motor-evacuation function of the upper digestive tract. This assessment of redo interventions prevents excessive enthusiasm for these procedures and makes it possible to reduce severity of post-gastrectomy pathological symptoms and even eliminate some manifestations. These are reliable arguments in favor of their implementation.

Body weight augmentation is an objective criterion characterizing nutritional status and testifying normalization of digestion after reconstructive surgery (**Table. 3**).

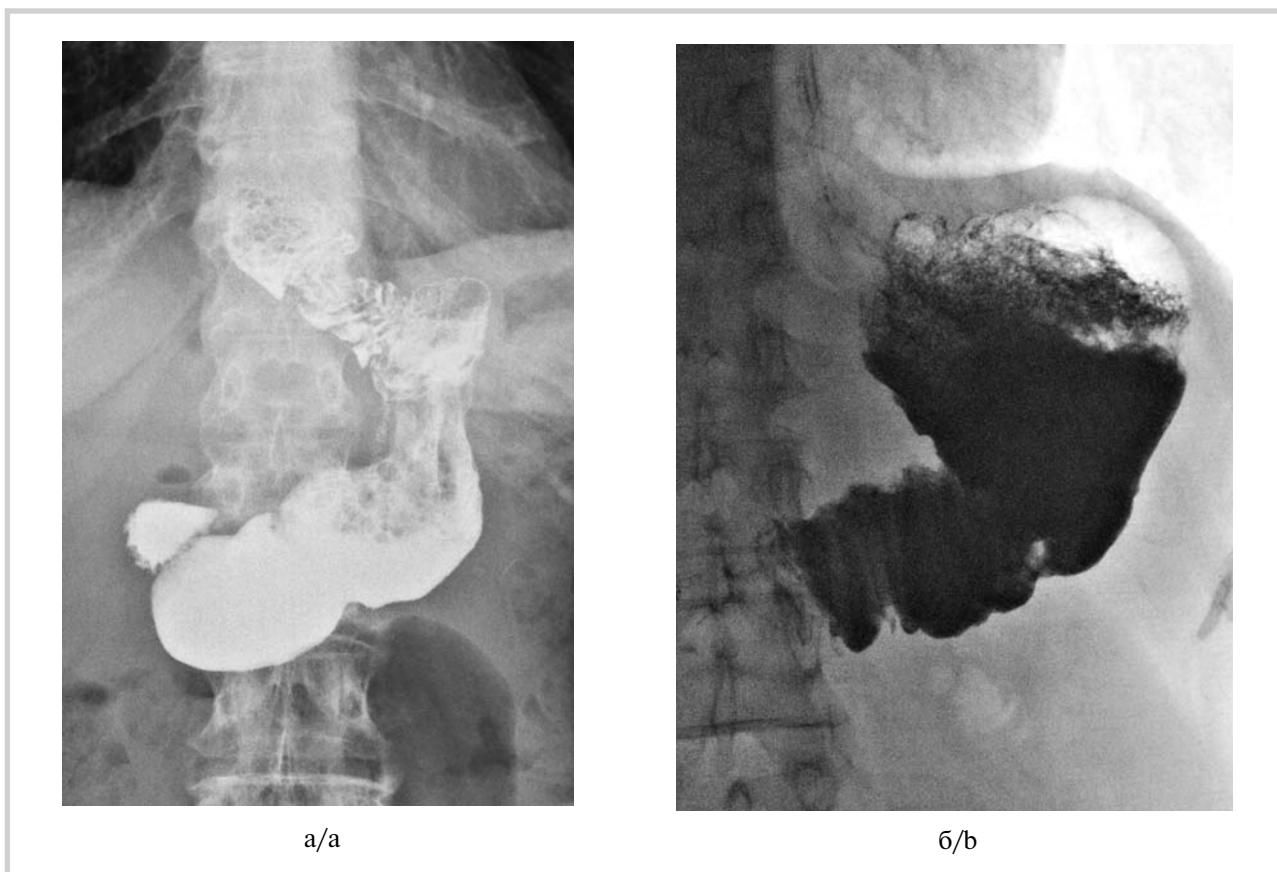


Fig. 5. X-ray scans in the long-term period.

a — after redo stomach resection followed by reconstruction by Merendino–Dillard; б — after distal redo stomach resection with EGP; в — after stomach stump extirpation and cologastroplasty.

Thus, body weight gain as an objective criterion of normalized digestive function was noted in 26 (74.3%) patients.

Considering complaints in the long-term period, clinical evaluation was conducted regarding two pathological syndromes (agastric asthenia and reflux esophagitis). Typical clinical and laboratory signs of agastric asthenia were observed in 24 (68.6%) patients. Mild asthenia occurred in 15 (62.5%), moderate — in 6 (25.0%), severe — in 3 (12.5%) patients. Reflux esophagitis with heartburn was observed in 11 (22.9%) patients.

There were no specific surgical complications (strictures of intestinal graft and its anastomoses, obstruction associated with bending or atony, etc.) in the long-term period. Only 2 (4.6%) patients required redo surgery in the long-term period: 1 (2.3%) patient with postoperative ventral hernia, 1 patient with small bowel obstruction associated with peritoneal adhesions.

Control X-ray examination in the long-term period confirmed dosed type of evacuation from the graft to underlying digestive tract and normal rate of intestinal passage (Fig. 5).

Long-term result of reconstructive surgery were assessed using Visick score system. Patients' state of health, nutritional status and digestive disorders were considered. The results are shown in Table 3.

The group of a good clinical result included patients without recurrent disease despite periodic dyspeptic disorders associated with dietary mistakes. Weight gain and good were observed in these patients.

Satisfactory outcome was determined by persistent mild-to-moderate postoperative digestive disorders. This group also included those patients whose death was not associated with redo surgery and its consequences. Poor result was recognized in patients with ineffective surgical treatment. Persistent or recurrent symptoms of disease were noted in these patients. Severity of these disorders was similar to that prior to redo surgery in some cases. Patients after incomplete reconstruction and continued feeding through the stoma were enrolled into the same group.

Systematization and choice of redo reconstruction of digestive tract are determined by the concept of physiological restoration of the gastrointestinal tract considering the following principles:

1) simultaneity and completeness — simultaneous complete resection and reconstruction with obligatory restoration of oral feeding and no need for stoma;

2) redo duodenization - restoration of the passage through the duodenum;

3) jejuno(colo)gastroplasty (EGP and CGP) — partial or complete replacement of the stomach using pedicled jejunum or colon segment;

4) rational utilization of plastic material — organ-sparing surgical technique without unreasonable resection of the fragments of digestive tract as a plastic reserve for subsequent gastric replacement.

At the same time, the disease itself and type of previous intervention require a personalized approach. The last one is realized through the so-called rational standardization. On the one hand (standard), this approach is valuable to determine reconstruction design in accordance with the developed principles, on the other hand (rational) — to choose the necessary surgical technique considering characteristics of the primary operation and the patient. The simplest reconstruction and minimally traumatic procedure are in accordance with the principle of minimum sufficiency.

Discussion

One cannot disagree with the opinion of A.A. Busalov, who as early as 1966 called disorders after stomach surgery the «unfortunate» section of all surgery. The author considered severity of post-gastrectomy syndromes and their difficult treatment [10].

Despite the long history of gastric surgery, the thematic literature practically does not contain a detailed analysis of the long-term results of redo surgeries, as well as systematization in the choice of reconstructive inter-

vention [11]. Various reconstructive procedures influencing certain pathogenetic mechanisms of post-gastrectomy syndromes were developed in some experimental studies [12—14]. The absence of a unified approach to this difficult and non-standard surgical problem is also explained by great traumatism of redo procedures, significant technical difficulties and number of postoperative complications [15].

Currently, surgeons are faced with the objectives of technical improvement of surgical procedures, creation of favorable conditions for compensation of digestion and improvement of the quality of life.

In our opinion, reconstructive operations with plastic replacement of the stomach and functional inclusion of duodenum are most consistent with normal physiology due to dosed food passage into small bowel and prevention of reflux esophagitis. This is evidenced by the results of redo operations with disappearance or significant improvement of the symptoms of post-gastrectomy syndromes.

Conclusions

Above-mentioned principles of physiological digestive reconstruction form the methodological basis of not only primary, but also redo stomach surgery due to their universality. Practical implementation of these principles is a difficult technical objective requiring surgical experience regarding all methods of gastro- and esophagoplasty. This aspect is valuable to choose the most rational reconstruction with a good functional result even in difficult and sometimes critical situations. At the same time, the success of redo procedure is by no means guaranteed. Therefore, measures aimed at improving the primary stomach surgery are strategically more beneficial.

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<https://doi.org/10.1186/s12893-018-0401-8>

Поступила 03.06.19
Received 03.06.19
Принята в печать 10.07.19
Accepted 10.07.19