COMPARATIVE EVALUATION OF VARIOUS APPROACHES FOR SURGICAL TREATMENT OF SPONTANEOUS ESOPHAGEAL RUPTURE

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RESUME

A ruptura espontânea do esôfago é relativamente rara, variando de 2 a 3% de todos os casos de lesões esofágicas com mortalidade acima de 90% devido ao desenvolvimento de complicações graves, como mediastinite purulenta, sepse, empiema pleural, pericardite, erosão de grandes navios de sredosteniye e multiorg um fracasso. 22 pacientes com ruptura espontânea do esôfago foram tratados no Hospital Clínico Regional de Voronezh nº 1 no período de 1998 a 2017. Todos os pacientes foram divididos em 4 grupos: grupo 1 - 8 pacientes submetidos à drenagem da cavidade pleural; grupo 2 - 2 pacientes com sutura das feridas de esôfago; grupo 3 - 2 pacientes submetidos à sutura do defeito da parede esofágica, fundoplicatura com pontos cobertos pela parte inferior do estômago; grupo 4 - 10 pacientes com orifício perfurado não suturado, mas formado um manguito do fundo do estômago, cobrindo a perfuração (fundoplicatura segundo Chernousov), a cavidade pleural foi drenada. Entre os pacientes do grupo 1, a mortalidade foi de 62,5% (5 pacientes). Em pacientes do grupo 2, falha de sutura e mortalidade - 2 pacientes (100%). Nos pacientes do grupo 3, falência da sutura do esôfago e do manguito ocorreu em 2 pacientes (100%), 1 deles morreu. 2 pacientes (20%) morreram entre os pacientes do grupo 4. Os dados obtidos mostraram que o método mais eficaz de tratamento cirúrgico de pacientes com ruptura de esôfago é o método de confecção de um manguito pelo fundo do estômago, cobrindo a perfuração sem sutura o orifício perfurado.

Palavras-chave: Boerhaave syndrome, spontaneous, barogenous, perforation, esophageal rupture.

ABSTRACT

Spontaneous rupture of the esophagus is relatively rare, ranging from 2-3% of all cases of esophagus damages with mortality rate above 90% due to the development of severe complications, such as purulent mediastinitis, sepsis, pleural empyema, pericarditis, erosion of large vessels of mediastinum and multiorg an failure. 22 patients with spontaneous esophagealrupture were treated in Voronezh Regional Clinical Hospital No.1in the period from 1998 to 2017. All patients were divided into 4 groups: group 1 - 8 patients who underwent pleural cavity drainage; group 2 - 2 patients with suturing of the esophagus wounds; group 3 - 2 patients who underwent suturing of the esophageal wall defect, fundoplication with covered stitches by the bottom of the stomach; group 4 - 10 patients with perforated hole not sutured, but a cuff was formed from the bottom of the stomach, covering the perforation (fundoplication according to Chernousov), the pleural cavity was drained. Among the patients of group 1, the mortality rate was 62.5% (5 patients). In patients of group 2, suture failure and mortality - 2 patients (100%). In patients of group 3, failure of the esophagus and cuff sutures occurred in 2 patients (100%), 1 of them died. 2 patients (20%) died among the patients of group 4. The obtained data showed that the most effective method of surgical treatment of patients with esophageal rupture is the method of forming a cuff from the bottom of the stomach, covering the perforation without suturing the perforated hole.

Keywords: Boerhaave syndrome, spontaneous, barogenous, perforation, esophageal rupture.

1. INTRODUCTION:

Spontaneous rupture of the esophagus (Boerhaave syndrome) was first described in 1724 by a Dutch physician Herman Boerhaave (Herman Boerhaave 1668-1738) (Flynn, 1989; Kochukov, 2012) and is a serious disease, the timely diagnosis of which is very difficult due to its rarity, the variety of clinical manifestations, often simulating various pathologies from other organs, as well as the lack of awareness among most doctors. Due to high lethality rate (25-85%) and the significant difficulty of diagnosis, the correct diagnosis is often established only posthumously with autopsy (Miroshnikov *et al.,* 1998; Gorelik *et al.,* 2018). In 95% of cases, a rupture of the left wall of the esophagus occurs, in 5% - a rupture of the right wall (Soldati di Piero *et al.,* 2000). Spontaneous ruptures of the esophagus account for 2-3% of all cases of esophageal damages, most often they occur in men older than 50 years. 40% of such patients are alcoholics. Some authors propose active tactic for treatment of esophageal perforations, which consists in suturing the defect, however, unambiguous recommendations on the timing of such surgical intervention have not been determined yet (Huber-Lang *et al.,* 2006). With late diagnosis, patients are hospitalized already with severe purulent complications (phlegmon of deep cell spaces of the neck, mediastinitis, pleural empyema, sepsis, esophageal-respiratory fistulas, erosive bleeding), which complicates closing of the esophageal defect (Polyanko *et al.,* 2008; Kotiv *et al.,* 2015). The best results are achieved if Boerhaave syndrome is diagnosed early and adequate surgical treatment is performed within the first 12 hours after the rupture. If the intervention is delayed by more than 24 hours, the mortality rate (even with surgical intervention) reaches 50% or higher (Rayhan *et al.,* 2017), and with a delay of adequate treatment for 48 hours, it approaches 90%. If untreated, mortality is close to 100% (Yangiev *et al.,* 2003; Zavgorodnev *et al.,* 2007). The complexity of the clinical pattern, diagnosis, technical difficulties of surgical interventions on the esophagus and contiguous organs, as well as the lack of a unified

approach in the treatment of patients with Boerhaave syndrome determine the significance of the problem and the necessity of scientific search for ways to solve it.

Purpose of the study is Improving the results of treatment of patients with spontaneous rupture of the esophagus.

2. MATERIALS AND METHODS:

In the period from 1998 to 2017, inclusive, in the department of thoracic surgery of Voronezh Regional Clinical Hospital No. 1, 22 patients were treated for spontaneous rupture of the esophagus. The average age of patients was 58 ± 26 years. Of those, 19 patients were male and 3 female patients. The period from the moment of the rupture to the moment of seeking primary health care ranged from 5 hours to 11 days. The length of the raptures ranged from 1.5 cm to 8 cm.

All patients received complex treatment, including antibacterial therapy, detoxification, symptomatic therapy, as well as measures aimed at maintaining water-electrolyte and protein-energy balance, correction of concomitant pathology was carried out.

Depending on the surgical treatment, patients were divided into 4 groups.

The first group included 8 patients who, in case of intrapleural complications, had a drainage of the pleural cavity followed by passive or active aspiration. The duration of treatment in this group averaged about 3 months.

The second group included 2 patients who underwent suturing of the esophageal wall defect, draining of the pleural cavity with subsequent passive or active aspiration

The third group consisted of 2 patients who underwent suturing of the esophageal wall defect, fundoplication with covering the sutures from the bottom of the stomach.

The fourth group included 10 patients. They underwent surgical treatment, which consisted in the formation of a cuff covering the perforated hole and capturing both walls of the stomach and esophagus into the sutures, and drainage of the pleural cavity. With this method of surgical treatment, suturing of the perforated hole was not performed (fundoplication according to Chernousov). The duration of treatment averaged 18 days.

3. RESULTS AND DISCUSSION:

Analysis of the treatment results showed that in the first group, 2 patients (25%) had esophageal-pleural fistulas, mortality rate was 62.5% (5 patients). The lives of 3 patients (37.5%) were saved.

Purulent-septic complications developed in all patients of the second group, mortality rate was 100%. One patient died on the 21st day, and the second patient – on the 108th day.

In the third group, in both cases, inconsistency of the esophagus and cuff sutures developed; mortality rate was 50%. One patient died of purulent-septic complications on the 7th day. The second patient was discharged on the 47thday.

In the fourth group, purulent-septic complications developed in 2 patients (20%) who

died on the 6thand 7thdays.

As an example, let us review several clinical cases of treatment of patients with esophageal rupture using different treatment tactics (Table 1)

Table 1. *Clinical Profile of Patients*

Studied parameters	**Groups of patients**			
	Group 1	Group 2	Group 3	Group 4
Average age (years)	58±26			
Time from rupture to admission	5 hours to 11 days			
Treatment duration (days)	90	21 -108	7-47	18
Complications (%)	25	100	100	20
Lethality (%)	62.5	100	50	20

Case1. Patient K., 64 years old, was urgently admitted to the thoracic department by ambulance from the city hospital No. 8, on March 8, 2017 with a suspicion of esophageal rupture three days after the disease occurred.

From the anamnesis: the disease was associated with sudden vomiting after eating. Pain in the chest on both sides, shortness of breath at rest developed on the third day, body temperature rose to 38 °C. On examination: the patient's condition was moderately severe. The patient was conscious, body position is active, the skin was of normal color. Breathing was independent, rhythmic with no rales in the lungs, respiratory rate – 16 per minute. Pulse – 72 beats/min. Blood pressure– 120/80 mmHg. The abdomen was soft, painless. Peritoneal symptoms were negative. Esophagogastroscopy was performed – a defect was found in the lower third of the esophagus with a size of 1.5 cm.

Anterolateral thoracotomy in the 6thintercostal space on the left was performed under general anesthesia. A turbid effusion with fibrin was found in the pleural cavity; copious purulent effusion and air were released from the mediastinum. The mediastinum was widely opened, the esophagus was mobilized. There was a longitudinal rupture of 1.5 cm in the lower third of the esophagus. The chest cavity was sanitized with 3 liters of normal saline solution. The esophagus wound was not sutured, two drainages were installed in the pleural cavity: one drainage in the 8th intercostal space along the posterior axillary line was brought to the place of the esophagus rupture, the second drainage in the 6thintercostal space along the posterior axillary line was placed under the lung. An endonasal tube was inserted into the stomach to monitor and nourish the patient.

In the postoperative period in the intensive care unit the patient was on mechanical ventilation, the patient's condition was serious. Infusion, antibacterial, symptomatic therapy, parenteral and enteral nutrition, active aspiration from the pleural cavities were conducted. Despite the treatment, the patient's condition showed negative dynamics, there were signs of multiple organ failure. On April 13, 2017 the patient's condition deteriorated sharply, blood pressure was maintained by high doses of vasopressors. On April 14, 2017 at 9.00 a.m. the patient had a cardiac arrest, resuscitation measures had no effect. On April 14, 2017 at 9.30 a.m. biological death was certified.

Autopsy results: the cause of the patient's death was purulent mediastinitis, bilateral focal purulent pneumonia, sepsis, infectious-toxic shock and multiple organ failure.

Case 2: Patient V., 54 years old, was urgently admitted to the thoracic department of Voronezh Regional Clinical Hospital No. 1 on April 02, 1999 with complaints of weakness, left-sided chest pain, shortness of breath at rest.

From the anamnesis: the patient was admitted to the central district hospital a day after the disease occurred, where during the X-ray examination, hydrothorax on the left side was diagnosed and the pleural cavity was drained on the left side. Upon the deterioration in the patient's condition, an X-ray examination with contrast was performed and a rupture of the lower third of the esophagus was found. For further treatment, the patient was transferred to Voronezh Regional Clinical Hospital No. 1.

Under general anesthesia, the patient underwent upper midline laparotomy. The diaphragm was dissected along the tendon expansion. The mediastinum was opened, the lower third of the esophagus was distinguished. The pleural cavity was sanitized several times with an aqueous solution. In the lower third of the esophagus there was a longitudinal gap of 2.5 cm in size. The mucous layer of the esophagus was sutured using atraumatic dissolvable stitches with a continuous suture. Then the second suture was applied with single interrupted stitches. The gastrostomy was superimposed and the mediastinum and left pleural cavity were drained: one drainage (in the 8^{th} intercostal space along the posterior axillary line) was brought to the place of the esophagus rupture, the second drainage (in the 6^{th} intercostal space along the posterior axillary line) was placed under the lung.

In the postoperative period the patient was on mechanical ventilation in the intensive care unit. Antibacterial complex therapy, parenteral and enteral nutrition, active aspiration and washing of the pleural cavity with antiseptics on the left side were carried out. The general medical status of the patient remained extremely serious. Signs of multiple organ failure and sepsis developed on February 23, 1999. On February 24, 1999 circulatory arrest occurred, resuscitation measures had no effect, biological death was certified.

Autopsy results of February 02, 1998: the cause of patient's death was purulent mediastinitis, fibro-purulent pleuritis on the left side, focal purulent pneumonia, sepsis and multiple organ failure.

Case 3: Patient A., 66 years old, was urgently admitted to the thoracic department on June 02, 2017 with complaints of weakness, chest pain on the left side, shortness of breath at rest. From the anamnesis: according to the patient, the above complaints appeared about 4 days ago. On examination, the general condition was moderately severe. Consciousness was clear, adequate. The speech was normal speech. The skin, visible mucous membranes were pale. Heavy breathing in the upper sections on both sides, weakened in the lower sections on the left side. There were no signs of tissue emphysema. Radiological diagnostics with contrast agent confirmed the diagnosis: perforation of the lower third of the esophagus,

bilateral pleural empyema.

The patient underwent a left-side anterolateral thoracotomy in the 6th intercostal space under general anesthesia. During intraoperative revision, fetid masses with admixture of gastric contents released from the left pleural cavity. The diaphragm was dissected along the tendon expansion. The mediastinum was opened, the lower third of the esophagus was distinguished. A longitudinal rupture of 3 cm in size was in the lower third. The pleural cavity was sanitized several times with an aqueous solution of dioxidine and chlorhexidine. The mucous layer of the esophagus was sutured using atraumatic absorbable thread Safil 3/0 with continuous stitch. Then the second suture was applied with single interrupted stitches (Safil 3/0) and a cuff was formed from the bottom and body of the stomach (according to Nissen).

The intersected left leg of the diaphragm was sutured using nylon, the cuff in the stomach was not transferred, left in the lower mediastinum. The diaphragm was sutured using double-row stitching with duplicate. The ring of the esophageal opening of the diaphragm was sharply weakened, flaccid, a finger passed near the cuff. The diaphragm tendon extension plasty was performed. A drainage to the esophageal rupture was placed in the 8th intercostal space along the posterior axillary line; the second drainage in the 6th intercostal space along the posterior axillary line was placed under the lung. The postoperative wound was sutured layer-by-layer. An endonasal tube was inserted into the stomach.

Antibacterial complex therapy, parenteral and enteral nutrition, and active aspiration from the pleural cavities were performed in the postoperative period in the intensive care unit. Despite the treatment, the patient's condition progressively deteriorated with the development of multiple organ failure. On June 23, 2017the patient went into cardiac arrest, resuscitation measures had no effect. Biological death was certified at 12:10 p.m.

Autopsy results of June 24, 2017: the cause of death of the patient was purulent mediastinitis, bilateral focal purulent pneumonia, sepsis, infectious-toxic shock and multiple organ failure.

Case 4: Patient K., 57 years old, was admitted to the surgical department of the Regional Clinical Hospital No. 1 on October 10, 2015, 2 days after the illness occurred. From the anamnesis: on October 27, 2015 the patient had a single vomiting at work and lost consciousness after that. After regaining consciousness, the patient continued to work until the end of the working day. At home, the patient's condition worsened, on October 28, 2015 at 6:50 a.m. the patient was delivered by the ambulance to the Rossosh district hospital, where a chest X-ray was performed and the diagnosis was established: spontaneous hydropneumothorax on the left side. Drainage of the left pleural cavity according to Bulau was performed. On October 29, 2015 the patient was transferred to the thoracic department of the Regional Clinical Hospital No. 1. Upon admission, the patient's condition was serious, complaints of severe pain behind the sternum, weakness, fever up to 38 °C. Pulse– 102 beats / min., blood pressure – 110/70 mm Hg. Cloudy fluid flowed down the drainage from the pleural cavities.

An emergency X-ray of the esophagus with urographin in a volume of 60 ml was performed on the patient, and no contrast drug intrusion was detected. In order to exclude spontaneous esophageal rupture, the patient underwent esophagogastroscopy, an oval shaped defect was found in the lower third of the esophagus, 3x1 cm in size with torn edges and a dirty-gray coating.

Under general anesthesia, the patient underwent anterolateral thoracotomy in the 6th

intercostal space on the left side. A cloudy exudation with fibrin was discovered in the pleural cavity, the lung was covered with fibrin. Purulence and air were released from the mediastinum. The mediastinum was widely opened, the esophagus was mobilized. A longitudinal esophageal rupture of 3x1 cm in size with necrosis of the mucous membrane edges and muscle layer was discovered in the lower third area. A cuff from the bottom of the stomach was formed (fundoplication according to Chernousov), which captured both walls of the stomach and the esophagus into the sutures. The wound of the esophagus was not sutured. The pleural cavity was washed with water solution of dioxidine and chlorhexidine. Three drainages were placed in the pleural cavity: the first was placed in the 8th intercostal space along the posterior axillary line to the place of the esophageal rupture, the second was placed in the 6th intercostal space along the posterior axillary line under the lung, the third was brought to the 7th intercostal space along the midclavicular line in front of the lung. The chest wound was sutured layer-by-layer. A feeding tube was inserted into the stomach.

In the postoperative period, the patient was treated in the intensive care unit. On the 2nd day, tube feeding was started. On the 7th day, the tube was removed, enteral nutrition was continued. On the 11th day of the postoperative period (November 09, 2015), CT scan of the chest organs showed an expansion of the mediastinum, a fluid with contrast was found in the right pleural cavity, which was a sign of cuff sutures failure. The failure of the sutures closed itself in 5 days. During the control X-ray examination of the pleural cavities there were no signs of fluid leakage, no discharge from the pleural cavities, the drainages were removed.

On December 15, 2015 the patient in satisfactory condition was transferred to the surgical department of the central district hospital for rehabilitation. During the examination two months later the patient had no complaints, no pathology of the esophagus was found.

4. CONCLUSION:

The results of our study showed that drainage of the pleural cavity with subsequent passive or active aspiration without and with suturing of the esophageal wall, as well as suturing of the esophageal wall defect with fundoplication with covering the sutures from the bottom of the stomach, leads to the development of severe purulent-septic complications with mortality rate from purulent mediastinitis, pneumonia, sepsis and multiple organ failure in the range of 50% -100%.

The most effective of the considered methods of surgical treatment is restoration of the torn esophagus without suturing the hole, but with the formation of a cuff from the bottom of the stomach covering the perforation, drainage of the pleural cavity and installation of nasogastric tube for nutritional support of the patient in the postoperative period. The use of this technique can significantly reduce the risk of developing severe purulent complications during spontaneous rupture of the esophagus.

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