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SURGICAL TREATMENT OF ESOPHAGEAL CANCER: YESTERDAY AND TODAY. SYSTEMATIC ANALYSIS OF IMMEDIATE AND LONG-TERM RESULTS OF TRADITIONAL AND MINIMALLY INVASIVE ESOPHAGECTOMY (LITERATURE REVIEW)

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ABSTRACT

Esophageal cancer (EC) has one of the leading positions among the incidence of oncological diseases and still occupies a high position in terms of the aggressiveness of the process. This paper thoroughly analyzes the current state of the issue of EC, evaluates the immediate and long-term results of traditional and minimally invasive surgery for EC.

KEYWORDS: Esophageal cancer, Ivor Lewis operation, transhiatal esophagectomy, minimally invasive esophagectomy,

INTRODUCTION

According to IARC data, esophageal cancer (EC) ranks 9th worldwide in the structure of new incidents of malignant tumors, accounting for 572,034 registered cases and 6th in the structure of mortality among all cancer forms, taking 508,585 lives annually.[7] According to statistical data, EC develops more often in men than in women (70% of new cases registered in men), in people over 70 years of age, EC is about 40% of the total number of malignant neoplasms. According to some researchers, the peak incidence occurs at the age of 50-60 years.[7, 40] However, these rates vary across geographic regions. For example, the highest incidence is found in eastern Asia, eastern and southern Africa (8,1-23,6$^0/_{0000}$), while the lowest rate belongs to Central America.[7, 20] This pathology is widespread in a number of regions of China (22,9 $^0/_{0000}$- men) and in Mongolia (16,1$^0/_{0000}$- women). In the European Union, the incidence of EC on average is 5,9$^0/_{0000}$ and ranges from 1.4$^0/_{0000}$ in Greece to 9.5$^0/_{0000}$ in the UK.[17] The aggressiveness index of the EC in 2018 was 88%. Despite the intensive development of medicine and the emergence of new technologies, the presented indicators are growing every year. So, in 2008, 482,300 new cases were detected, and in 2018 - 572,034 cases of EC worldwide. The increase in the incidence over the past 10 years is 18%.[20, 52]

According to Tillyashaykhov M.N. et al. (2020) in 2019, 24,648 new cases of malignant neoplasms were detected in the Republic of Uzbekistan. Of these, in 2019, EC was detected in 753 (3.0%) patients. At the same time, the annual mortality from EC has decreased from 704 deaths in 2016 to 584 in 2019. The five-year survival rate is 21.4%.[58]

Adenocarcinoma, in turn, is common in more developed countries and correlates with Barrett's metaplasia and gastroesophageal reflux disease (GERD).[22] Adenocarcinoma is most often localized in the area of the esophageal-gastric junction and the proximal stomach.[59; 38]

The prognosis for patients with esophageal cancer remains disappointing, with a low five-year survival rate of 15-25%.[51] This fact is due to the late diagnosis of the disease (often at the stage of the presence of metastases) and the tendency to metastasize in early stages.[25; 38]

Surgical treatment of esophageal cancer
"Traditional" operations

Treatment of EC depends on the location of the tumor and the stage of the disease.[4, 12, 30]

Surgical treatment consists in resection of the esophagus (esophagectomy) and recovery with gastric transplantat or part of the intestine.[8, 13, 15]

To perform esophagectomy, several methods have been described, which can be classified thematically according to two main methods: transthoracic and transhiatal.[2, 11]

Transhiatal esophagectomy (THE) is performed by laparotomy and a left-sided neck incision.[13, 19] Gains recognition of TCE, using abdominal transphrenic lymph dissection in combination with cervical access. The main advantages of the method over transthoracic techniques are the less invasiveness of the intervention and its higher efficiency, as well as the volume of esophageal resection equal to the subtotal, with an anastomosis on the neck, and a significantly shorter duration of the operation.[54] The main disadvantage of transhiatal esophagectomy is considered to be insufficient oncological radicality when removing the esophagus.

Transthoracic esophagectomy (TTE) is most often performed by laparotomy followed by right-sided thoracotomy with the formation of an intrathoracic esophageal-gastric anastomosis (Ivor Lewis operation). This operation was first described in 1946 and has become the standard against which other methods of esophagectomy are compared. Similarly, a left-sided thoracotomy or thoracoabdominal incision ensures adequate work of the surgeon in the lower third of the esophagus, but presents great difficulty for access to the upper and middle third and for the formation of an intrathoracic esophageal-gastric bypass.[17]

The transthoracic method allows more accurate resection of the esophagus within safe distance and wider lymphadenectomy due to direct visualization and direct work with the thoracic esophagus.[30, 53]

However, performing a laparotomy in combination with thoracotomy suggests the development of cardiopulmonary complications, especially in patients with concomitant lung and heart diseases. Another significant disadvantage of transthoracic esophagectomy is that failure of the intrathoracic esophageal-gastric anastomosis can lead to catastrophic consequences, including mediastinitis, sepsis and death.[57]

Perioperative mortality in the case of transthoracic esophagectomy ranges from 1.4% to 9%.[19, 63, 64] According to the literature, the five-year survival rate corresponds to approximately 25% of patients.[26] However, these data were obtained from a study of a heterogeneous population of patients with esophageal cancer who underwent various variants of transthoracic esophagectomy.[60]

According to Yusupbekov A.A.. (2020), from 2000 to October 2019, 600 patients with cancer of the middle and lower thoracic esophagus were operated on in the department of thoracic oncosurgery of the RSSPMCO&R. There were 243 men (40.5%) and women - 357 (59.5%), the average age was 55.3 years (from 24 to 74 years).[67] From 2000 to 2012, 257 patients underwent THE with an anastomosis on the neck, which were performed under the guidance of prof. Krotov N.F..[30] But from 2012 to October 2019, 311 patients underwent TTE (Lewis operation). The entire

data was obtained from the one center, which allows a more thorough comparative analysis of the immediate and long-term results.[67]

Of 600 patients, mid-thoracic localization of the cancer was diagnosed in 181 (30.2%) patients, lower thoracic in 122 (20.3%) patients and mid-lower thoracic localization was diagnosed in 297 (49.5%) patients. Distribution of patients by tumor stage: I - 14 (2.33%), II - 305 (50.83%), III - 281 (46.83%).

General postoperative complications were observed in 152 (25.3%) patients. After THE (257 patients): leakage of the esophageal-gastric anastomosis was detected in 17 (5.88%) patients, cardiovascular - in 9 (3.11%), postoperative bleeding in 5 (1.73%), apical necrosis of gastric transplant in 12 (4.15%), pulmonary 11 (3.8%), pleural 22 (7.61%), purulent-septic in 6 (2.1%), pancreatitis in 1 (0.34%) patients. Postoperative mortality rate was 16 (6.02%). After TTE (311 patients): leakage of the esophageal-gastric anastomosis was detected in 12 (3.85%) patients, cardiovascular - in 11 (3.54%), postoperative bleeding in 3 (0.96%), apical necrosis gastric transplant in 7 (2.25%), pulmonary 10 (3.21%), pleural 15 (4.82%), purulent-septic in 10 (3.21%), pancreatitis in 1 (0.32%) patients. Postoperative mortality rate was in 21 (6.7%) patients.[67]

As a result of numerous studies comparing transhiatal versus transthoracic esophagectomy, neither method has been proven to be superior to the other, and both can provide excellent short-term results in the hands of experienced surgeons. In addition, reviewed literature indicates that the experience of a surgeon and clinic in the surgical treatment of esophageal cancer is the most important factor determining the incidence of perioperative complications and mortality.[63, 64] However, for many years, the operation of choice was and remains the operation of Ivor Lewis.

Minimally invasive surgery

There are several controversies in the surgical treatment of EC, including the surgical approach, the degree of resection, the optimal areas for lymph node dissection, and the ideal location of the gastroesophageal anastomosis.[30, 13, 37]

Cuschieri et al. (1992) were the first to report minimally invasive esophagectomy in 5 patients by performing video-assisted thoracoscopy (VATS) to mobilize the esophagus.[14] This study was followed by several reports of minimally invasive techniques for esophageal resection. Thus, Collard et al. (1993) and McAnena et al. (1994) published data on thoracoscopic resection, while DePaula et al. in 1995 - on laparoscopic transhiatal resection.[18] In these early reports, clinical results were inconclusive and McAnena et al. concluded at the time that the widespread use of this technique cannot be recommended.[37]

In 2003 J. Luketich et al. reported the first large series of minimally invasive esophagectomy (MIE) in 222 patients and demonstrated impressively low morbidity and mortality. Thirty-day mortality and the incidence of pneumonia were 1.4 and 7.7%, respectively.[33] The first report on MIE in a large patient population was published by Palanivelu et al. (2006), according to which both the thirty-day mortality rate and the incidence of pneumonia in 130 patients were 1.54%.[34]

Following these promising results, MIE subsequently gained gradually increasing acceptance.[16, 29]

When studying the literature data on MIE, it is impossible not to mention the University Hospital of Pittsburgh and personally Professor J. Luketich for their contribution to the development, formation, optimization of the details of operations and a comprehensive analysis of MIE. From 1996 to 2015 more than 1000 MIEs have been performed at the University Hospital of Pittsburgh. As a result of a number of studies[33, 34, 46, 47], the scientists of this clinic came to the conclusion that it is advisable to perform laparothoracoscopic esophagetomy by the Ivor Lewis type instead of laparoscopic transhiatal esophagectomy (laparoscopy + esophageal-gastric anastomosis on the neck) or McKeown esophagectomy (laparoscopy + thoracoscopy + esophageal gastric anastomosis in the neck).[34]

A similar development of the methodology for performing MIE is described by J. Zhang et al. (2012).[68]

Zhang et al. (2012) first performed a laparoscopic transhiatal esophagectomy, but it soon became apparent that there were several significant disadvantages of this type of operation. Laparoscopic transhiatal mobilization of the esophagus provides insufficient visualization of important anatomical structures and does not allow an adequate amount of lymphadenectomy. These problems are even more significant in tall patients. In this regard, Zhang J. et al. began to perform esophagectomy by McKeown (laparoscopy + thoracoscopy + esophageal-gastric anastomosis in the neck). However, the most significant drawback of this operation is the cervical approach, which entails possible damage to the recurrent laryngeal nerve with the subsequent development of hoarseness, impaired swallowing and, as a result, aspiration pneumonia.

In addition, it has been proven that the incidence of gastroesophageal anastomosis leakage is higher in case of McKeown esophagectomy compared with "open" surgery. In this regard, J. Zhang et al. (2012) consider Lewis-type MIE to be the operation of choice in the surgical treatment of esophageal cancer. With this variant of esophagectomy, there is a low incidence of leakage of the esophageal-gastric anastomosis (3%) and low mortality (1.5%), and the degree of radically performed lymphadenectomy is comparable to "open" esophagectomy.

It should be emphasized that performing MIE requires high surgical training. Among the important features of the operation, the authors note the need for the correct positioning of the thoracoscopic ports, since incorrectly positioned trocars can lead to difficulty in maneuvering instruments through the rigid chest wall.[68]

In addition, patient's advanced age should not be considered as a limiting factor. Puntambekar S. et al. (2013) in their study concluded that MIE is feasible and surgically safe in elderly patients.[49]

Published in 2014, paper of Benedix F. et al. indicates the need for highly professional surgical training for performing MIE, since in experienced hands, the authors suggest, MIE has good results and may be the operation of choice in patients with esophageal cancer.[4]

At the present stage of development of clinical oncology, including the equipping of our center with modern video-thoracolaparoscopic equipment, minimally invasive methods (hybrid minimally invasive esophagectomy (HMIE) for surgical treatment of cancer of the thoracic esophagus) have been started.

This minimally invasive intervention is part of the global standard for the surgical treatment of malignant neoplasms of the esophagus. Routinely performed in our center hybrid Lewis' operation, consists of two stages, abdominal (mobilization of the stomach and the formation of a gastric graft) and thoracic (subtotal resection of the esophagus with the formation of esophagogastroanastomosis), which in hybrid case the abdominal stage is performed completely laparoscopically, the thoracic stage is performed traditionally.

Comparative analysis of "traditional" and minimally invasive esophagectomy: immediate and long-term results

Currently, there are several comparative studies concerning MIE and "open" esophagectomy (OE).[26; 38; 46; 49; 55; 62; 66]

Narumiya K. et al. in 2005 reported the results of a prospective clinical study of 40 patients prescribed for OE and MIE. After MIE, patients required fewer narcotic analgesics, had a lower concentration of the interleukin-6 mediator, faster recovery of vital functions, and a shorter stage of inpatient treatment.[41] A study by Tsujimoto H. et al. in 2012, determined that in the case of MIE, the level of interleukin-6 in the blood serum immediately after surgery and on the first postoperative day is lower than after OE. The authors concluded that MIE has a less pronounced systemic inflammatory response.[61]

In 2009 Verhage R. et al. published the data of a systematic review, in which they came to the conclusion that in the case of MIE, less blood loss (577 ml - OE, 312 ml - MIE), less length of hospital stay (19.6 days - OE,

14.9 days - MIE). The overall complication rate is 60.4% for OE and 43.8% for MIE. Pulmonary complications occur in 22.9% of cases in the OE group and 15.1% in the MIE group. The number of removed lymph nodes was higher in MIE (20.2 - OE, 23.8 - MIE). Thus, this systematic review confirms the feasibility and safety of MIE. Moreover, the authors point to better immediate results after MIE.[62]

In a retrospective study, Nguyen N. et al. (2010) compared minimally invasive (n = 18) and "open" (n = 16) esophagectomies and found that the duration of the operation, blood loss, and the length of stay in intensive care were shorter in the case of transhiatal esophagectomy and laparothoracoscopic esophagectomy compared with "open" operation. The incidence of pulmonary complications was similar between the groups. However, this retrospective study had a drawback: patients in the open esophagectomy group had more advanced cancer stages. In addition, the authors emphasized the fact that "open" esophagectomies were performed by a group of four surgeons, while MIE was performed by one surgeon with experience in minimally invasive esophageal surgery.[42]

Biere S. et al. (2011) presented the results of the first multicenter randomized clinical study comparing the direct results of MIE (n = 59) and OE (n = 56). In the MIE group, blood loss, the severity of postoperative pain, the incidence of pulmonary complications and hoarseness, and the duration of inpatient treatment were statistically significantly lower than in the OE group. At the same time, there were no differences in mortality and the number of removed lymph nodes. However, the MIE group included various variants of esophagectomy: both McKeown esophagectomy and laparothoracoscopic esophagectomy, but performed in the prone position of the patient with the formation of carboxytorax without single-lung ventilation.[6]

Takeuchi H. et al. (2013) in their work also demonstrated a faster and more adequate recovery of the pulmonary system in the case of laparothoracoscopic esophagectomy compared to the "open" operation. However, the authors point out that the significance of MIE in relation to cancer prognosis has not been proven, since there is no randomized clinical trial that compares the long-term survival of patients with those who underwent OE. According to the authors, if future prospective studies prove the oncological benefits of MIE, then MIE will become the standard treatment for esophageal cancer.[56]

Several systematic reviews and meta-analyzes have been carried out based on previous clinical studies.[26; 38; 65; 66]

In a meta-analysis of Yibulayin W. et al. (2016) included 57 studies containing 15,790 cases of esophageal cancer. Compared with the OE group, in the MIE group the duration of the operation was longer, the blood loss was

less, and the duration of inpatient treatment was less. MIE also reduced the incidence of general complications, pulmonary and cardiovascular complications, the incidence of gastroesophageal anastomosis leakage, and hospital mortality.[66]

Results of the meta-analysis by Xiong W. et al. (2017) made several conclusions. Compared to OE, in the case of MIE, the duration of the operation is longer, the blood loss and length of hospital stay are shorter, and the incidence of pneumonia is lower. There was no difference between MIE and OE regarding the number of lymph nodes removed. The length of stay in intensive care unit, hospital mortality, and 30-day mortality were the same in both groups.[65]

Kauppila J. et al. in 2017, published data from a systematic review and meta-analysis, the aim of which was to compare the quality of life of patients at 3, 6 and 12 months after OE and MIE.[26] The analysis included 9 studies, which included 1157 patients after MIE and 907 patients after OE. It was concluded that patients 3 months after MIE noted a better quality of life, a higher level of physical activity, and suffered less fatigue and pain. However, after 6 and 12 months, there were no differences in the quality of life of patients after minimally invasive and "open" esophagectomy.[26]

In the work of Mehta K. et al. (2017) identified two main advantages of MIE: improved assessment of locoregional lesions and better detection of distant metastases. These advantages reduce the likelihood of exploratory laparotomy. The authors believe that laparoscopy in the case of MIE allows a more thorough examination of the abdominal organs to detect distant metastases.[38]

In turn, the most frequent complications of MIE and OE are pulmonary and cardiovascular complications, and, first of all, the leakage of the esophageal-gastric anastomosis (LEGA).

Pulmonary complications
According to a study by Luketich J. et al. (2015), at MIE, pulmonary complications develop in 15-24% of cases.[34] These include pneumonia, pneumothorax, hydrothorax, pleural empyema, and acute respiratory distress syndrome. However, only four comparative studies took into account pulmonary complications.[45; 64] In a study by Perry K. et al. (2009) pulmonary complications were noted in 24% of cases in the MIE group and in 29% of cases in the OE group[48], in a study by Maas K. et al. (2012) - in 18% and 26%, respectively.[35] Wullstein et al. (2015) indicate that the likelihood of pulmonary complications with MIE is less for 14-65%, and the quality of life in 6 weeks after surgery is higher compared to OE.[64]

Multivariate analysis by Kubo N. et al. in 2014 demonstrated that the presence of concomitant heart disease, pulmonary diseases and LEGA were

independent risk factors for the development of pulmonary complications after esophagectomy. However, in the case of MIE, the risk of developing pulmonary complications is significantly lower compared to open surgery.[31]

Leakage of the gastroesophageal anastomosis
According to a study by Luketich J. et al. (2015), after MIE operations LEGA ranges from 3 to 25% of cases.[34]

At the same time, only two comparative studies have been published reporting on LEGA, and in both studies there was no significant difference between MIE and OE.[9; 48] In a study by Perry et al. (2009) LEGA developed in 19% of patients after MIE and in 29% after OE.[48] In a study by Cash et al. (2014) - in 9% and 13% of cases, respectively.[9]

It is still unclear whether the relatively high incidence of LEGA is associated with the diameter of the gastric transplant or the features of its formation in the abdominal cavity. There is some evidence that ischemic conditioning of the stomach can improve vascularization of the gastric transplant.[36] Thus, Berrisford R. et al. (2009) point out in their work that previous studies in animals and humans suggest that ischemic conditioning of the stomach prior to esophagectomy improves gastric transplant perfusion.[5]

The opinion that necrosis of the gastric transplant after esophagectomy is associated with the imperfection of the minimally invasive method of surgery, Ramage L. et al. (2013) refuted in their study, concluding that the experience of the surgeon is of decisive importance. Gastric transplant necrosis is associated with transection of the gastroepiploic arcade, tension in the gastroesophageal anastomosis area, and incorrect positioning of the gastric transplant.[50]

In a meta-analysis published in 2013 by Markar S. et al. indicated that there were no significant differences in the likelihood of developing LEGA after MIE and OE, as well as in the case of ischemic conditioning of the gastric transplant. In addition, four randomized controlled trials (298 patients) were identified that compared cervical and thoracic esophageal-gastric anastomosis. LEGA was more often observed in the group of patients with neck anastomosis (13.64%) compared with the group with thoracic esophageal-gastric anastomosis (2.96%). As a result, the authors concluded that an individual surgical approach to the anatomical and physiological characteristics of the patient and the stage of esophageal cancer is the most important factor affecting the integrity of the gastroesophageal anastomosis after esophagectomy.[9]

In 2015, the results of a meta-analysis by Zhou S. et al. were published, which included 43 studies in which 5537 patients participated: 2527 (45.6%) patients who underwent MIE, and 3010 (54.4%) patients who

underwent OE. Patients after MIE did not have a statistically significant lower incidence of LEGA compared with the group of patients after OE. An insignificant decrease in the amount of LEGA after MIE was not associated with the location of the anastomosis or the method of forming the esophageal-gastric anastomosis (circular-stapled or hand-sewn). The authors concluded that more researches are needed to clarify the pros and cons of MIE in preventing the development of LEGA.[69]

On the other hand, according to the results of a meta-analysis by Zhou C., Zhang L. et al. (2015), from the point of view of nosocomial mortality, performing MIE is safer compared to OE, and therefore MIE, according to the authors, should be the operation of choice in esophageal cancer.[69]

It should be noted that due to the lack of a unified methodology for performing MIE, in particular, the level of formation of the esophageal-gastric anastomosis (first of all, when it is formed by a hand-sewn method), it is currently not possible to compare the data obtained from multicenter studies. And the averaged results will be doubtfully reproducible when choosing exact MIE methodology.

The criteria for assessing the immediate results of MIE and OE, found in the literature, are most often: the duration of the operation, the amount of blood loss, the duration of stay in the intensive care unit and inpatient treatment, as well as oncological criteria (radicality of the performed resection and lymphadenectomy).

Duration of surgery and amount of blood loss
The overwhelming majority of literary sources indicate that the duration of the operation is determined by the anatomical characteristics of a particular patient, as well as the stage of the disease and, above all, the professional training and manual skills of surgeons.[10; 24] In the case of comparable conditions, the difference in the duration of surgery in the MIE and OE group is statistically insignificant.[23; 24]

In all comparative studies that devoted to blood loss, indicate it was significantly less in the case of MIE than in OE [23; 24]. When performing MIE, blood loss, on average, is from 100 to 500 ml [40], while with OE it is from 526 to 900 ml.[44] Some studies report the need for intraoperative transfusion of blood components in the case of OE.[9]

Duration of stay in intensive care unit and inpatient treatment
The average length of stay in intensive care unit, according to the literature, varies from 1 to 3 days for patients who have undergone MIE.[48; 35] Two comparative studies were conducted on the stay in the intensive care unit. In a study by Maas K. et al. (2012) staying in intensive care unit was significantly shorter

after MIE (1 day - MIE, 3 days - OE).[35] In a study by Perry et al. (2009) there was no significant difference between the MIE and OE groups (2 days - MIE, 3 days - MA).[48]

In all comparative studies, the duration of inpatient treatment was significantly shorter in the MIE group (9-13 days - MIE, 12-16 days - OE). [60; 63]

ONCOLOGICAL CRITERIA

Oncological criteria for assessing immediate results include: the radicality of the resection margins performed and the number of removed lymph nodes. The radicality of the resection margins in the case of MIE varies from 82 to 100%[53, 63], which is comparable to OE.[44] The number of removed lymph nodes in the MIE group is also comparable to OE.[64]

As a result of a systematic review by Verhage R. et al. (2009), it was found that compared with OE, when performing MIE, there is less blood loss (312 ml - MIE, 577 ml - MA), less inpatient treatment (14.9 days - MIE, 19.6 days - OE) and the frequency complications (43.8% - MIE, 60.4% - OE), but the average number of removed lymph nodes is higher (23.8 - MIE, 20.2 - AE).[62]

In 2016, the results of a study by Mohos E. et al. were published, in which the authors concluded that MIE has oncological results comparable to OE, but with a lower incidence of cardiopulmonary complications, as well as LEGA.[39]

LONG-TERM RESULTS

According to the available literature data, the survival rates after MIE and OE do not differ significantly.[41; 44; 48] In a study by Maas et al. (2012), the five-year survival rate of patients after laparoscopic transhiatal esophagectomy and "open" esophagectomy was 29% and 26%, respectively.[35] In a study by Cash et al. (2014) the two-year survival rate after MIE was 70% and 65% after OE.[9]

According to Wullstein C. et al. (2015), long-term survival after MIE and OE is comparable.[64]

Study by Luketich J. et al. (2015) found that 30-day and perioperative mortality in the case of MIE was 2.1% and 2.9%, respectively. The three-year survival rate is 58.4%. These data showed that laparothoracoscopic esophagectomy is a safe operation with acceptable perioperative and oncological consequences.[34]

In 2014 Khatkov I.E. et al.[27] reported three cases of laparothoracoscopic esophagectomy with thoracic esophageal-gastric anastomosis. The average duration of operations was 579 minutes (from 305 to 710 minutes), the average volume of blood loss was 141 ml (from 50 to 300 ml). Thirty-day lethality - 1 (LEGA, myocardial infarction). The authors believe that Ivor Lewis-type laparothoracoscopic esophagectomy allows adequate mobilization of the esophagus and stomach, adequate lymphadenectomy with minimal blood loss and surgical trauma.[27]

In 2016 Allakhverdyan A.S.[1,2] published data on 14 esophagectomies and 19 resections of the proximal stomach and lower thoracic esophagus with simultaneous intrapleural esophagogastroplasty with combined laparoscopic and thoracoscopic access on the right. The average duration of surgery for esophagectomy was 430 minutes, for cardioesophageal cancer - 375 minutes. The average length of stay in intensive care unit was 17 hours.

Enteral nutrition was started on the 4th day after surgery. The average postoperative in-hospital treatment was 8.5 and 7 days, respectively. Postoperative complications - 1 (pulmonary embolism). Hospital mortality - 0 [1; 2].

CONCLUSION

Analyzing the data given above, it is possible to conclude that in modern surgery, the development of surgical approaches for the treatment of esophageal cancer continues. This, first of all, concerns the introduction of minimally-invasive video endoscopic approaches.

The short-term perioperative results of video endoscopic minimally invasive esophagectomies versus traditional "open" techniques are still under discussion.

In the analysis of the incidence of gastroesophageal anastomosis leakage, cardiopulmonary complications and survival, there are various data, which indicate the relevance of studying the possibility of optimizing and standardizing the methodology of laparothoracoscopic esophagectomy.

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