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High and Ultra-High Anastomoses in Esophagogastric Junction Cancer with Extended Esophageal Involvement

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Abstract Cancer of the esophagogastric junction (GEJ) represents a significant clinical challenge in surgical oncology, accounting for approximately 10-15% of all esophageal and gastric cancers. Tumors involving the esophagogastric junction with extended esophageal involvement require extensive surgical resection to achieve adequate margins and improve oncological outcomes. The proximal location of these neoplasms and their longitudinal spread along the esophageal wall necessitate resection of significant portions of the intrathoracic esophagus, creating unique surgical and reconstructive challenges.

Keywords Esophagogastric junction cancer, Esophageal cancer, High anastomosis, Ultra-high anastomosis, Extended esophageal involvement, Esophagectomy, Surgical technique, Reconstruction, Gastric conduit, Anastomotic complications, Swallowing function, Quality of life, Postoperative outcomes

1. Introduction

High and ultra-high anastomoses are feasible and oncologically justified in GEJ cancer with proximal esophageal extension. Accurate intraoperative determination of the proximal invasion zone, individualized choice of approach, and refinement of anastomotic techniques significantly influence early and long-term outcomes [1]. Gastroesophageal junction (GEJ) cancer surgery is one of the most complex and prognostically unpredictable interventions in the upper gastrointestinal tract, involving manipulations in both the abdominal and pleural cavities, and sometimes in the neck. Such work on "two-..." and sometimes on three floors undoubtedly requires a lot of surgical experience and knowledge [2].

Optimal surgical tactics are determined by the degree of tumor invasion of the esophagus, its type according to the Siewert classification, histological structure, stage of the disease and the general somatic status of the patient [6]. Current trends in cardioesophageal cancer surgery are aimed at improving the safety of interventions through the improvement of surgical instruments, the widespread introduction of minimally invasive technologies, the use of intraoperative fluorescence imaging and the introduction of navigation systems for the accurate identification of lymphatic drainage pathways. However, in locally advanced forms of GEJ cancer, the benefits of minimally invasive techniques remain limited. This is due to the strict requirements for oncological ablasticity and the limited range of movements of laparoscopic instruments, especially when there is tumor growth into surrounding structures [3].

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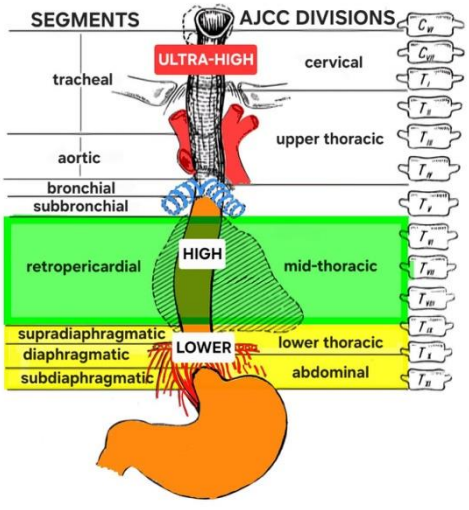

Figure 1. Classification according to Brombard (1956) as modified by S.A.Gashelin (1988)

In order to improve the surgical treatment of CEJ cancer, we attempted to divide patients with a high transition of tumor infiltration into the esophagus according to the level of the applied anastomosis into 3 floors or levels [8].

- Low esophageal anastomoses are defined as those constructed at the level of the abdominal and diaphragmatic segments of the esophagus [7];
- High anastomoses are those created at the level of the retropericardial segment of the esophagus;
- Ultra-high anastomoses are constructed at the level of the subbronchial segment and above [4].

To clarify the exact localization of the pathological process in the esophagus and from a practical point of view, we applied the classification according to Brombard (1956), modified by S.A. Gashelin (1988), recommended by the school of Academician M.I. Davydov, which best meets the requirements of modern oncosurgery (see Fig. 1). Taking into account this classification, the esophagus is divided into 9 segments [5].

2. Material and Methods

The basis of the clinical material was the analysis of the results of surgical treatment of 76 patients with GEJ cancer who underwent surgery at the Thoracoabdominal Oncosurgery clinic of the Tashkent Regional Branch of the Russian National Cancer Research Center from 2014 to 2023, that is, over a ten-year period. During the study in these 76 patients, it was found that the C16 (stomach cancer) code, according to ICD-10, was assigned to 45 patients (59.2%), while the C15 (esophageal cancer) code was assigned to 31 patients (40.8%).

All patients underwent radical surgery. There were 26 (34.2%) women and 50 (65.8%) men among the patients. The age of the patients ranged from 30 to 73 years (average age 62.4 years).

In our study, there were no patients with stage I of the disease. In stage II, only one patient (1.3%) was operated on. The vast majority of patients — 58 cases (76.3%) — underwent surgery at stage III, which reflects the tendency of late detection and locally advanced course of the disease characteristic of GEJ cancer. A special group consisted of patients with stage IV — 17 cases (22.4%). Surgical interventions in this category were performed in a cytoreductive volume with reasonable prerequisites for achieving R0 resection, despite the presence of separate distant metastatic deposits. These situations included limited perigastric or paraesophageal dissemination, potentially subject to removal as part of a single surgical stage. Among them, 8 patients (10%) had distant metastases, whereas in 9 patients (11.8%), stage IV was established based on the local prevalence of the process without confirmed distant deposits. It should be emphasized that in the TNM classification, esophageal cancer can be classified as stage IV not only in the presence of M1, but also in the case of a locally widespread pT4a/bN2 process, which is essential in interpreting clinical data.

3. Results

Surgery with the formation of an anastomosis exclusively through the abdominal cavity were not considered in the framework of this study due to their fundamental unacceptability in high tumor locations. When analyzing the types of surgical interventions performed in patients with GEJ cancer, the following distribution was found:

Table 1. Distribution of types of surgical interventions

Type of operation	High anastomoses	Ultra-High anastomoses	Total
Left thoracoabdominal approach (proximal gastric resection)	32	2	34
Left thoracoabdominal approach (total gastrectomy)	11	1	12
Ivor Lewis esophagectomy	1	27	28
McKeown esophagectomy (3-hole)	0	2	2

The most frequently performed surgery was a transpleural proximal resection of the stomach - left thoracoabdominal approach, which was performed in 34 (44.7%) patients, of which 32 had a high anastomosis and 2 had an ultra—high anastomosis. Transpleural gastrectomy - left thoracoabdominal approach was performed in 12 (15.8%) patients, mainly with the formation of high anastomoses (11 cases) and in only one case — ultra-high. Ivor Lewis esophagectomy was performed in 28 (36.8%) patients, mainly in the ultra-high anastomosis variant (27 cases), which reflects the desire for a more proximal level of reconstruction with a significant transition of the tumor to the thoracic esophagus. McKeown esophagectomy (3-hole) was performed in 2 (2.6%) patients, both times with the formation of an ultrahigh anastomosis.

This distribution of interventions demonstrates that with limited tumor transfer to the esophagus, preference is given to transpleural gastric resections and gastrectomy with high anastomoses, whereas with extended esophageal invasion, the proportion of two- and three-hole operations (Lewis, McKeown) with the formation of ultra-high anastomoses increases.

The total frequency of postoperative complications (morbidity) was diagnosed in 13 patients (17.1%). The structure of complications is presented in tab. 2. Of these, complications were recorded in 5 patients (11.4% of 44) in the group with high anastomoses, and in 8 patients (25% of 32) in the group with ultra—high anastomoses.

Anastomotic leakage occurred in 6 patients (7.9%). Notably, the incidence was higher in the high anastomosis subgroup, where leakage developed in 4 cases (5.2%). These patients were characterized by advanced local disease, including invasion of the left diaphragmatic crus, pancreatic

capsule involvement, and, in some cases, diffuse gastric infiltration. Tumor size ranged from 10 to 20 cm, indicating a substantial tumor burden. The gastric-to-esophageal cancer ratio was approximately 2:1. Importantly, 3 of the 6 patients with leakage underwent transthoracic gastrectomy, which likely reflects both the aggressive tumor biology and the technically demanding nature of these procedures. From a pathophysiological standpoint, the higher leakage rate in this subgroup may be attributed to compromised microvascular perfusion, increased anastomotic tension, and the extent of surgical resection required in locally advanced disease.

In the ultra-high anastomosis group, complications were observed in 2 patients (2.6%) following Ivor Lewis procedures and transthoracic gastrectomy. All cases were associated with a pronounced inflammatory response and the formation of a high-tension anastomosis, further supporting the role of local and technical factors in the development of postoperative complications.

Importantly, the overall anastomotic leakage rate in our series (7.9%) lies at the lower boundary of the range reported in the international literature (3–25%) [6–8]. This finding supports the adequacy of the chosen intrathoracic reconstructive strategies and highlights the importance of meticulous intraoperative assessment of tissue perfusion and anastomotic viability.

Hospital mortality in the ultra-high anastomosis group was 3.1% (1 of 32 patients died during hospitalization), while overall early mortality (within the first postoperative month) reached 6.3% (2 of 32 patients). These outcomes are consistent with the complexity of surgical management in patients with advanced esophagogastric malignancies and emphasize the need for careful patient selection and optimization of perioperative care.

The overall rate of postoperative complications in the high anastomosis group (11.4%) did not exceed that observed in the ultra-high anastomosis group (25%). This finding may suggest a trend toward a reduced complication burden with the use of the Garlock procedure, potentially reflecting improved surgical exposure, more favorable anastomotic conditions, and ongoing refinement of surgical technique. However, these observations should be interpreted with caution, given the potential influence of confounding factors such as tumor extent, patient selection, and procedural complexity.

The anastomotic leakage rate of 7.9% (6/76) falls within the lower range reported for intrathoracic anastomoses in the literature and is notably lower than the rates typically observed for cervical anastomoses. This finding is consistent with the predominance of Garlock and Ivor Lewis procedures in our series (97.4% of all interventions) and the selective use of the McKeown approach for a narrow subset of indications.

The in-hospital mortality rate of 3.9% is comparable to outcomes reported by high-volume centers and remains within the reference range for open surgical procedures in GEJ cancer [6–8].

4. Conclusions

Surgical management of esophagogastric junction cancer is entering a phase of sustained advancement, with a clear trajectory toward improved clinical and oncological outcomes. This progress is underpinned by continuous innovations in surgical technique, increasingly precise radiologic and endoscopic staging, and the integration of multimodal treatment strategies. Centralization of care in high-volume centers, combined with the development of dedicated multidisciplinary teams, has emerged as a critical determinant of outcomes, enabling both technical excellence and optimal perioperative management in this complex patient population.

In this context, refined intrathoracic reconstructive approaches, meticulous assessment of conduit perfusion, and adherence to oncologic principles collectively contribute to improved safety and radicality of surgical treatment. Taken together, these advances position modern esophagogastric surgery not only as a technically feasible intervention but as a highly effective cornerstone of curative treatment, capable of achieving meaningful reductions in postoperative morbidity and durable improvements in long-term survival.

Table 2. Structure of postoperative complications by groups

Indicator	High (n=44)	Ultra-high (n=32)	Total (n=76)
Patients with ≥1 complication	5 (11,4%)	8 (25,0%)	13 (17,1%)
Anastomotic leakage	4 (9,1%)	2 (6,3%)	6 (7,9%)
Pneumonia (including COVID-19–associated)	0	2 (6,3%)	2 (2,6%)
Perforation of the colon	0	2 (6,3%)	2 (2,6%)
Acute pancreatitis	1 (2,3%)	0	1 (1,3%)
Myocardial infarction	1 (2,3%)	0	1 (1,3%)
Cardiac arrest (resuscitated)	0	1 (3,1%)	1 (1,3%)
In-hospital mortality	1 (2,3%)	1 (3,1%)	3 (3,9%)
Early mortality (≤30 days)	2 (4,5%)	2 (6,3%)	4 (5,3%)

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