Combined thoracicoabdominal access is main method for surgery of gastric cancer with esophageal junction.

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Summary. The article explains the use of combined thoracoabdominal access during surgery for gastric cancer with spread to the esophagus. Describes the historical development of surgical approaches. We present our own experience with the use of surgical interventions thoracoabdominal access. It is concluded that sinistral oblique thoraco-line access is the optimal choice for resection of gastric cancer to spread to the esophagus, which allows resection of adjacent organs, any type of lymph node dissection, and, due to convenience - to reduce the time of surgery.

Key words: surgical access, thoracicoabdominal access, gastric cancer with esophageal juntion, thoracic surgery

At the present time, surgical approach remains to be the main and the only radical treatment for carcinoma of the esophagogastric junction.

Rational surgical approach has always been considered the one that provides the greatest space and an ease of access. Visualization of the area and the organ, where surgery is performed, is extremely important. An ease of access allows to provide a safe positioning of anastomosis and to perform a radical surgery. That is why the immediate and long-term results while dealing with carcinoma of the esophagogastric junction depend on surgical access.

Carcinoma of the esophagogastric junction is not a widespread pathology. A cancer incidence rate in geographical aspect most frequently ranges within the limits of 3-7 new cancers per 100,000 population at risk (2404 residents, that is 4,76 per 100,000, developed cancer in Ukraine in 2000). The most severe effect of the given pathology is esophageal food impaction.

Radical surgical treatment of carcinoma of the esophagogastric junction has some significant technical challenges. First of all, it is associated with the location of the target affected organs in hard-to-reach anatomical areas, a high grade of malignancy, as well as the detection of tumor lesions in the advanced stages of a disease. The last predetermines spread of the process through the lymphatic viae and tumor ingrowth into adjacent organs. As a rule, a given cancer localization requires performance of combined and extensive operations with resection of several adjacent organs (pancreas, spleen, liver, diaphragm, etc.).

Despite the complexity of operations of the cardioesophageal cancer, some specialized divisions get quite good results of surgical treatment. For instance, postoperative mortality rate

among patients treated for this pathology in the Department of Thoracic Cavity Tumors of the National Cancer Institute is 1,1 %.

These results to a large extent depend on the choice of surgical access. Unfortunately, in the most Departments of General Surgery, where patients with such a cancer localization are operated on, the most popular surgical access is an upper-midline laparotomy.

Surgical access is a set of procedures carried out by a surgeon, which provides exposure of an organ affected by a pathological process. Surgical access has to meet certain requirements, which can be divided into qualitative and quantitative. The criteria for qualitative assessment of surgical access are: width of the access, shortest way to the organ to be operated, correspondence to the courses of great vessels and nerves at an area of incision, satisfactory blood supply of surgical wound edges. It'll provide quick healing of a wound.

The basis for the quantitative assessment of surgical access comprises criteria elaborated by A. Yu. Sozon-Yaroshevich. The criteria for the objective assessment of surgical access are the following.

Direction of the axis of surgical action. The axis of surgical action implies a line that connects surgeon's eye with the deepest point of surgical wound or the most important object of surgery. Most often, the axis of surgical action passes through the axis of a cone of the wound or is the bisector of the angle between the side edges of the wound cavity.

An angle of inclination of the axis of surgical action. The term is defined as the angle between the axis of surgical action and body surface of the patient within the surgical zone

An angle of surgical action. This angle is made by walls of a cone of the surgical wound. Its size determines freedom of movements of surgeon's fingers and instruments in a wound.

Depth of a wound. It is a distance between wound aperture and its bottom. The depth of a wound is determined by the axis of a cone, which is also an axis of surgical action or by the bisector of an angle of surgical action. This is a segment of the axis of surgical action from the surface of wound aperture to the object of surgery.

Zone of accessibility in the classic sense is the area of a bottom of a wound.

Combined left thoracoabdominal access in combination with a full or partial diaphragmotomy has long been recognized as a surgical management of tumors of the esophagogastric junction. This access has significant advantages over the left thoracotomy only. Additional laparotomy significantly extends the surgeon's actions zone and therefore facilitates considerably the process of mobilization of not only the stomach, but the esophagus as well. K. Nakamura et al. [36] believe that the left thoracotomy in combination with diagonal (oblique) laparotomy and full diaphragmotomy (up to esophageal hiatus) provides ideal conditions for the mobilization of the lower esophagus in compliance with the principles of radicalism. At the same time pulmonary ventilation rates did not differ from those of patients after only upper midline laparotomy.

V. Anikin et al. [2] use widely left thoracolaparotomy not only while dealing with the lower esophagus cancer, but also in the case of mid- esophagus cancer (27 observations). In the

position of the patient on the right side they make a skin incision along the sixth intercostal space to the left from the left scapular line to the point of 3 cm distal to the costal arch. After performing a thoracotomy and resection of costal arch abdominal wall is dissected to the outer edge of the left rectus abdominis muscle and then diaphragm is also partially dissected. In the course of the esophagus mobilization the last one is exteriorized along the entire length to the very throat. To facilitate the mobilization of the esophagus at the level of the aortic arch authors resort to the dissection of the parietal pleura over the aortic arch lateral to the left supraclavicular artery. It is easier to exteriorize the esophagus through the formed space. An average duration of such operations is 309 minutes (5 hours), which is too long in our opinion.

Resection of the cardia by means of abdominal access was elaborated experimentally on human cadaver material by Levy (1894).

Transpleural access of cardia removing was elaborated by Biondie (1895) and Gosset (1903), and applied in the clinic Miculicz (1904) and Sanerbruch (1905). Staged thoracoabdominal access which is applied with additions even at the present time was suggested by Küttner (1905).

Thoracoabdominal access method, when a thoracotomy is performed on the first stage and a laparotomy – on the second, was suggested in 1908 by Henle. Favorable outcome of the cardia resection was achieved in the clinic Voleker (1908).

Technique skills, facilitating an access to the cardia in the course of its mobilization and removal by means of laparotomic access, suggested at different times by well-known surgeons appeared to be quite important. The following operations became widespread: mobilization of the left lobe of the liver through its coronary ligament dissection (Kocher, 1911); transection of a crus of diaphragm (Clairmont, 1921); incision of diaphragm in the area of its esophageal hiatus (Hörhammer, 1923); transection of a diaphragm tendon (K.P. Sapozhkov, 1930); diaphragmocrurotomy (A. G. Savinykh, 1931); double-stage operations (mobilization and cardia transfer into the pleural cavity at the beginning and its removal with reconstruction on the second stage) were popularized by many authors (Zaayer, 1913; V. S . Levit, 1928 etc.); application of thoracic access (Sanerbruch, 1932; Nissen, 1937; Garlock, 1943; V. I . Kazanskiy, 1945; B. V. Petrovskiy,1946); combined thoracoabdominal access (Ohsawa, 1932) with the obligatory removal of a bottom of a stomach.

Further improvements in surgery of the esophagus and cardia cancer are associated with the names of A. Rusanov (1955) - the formation of gastric tube after resection of the cardia and the lesser curvature of the stomach, P. A. Androsov (1960) - replacing of the resected esophagus with the small and large intestine;

P.N. Napalkova (1963, 1969) - two-stage operations of removal and plastic surgery of the esophagus with demucosation of the thoracic esophagus;

A. A. Shalimova (1962) – application of a staged thoracoabdominal access; A.A. Shalimov S.A. Shalimova (1970) - combined thoracoabdominal access with transection of costal arch, partial median diaphragmotomy and preservation of the diaphragm innervation.

In recent years, an interest towards implementation of various surgical operations using video endoscopic technologies has aroused in the world. It is quite natural that the surgery of the esophagus has also become a subject to numerous attempts to implement this technique.

Proponents of video endoscopic approach try one of surgical approaches - thoracotomy, laparotomy or diaphragmotomy - replaced by the corresponding video-thoracoscopy, video-laparoscopy or video-mediastinoscopy. J.C. Lin et al. [27] believe that such a minimal access significantly reduces the traumaticity of operations. J.M. Collard [12] also sees in this approach additional diagnostic advantages.

Performance of video-endoscopic operations on the esophagus requires high qualifications and availability of special sophisticated equipment. O.J.McAnena et al. [33] formulated the five basic principles for the performance of these surgical operations: 1) confidence in the absence of evidence of tumor local invasion; 2) double-lumen anesthesia and complete collapse of the right lung during surgery; 3) simultaneous use of a flexible gastroscope; 4) high-quality illumination; 5) minimal blood loss during dissection.

An opportunity to use the full set of videoscopic equipment and instruments requires at least four-five incisions [20]. Kuzin N.M. et al. [5] to perform videoscopic mobilization and transection of the esophagus made four incisions: in the 10th, 9th and 8th intercostal space on the scapular line, and in the 7th intercostal space on the posterior axillary line. A patient was lying horizontally on his belly. Seven manipulation trocars were introduced into the incisions. Apparently, such operations cannot be called simple. The duration of operations reflects its complexity, for example, it takes 460 minutes (7-8 hours) for JD Luketich et al. [30] to perform them. In comparison with a surgery of 2-2,5 hours applying thoracoabdominal access duration difference is significant enough.

The most common use of video-endoscopic operations is instead of right thoracotomy. A. Cuschieri [14] insists that it allows to resect tumors of the middle and lower thirds of the esophagus and to perform lymphadenectomy. D.M. Lloyd et al. [29] modified the standard procedure developed by Lewis: the right thoracotomy was replaced by thoracoscopic surgery, in the course of which authors not only mobilized and resected the esophagus, but also created esophagogastric anastomosis using stapling devices. H.P. Liu [28] et al. see the benefits of such an approach in reducing the traumaticity of operations, and in facilitating the postoperative period passing, since the small intercostal incisions do not hamper rib mobility.

Another scope of application is to use video-endoscopic technologies in addition to transhiatal access. As mentioned above, the major disadvantage of transhiatal access is the stage of a blunt exposure of the esophagus “blindly” which is fraught with serious complications. Video-mediastinoscopy can reduce the risk, as it allows to visualize such structures as the trachea, mainstem bronchi, aorta, vagus nerve, parietal pleura, as well as the lymph nodes. D. Alderson et al. [11] perform such operations with good results while treating elderly patients. A.L. DePaula et al. [15] rejected application of a classical laparotomy, since they perform gastric mobilization and a transhiatal exposure of the esophagus by means of video-laparo-mediastinoscopy, and the only "true" incision is made only on the neck - to create the esophagogastric anastomosis. However, the number of operations performed in accordance with such methods is not numerous.

Despite the apparent advantages, video-endoscopic approach has many disadvantages. It is impossible to replace thoracotomy by thoracoscopy in patients whose pleural cavity is imperforated with adhesions. Duration of an operation increases significantly. The number of postoperative complications increases as well [16]. Possible complications are: pulmonary complications [33, 38] (including pneumothorax [30]), hemorrhage (including hemorrhage of an aorta [14]), as well as, anastomotic dehiscence [30, 38]. Sometimes, due to the fact of complications in the course of a surgical operation it is necessary to resort to thoracotomy [20]. In relation to the high rate of complications O.J. McAnena et al. [33] came to the conclusion that such methods are not yet safe enough to be recommended for wide application.

It is quite evident that a video-endoscopic approach can be successfully applied in treatment of non-neoplastic pathologies of the esophagus: leiomyomas, gastroesophageal reflux, intramural cystic lesions, achalasias, iatrogenic perforations and malformations in children.

In the clinic of the National Cancer Institute of Ukraine an oblique left thoracoabdominal access modified by prof. Ganula V.L. is used for surgical operations in the cardioesophageal area.

After putting under anesthesia, the patient is turned on the right side in such a way that a roll of an operating table is placed under a projection of the center of the tumor mass and thus as close as possible to the edges of the future incisional wound. The patient's left arm is thrown forward and upward and placed on a special holder of the operating table. It provides maximum space for the surgical team, and the patient is kept in conventionally functional position, thus avoiding patient placement complications.

Surgical operation starts with an oblique laparotomy. Incision line presents itself a single unit that will be located on the selected intercostal space from the broadest muscle of back to the umbilicus. After a layer-by-layer dissection of the abdominal wall from the costal cartilage to the umbilicus, manual and partly visual surgical revision of a neoplastic process in the stomach is performed. To detect operability and resectability of a neoplastic process manual estimation of an extension of a neoplastic process is performed. It is done for the purpose of a possible correction of thoracic access. If only the abdominal part of esophagus is affected by a tumor, there is no need in a wide thoracotomy. That is why it is possible to limit the size of an incision. Whereas, the standard incision is done through all the layers of intercostal space from the costal cartilage to the broadest muscle of back. Thoracotomy in the 7th intercostal space is considered to be a standard access on condition that a tumor extension into the esophagus does not exceed 5 cm. For tumors extending more than 5 cm towards the esophagus surgical access is performed in the 6th intercostal space.

The costal cartilage is dissected out, making two parallel incisions with the removal of not more than 1 cm of the cartilage. A smaller dissection of the cartilage won’t allow to approximate wound edges later on in a proper way, and a wider dissection will cause deformation of the thorax shape while stitching. The last one occurs because of too close approximation of two stitching ribs and, as a result, causes deformation of a shape and a function of the costovertebral joint.

A careful hemostasis of the wound surface is performed. A partial or complete (depending on the tumors extension) diaphragmotomy with a deligation of the phrenic vessels is performed.

With the help of a retractor wound edges are diverged.

If it is necessary the pulmonary ligament is transected to the lung root vasculature.

Access is completed.

Owing to such an access a surgeon is able to manipulate in the upper abdominal cavity up to the urinary bladder. There are no obstructions for manipulation in the left kidney, adrenal, spleen, and retroperitoneal lymph nodes. Such an access makes it difficult to manipulate: the right lobe of the liver, gall bladder, the right colon and the sigmoid colon, ovaries.

In the thorax cavity due to such an access an opportunity appears to manipulate in the left lung, esophagus up to the aortic arch, and mediastinal lymph nodes on the left. The right half of the thorax cavity through such an access is not actually available, even on condition of opening of the opposite pleura it is impossible to manipulate in there.

On performing a surgical operation, the procedure of surgical access closure is applied.

At first it is necessary to insert a drain tubes. Then integrity of the diaphragm should be restored. The basic requirement on the given stage is a free location of a graft in the diaphragm aperture with its fixation by interrupted stitches. The aim of this procedure is to avoid strong compression of a graft in the diaphragm aperture and, consequently, disorder in its nutrition and functioning. Furthermore, it prevents eventration and knuckle in the diaphragm aperture.

Then the abdominal wall should be restored. After it restoration of the integrity of the rib cage is performed. The next step is a layered closure of a surgical wound incision. Wound incision is healing during the same period of time as it would be while applying laparotomy. Removal of sutures is carried out on the 7-10th day, taking in consideration their condition.

The Department of Thoracic Cavity Tumors of the National Cancer Institute performed over 2,400 radical surgeries of the carcinoma of the esophagogastric junction. Postoperative complications were 10.2% and a mortality rate of was 1.1%. All operations were performed by means of a thoracoabdominal access.

An average duration of the standard surgery for carcinoma of the esophagogastric junction is 2.5 - 3 hours.

Length of stay in the intensive care unit is 2-3 days. And a length of hospital stay for a patient after such a surgery is 8-10 days.

We also would like to remind, that the majority of operated patients in our clinic had the third stage of gastric cancer.

The majority of patients belonged to the elder age group and had the relevant co-morbidities, many of which had had a special pre-surgical treatment (chemotherapy, radiotherapy).