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Acute purulent mediastinitis of various etiologies: issues of diagnosis and treatment methods

K.Kh. Boboev[1]

[1]*Assistant of the Department of General and Pediatric Surgery, Tashkent Medical Academy, Tashkent, Uzbekistan*

Abstract

The article discusses the development of an acute mediastinal process. Despite the progress of modern surgery, the achievement of asepsis and antisepsis, the great possibilities of antibacterial infusion and detoxification therapy, the incidence of mediastinitis and mortality remain high. Mediastinitis is one of the most significant etiological factors in the development of a septic condition. The problem of mediastinitis in relation to both the clarity of pathogenesis and diagnosis, and the effectiveness of therapy is far from being resolved.

Corresponding author: K.Kh.Boboev, assistant of the Department of General and Pediatric Surgery, Tashkent Medical Academy, Tashkent, Uzbekistan, e-mail: boboev_KKh@tma.uz

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INTRODUCTION

Acute purulent mediastinitis is a diffuse purulent-necrotic inflammation that spreads to the loose connective tissue of the mediastinum [1].

For the first time, acute purulent mediastinitis was described back in 1938 by Herman E. Pearse in a work entitled “Mediastinitis after neck phlegmon” [2].

Although A.K. Celsus and Claudius Galen. In particular, Galen in his practice removed fragments of the sternum and part of the pericardium involved in the process after an abscess of the anterior mediastinum [3].

Abu Ali ibn Sina introduced the term "putrid tumor" (Inflammatio velaminis), and the term "mediastinitis" appeared in the literature in the 12th century thanks to the works of Ibn Zor [4].

In most cases, purulent-necrotic inflammation is caused by a polymicrobial infection [5]. Often, the etiological causes of mediastinitis are such pathological processes as perforation of the upper gastrointestinal tract in the form of iatrogenesis during endoscopy, with anastomosis failure after operations on the esophagus, after perforation by a swallowed foreign body, or after severe vomiting in Boerhaave's syndrome [6].

However, the most common occurrence of the possibility of the formation of acute purulent mediastinitis is the descending path with an odontogenic or peritonsillar infection [7].

Such pathological processes are known as descending necrotizing mediastinitis or cervical -mediastinal necrotizing fasciitis [8].

Descending necrotizing mediastinitis occurs in approximately 5.1 cases per 1 million populations per year [9].

Spread of infection from the chest wall or from the adjacent lung parenchyma can also cause acute mediastinitis. Finally, acute mediastinitis can occur as a result of surgical interventions in the mediastinum. This type of acute mediastinitis is from 1% to 2.7% of all cases [10].

Acute mediastinitis can also occur on the basis of a penetrating wound of the chest. There are exceptional cases when mediastinitis is a consequence of hematogenous bacterial super-

infection after infectious mononucleosis or as a complication against the background of immunodeficiencies [11].

MATERIAL AND METHODS

The results of the examination and treatment of 84 patients who were treated for acute purulent mediastinitis at the clinic of the Republican Center for Purulent Surgery and Surgical Complications of Diabetes Mellitus of the Ministry of Health of the Republic of Uzbekistan from 2000 to 2022 are analyzed. Patients with acute purulent mediastinitis after cardiac surgery were deliberately not included in our studies.

The mean age of the patients was 56.5±24.5 years. The group included 56 male patients and 28 female patients. The main research methods were reduced to identifying the etiology of the pathological process, the duration of the disease, the features of its development and course, microbiological studies, methods of treatment and their results. The analysis of the causes of mortality among patients with acute purulent mediastinitis was also carried out separately.

RESULTS

All etiological factors in the development of acute purulent mediastinitis are divided into 3 groups: perforative, complications of purulent-inflammatory diseases of the submandibular zone and the neck, hematogenous and 1 case with unknown etiology (Figure 1 and 2).

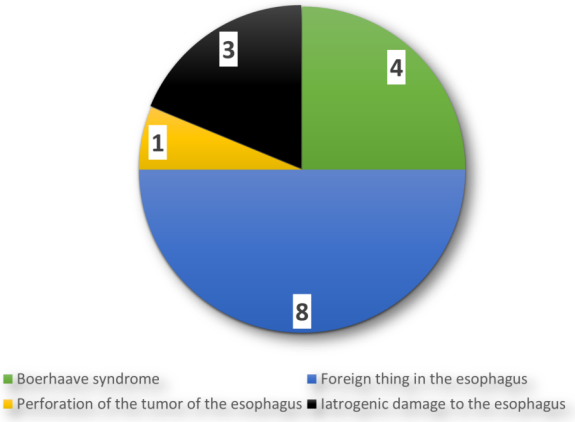

Figure 1. Etiological cause of mediastinitis (absolute number of patients)

The largest number of patients were patients with complications of purulent-inflammatory diseases of the submandibular zone and the neck region (76.2%). The lion's share was made up of patients with odontogenic phlegmon of the neck (47.6%) and adenophlegmon of the neck (16.7%).

Among the etiological factors of a perforative nature, the largest number of cases with a foreign body of the esophagus (9.5%) was noted. In all cases it was a fish bone. Patients with esophageal tumor perforation and iatrogenic damage to the esophagus met in the same proportion (2 cases each). Boerhaave's syndrome was diagnosed by us in 4 patients (4.8%). In 3 patients, acute purulent mediastinitis of hematogenous etiology was diagnosed against the background of the development of abscessing pneumonia (1.2%) and necrotizing fasciitis of the axillary region (2.4%). In 1 patient, the etiological cause of acute purulent mediastinitis could not be determined.

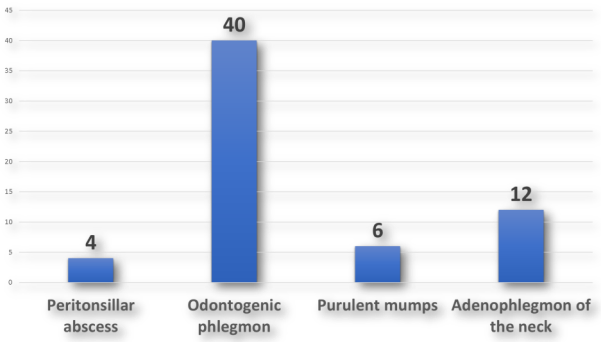

Figure 2. Etiological cause of inflammatory mediastinitis (absolute number of patients)

The average duration of the disease development was 6.2±3.8 days. In some cases, terms and up to a 2-week period for the development of acute purulent mediastinitis were noted. So, for example, if in patients with an iatrogenic cause of acute purulent mediastinitis it was very short (1-2 days), then in the case of a hematogenous cause of the development of the disease, the terms were protracted.

The spectrum of cultivated microbes was represented by an extensive polymorphism of the bacterial flora. The majority were Gram-positive (57%) bacteria. Gram-negative bacteria were found in 33% of cases, and fungal flora in 10% of cases.

Staphylococci and streptococci were the most common microbes cultivated in the Gram-positive group. Fusobacteria and Enterobacteria were the most common microbes in the Gram-negative group. Prevotella and Candida - were dominant in fungal infection.

A total of 252 surgical interventions were performed (figure 3 and 4). Statistically, each patient has an average of 3 operations. To a greater extent, drainage of the mediastinum (61.1%) and opening of the mediastinum with a collar-shaped incision in the neck (36.1%) were performed. Often, surgical interventions were supplemented by the treatment of the primary

focus of infection. Thus, in 148 cases, drainage of the deep spaces of the neck was performed jointly with maxillofacial surgeons, 3 patients underwent tonsillectomy, and 1 patient underwent closure of the communication between the pharynx and the pharyngeal space. All these procedures were performed directly by an otorhinolaryngologist. Removal of decayed teeth was performed in 38 patients. Laparotomy with drainage of the abdominal cavity was performed in 2 patients as a solution to particular cases of anastomotic failure after surgery on the esophagus. Other procedures were rarely used.

The average duration of hospital stay was 49.8±24.7 days. 25 patients (29.8%) died due to acute mediastinitis.

Figure 3. Stages of a surgical operation opening mediastinitis

Figure 4. Cavity contents

DISCUSSION OF THE RESULTS

Anamnesis plays a very important role in the diagnosis of acute purulent mediastinitis [12].

According to the anamnesis, it is possible to draw a conclusion about the etiology. It must be borne in mind that the ingestion of foreign bodies, such as chicken or fish bones, can cause perforation of the esophagus, and then acute purulent mediastinitis.

Boerhaave's syndrome is the name given to perforation of the esophagus after strenuous vomiting [13].

If there is a history of tonsillitis or odontogenic infection, descending necrotizing mediastinitis should be considered [14].

Acute purulent mediastinitis after iatrogenic perforation has a very short history, since these patients were immediately placed in the intensive care unit and adequate surgical treatment was started. A longer anamnesis was in patients who were diagnosed in our clinic or in the hospital closest to us.

Signs and symptoms of acute purulent mediastinitis depend on the etiology [15].

Descending mediastinitis, like mediastinitis after perforation of the upper esophagus, is manifested by fever, sore throat, dysphagia, and swelling of the soft tissues of the neck [16].

A characteristic symptom is subcutaneous crepitus of the soft tissues of the neck. This can be caused both by gas in the soft tissues of the neck, which occurs as a result of bacterial metabolism, and by perforation of the esophagus [17].

Odontogenic or peritonsillar infections are characterized by difficulty in swallowing or opening the mouth [18].

With the development of infection, trismus of masticatory muscles or stridor can be detected, which is caused by damage to the recurrent laryngeal nerve [19].

If the perforation is in the middle part of the esophagus, there may be pain behind the sternum or pain in the epigastrium. Perforation near the gastroesophageal junction can lead to peritonitis [2].

Rapid progression and rapid development of septic shock are characteristic of all types of mediastinitis. Laboratory signs are nonspecific. Leukocytosis and elevated levels of C-reactive protein are noted. During the course of the disease, signs of multiple organ failure syndrome are found [4].

Computed tomography of the neck and chest is the most important imaging method that allows localization and examination of the inflammatory process [9].

In this way, we can perform the surgical procedure more accurately.

The literature describes a wide age range [17].

Various articles present patients from 40 to 90 years of age. Both extremes are quite rare, as our study confirms.

Acute mediastinitis is characterized by a polymicrobial spectrum of pathogens [8].

Bacteria of all different classes are cultivated

for each form of the disease. Gram-positive bacteria are the most common, followed by anaerobic bacteria. In 78% of cases, the infection has a combined form. In isolated cases, monoinfections are found.

Surgical treatment consists in opening purulent spaces and removing necrotic tissues, adequate sanitation of the mediastinum and with the installation of drains. Surgical intervention should be carried out early, in sufficient volume and depend on the spread of inflammation [10,19]. According to the Endo classification of mediastinitis (1999), patients of group I need to perform drainage of the upper mediastinum through collar mediastinotomy and drainage of deep spaces of the neck. These patients have a better survival rate. The literature provides information on survival in these cases up to 85%. Sanitation and drainage of the anterior mediastinum are recommended for patients of group II A.

The literature describes access to the anterior mediastinum through a median sternotomy. However, this access is not used in our clinic. If the patient is in group IIB, a paravertebral mediastinotomy is indicated through a posterolateral thoracotomy. There are different approaches in the literature [12, 13].

Some authors recommend posterolateral thoracotomy, some bilateral transversal sternothoracotomy. If necessary, repeated revisions are carried out with additional sanitation of both the pleural cavity and the mediastinum. These approaches are combined with drainage of deep spaces of the neck and collar mediastinotomy, depending on the etiology.

Minimally invasive techniques such as videothoracoscopy are more commonly used to treat acute mediastinitis, but we do not perform such procedures. But with purulent-necrotic spread of the process, “open” surgical intervention is preferable, since it is more radical [3,8].

Patients should be in the intensive care unit and intensive care, under careful monitoring of the parameters of vital organs. In most cases, intubation and mechanical ventilation are required [3,6].

In the case of acute purulent mediastinitis, we prefer emergency surgical intervention. Surgical treatment is always supported by antibiotics. Already in the early stages, antibiotic therapy begins with an empirical broad spectrum of action. On the following day, antibiotic therapy is transferred to the target, according to the results of bacteriological examination of the samples taken [4,11,16,19].

Despite early surgery and early treatment, the mortality rate is quite high. The mortality range is 5.6% to 40% [3,10,17].

CONCLUSIONS:

1. Despite the availability of modern methods of examination and early surgical treatment, acute purulent mediastinitis remains a life-threatening disease with high mortality.

2. To make a correct diagnosis, a history of the development of the disease is necessary (dental caries, peritonsillar inflammation, etc.). The correct diagnosis is confirmed by clinical signs and symptoms of acute purulent mediastinitis. Computed tomography plays a critical role in assessing the spread of acute mediastinitis.

3. According to the spread of inflammation, we performed the appropriate surgical procedure. Early diagnosis and aggressive surgical procedure are one of the most important factors in treatment. Of course, surgical treatment is supported by broad-spectrum antibiotics. Patients are placed in the intensive care unit from the beginning of their hospitalization.

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Compliance with patient rights & principles of bioethics - All patients gave written informed consent to participate in the study.

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