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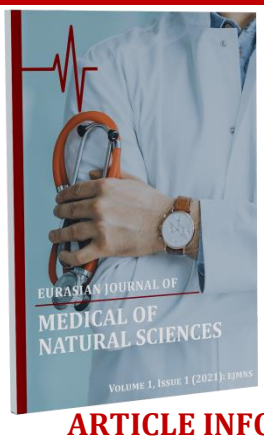

OPTIMIZATION OF DIAGNOSTICS AND TACTICS OF TREATMENT OF RIGID HYDROTHORAX

Eshonkhodjaev O.D.
Tursunov N.T.
Amonov B.B.,
Yakubov B.F.
Republican Specialized Scientific and Practical Medical Center of Surgery
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ABSTRACT

Rigid hydrothorax is a condition characterized by persistent fluid accumulation in the pleural cavity, which can cause significant narrowing of lung volume and complications in respiratory function. This condition has serious clinical significance and requires timely intervention.

Introduction. Pleurisy as an independent inflammatory disease, as well as a syndrome accompanying other diseases, is still an object of constant attention not only for surgeons, but also for researchers of other specialties. Chest drainage was first applied in the XIX century and was used as the only method of treatment of the disease, especially widely used during the influenza epidemic in 1917-1919. The increase in the number of patients with effusion pleurisy at present is associated with a wide spread of nonspecific lung diseases, tuberculosis, lung tumors. Bacterial pneumonia in 40% of cases is accompanied by pleural effusion, lung cancer - in 15-50%, breast cancer in late stages - in 48%. The specific weight of pleurisy in the structure of general morbidity is up to 4% [2, 3]. The problem of treatment optimization becomes obvious due to the increasing number of these patients [1, 4].

A large number of works concerning the problem have been published in the literature. Among private issues, the clarification of the etiology of the process remains central; however, the expansion of the range of diagnostic and therapeutic techniques has made the problem of optimizing their application obvious [5, 6]. Traditionally, in such cases, repeated punctures of the pleural cavity with radiologic control of the situation in dynamics are first attempted, and if unsuccessful - drainage of the pleural cavity without its examination [7]. However, in both cases, morphologic evaluation of the process that led to fluid accumulation in the pleura remains inaccessible, and the imbalance between exudation and resorption, which is the main mechanism of fluid accumulation in the pleural cavity, is not eliminated. More than a half of patients still have undrained areas of the pleural cavity, limited by fibrin deposits.

The majority of all patients with pathology of thoracic organs are patients with pleurisy. All patients with exudative pleurisy undergo pleural puncture with aspiration of pleural fluid. However, in approximately 20% of all patients, the diagnosis cannot be made by cytologic examination of pleural fluid alone. That is why, in the last twenty years, video thoracoscopy

(VTS) has become widespread worldwide as the final stage of diagnosis in the absence of morphologic examination of the diagnosis of exudative pleurisy. VTS provides high efficiency in differential diagnosis of pleural fluid of various etiologies with biopsy, which, according to different authors, is 95.5-100% [4].

The most common causes of pleural fluid are diseases of the cardiovascular system, heart failure, malignant tumors, tuberculosis and inflammatory lung diseases. Rigid hydrothorax is characterized by the accumulation of pleural fluid, which forms dense connective tissue adhesions that prevent the normal movement of lung tissue. This can lead to difficulty breathing, chest pain, and hypoxia. Understanding the pathophysiologic mechanisms of this condition is critical to choosing the correct treatment tactics[8].

Hydrothorax is a condition in which fluid builds up in the pleural cavity, which can cause chest pain and respiratory depression (shortness of breath, poor exercise tolerance). Hydrothorax is also called thoracic hydrocele.

In Germany, there are approximately 400,000-500,000 cases per year per 85 million people.

In Uzbekistan, the number of cases of hydrothorax is unknown due to the lack of systematization of data, but given the European statistics, we can assume that in Russia hydrothorax is about 430-580 thousand people a year. It should be noted that the disease develops in people of all ages[9].

Hydrothorax is considered only an accumulation of fluid, not pus (pyothorax), blood (hemothorax), chylous (lymph with a lot of fat; chylothorax), urine (urinothorax), etc. It is impossible to foresee and prevent the appearance of hydrothorax, but the doctor can notice it at an early stage. Timely detection of this condition and adequate drug therapy can avoid surgical intervention. Hydrothorax is not an independent disease. It occurs as a complication of another disease [1]. To find out the underlying cause, it is necessary to analyze the fluid and determine its composition[10].

Causes of hydrothorax

Hydrothorax develops when too much fluid enters the cavity or when the body eliminates fluid 30 times slower than normal. There are many possible causes of this condition, so only a few are listed below:

- pneumonia;
- tuberculosis;
- heart failure;
- liver failure;
- kidney failure;
- metastatic lesions of the pleura in cancer;
- multi-organ failure;
- drug therapy, such as taking Amiodarone, Nitrofurantoin, Interleukin-2 and some other drugs.

Hereditary predisposition and sex dependence are not present or have not been evaluated according to scientific publications. However, one scientific paper reports a higher incidence of hepatic hydrothorax in men relative to women (1.67:1). In other words, the statistics of hydrothorax by sex and age depend on the cause[11].

Symptoms of hydrothorax

For a long time, hydrothorax can proceed without symptoms, since the main syndrome - respiratory failure - develops only with a significant accumulation of fluid. With an asymptomatic course, the pathology is found accidentally.

The amount of fluid that will begin to cause shortness of breath depends on many factors, such as age, the presence of chronic cardiologic and respiratory diseases, physical development and the general condition of the person. Typically, symptoms appear when there is an accumulation of 500 ml or more of fluid[12].

These include:

- Tachypnea - rapid shallow breathing (more than 16-18 respiratory movements per minute) and dyspnea (a feeling of shortness of breath that can appear both during physical exertion and in a calm state). Occurs with a large volume of fluid (more than 1.5 liters). In some cases, additional examination is required to exclude other concomitant pathologies.

- Rapid fatigue - severe fatigue with minimal physical activity. In the early stages and with a small volume of fluid usually appears during intense exertion, in other cases, it can bother the patient and in everyday activities.

- Constant chest pain - a pressing pain from the inside of the chest on the side of the fluid accumulation.

- A feeling of chest tightness - a constant feeling of compression similar to a “corset”.

- Inability to take deep breaths.

- Lagging respiratory movements of the chest on the side of fluid accumulation - usually manifested in unilateral lesions.

- Bulging of the intercostal spaces on the side of the lesion (does not always appear).

- Dry cough - in some cases, the cough develops due to the lesion of the pleura and displacement of the mediastinum by the accumulated fluid.

- Dizziness.

Symptoms of hydrothorax usually do not depend on the cause, but the underlying disease and weakening of the body can provoke their earlier manifestation.

With the development of hydrothorax on the background of heart failure, swelling of the legs and swelling of the neck veins are sometimes observed. The patient has to keep his head above the body (even when sleeping) to reduce shortness of breath and the load on the heart.

Pathogenesis of hydrothorax Normally, each person has a minimal amount of pleural fluid (10-20 ml), which is necessary for the lung to glide during breathing, while pathologic accumulation of fluid in the lower parts of the thoracic cavity squeezes the lung and does not allow it to expand normally. This leads to impaired gas exchange and the development of compensatory respiratory failure, when the body tries to keep the normal amount of oxygen in the blood by increasing the rate of breathing. There are two main mechanisms for increasing the volume of fluid in the lungs:

- Decrease in oncotic (protein) pressure in the blood due to decreased levels of various proteins (mainly albumin). The most common causes are hypoproteinemia (low level of total protein in the blood), starvation, digestive tract disorders, protein loss with urine in kidney disease, impaired protein synthesis by the liver and heart failure. When the concentration of protein decreases, the liquid part of the blood (plasma) begins to pass through the walls of the

pleural cavity, resulting in hydrothorax. If the condition is accompanied by heart failure, the pumping function of the heart also decreases, so blood circulates more slowly through the body and fluid stagnates in the vessels. Gradually it “seeps” into the soft tissues of the legs, pleural and abdominal cavity, which leads to edema[13].

- Direct formation of fluid in the pleural cavity due to various pathological processes: lesions of the pleura by metastatic cells in cancer, wounds and trauma to the chest, viral infection of the lungs or heart, including pneumonia and other infectious processes in the pleural cavity (pleurisy). In such a case, there will be a large amount of protein in the pleural fluid, which is produced during the local immune response.

In the first mechanism (reduction of oncotic pressure in the blood), a transudate is formed, and in the second mechanism, an exudate is formed.

But in fact, the pathogenesis of hydrothorax is more complex, since there are other, “additional” mechanisms of its development, such as a violation of lymphatic drainage, in which inflammatory fluid passes through the diaphragm from the abdominal cavity and retroperitoneum[14].

Classification and stages of development of hydrothorax

• By composition, exudative and transudative hydrothorax (high and low protein) are distinguished.

• On the cause of development of hydrothorax can be:

• inflammatory - the disease is caused by purulent-inflammatory processes of thoracic organs, autoimmune inflammatory processes (connective tissue diseases, vasculitis, postinfarction Dressler syndrome), inflammation caused by external causes (trauma, physical or chemical impact on the pleural cavity),

• non-inflammatory - hydrothorax is provoked by hypoproteinemia, ie, conditions associated with low total protein (nephrotic syndrome, liver cirrhosis and malabsorption) or stagnation of fluid (impaired blood and lymph circulation, such as in heart failure).

• According to the amount of fluid allocated small, medium, large and total hydrothorax. There is no unified classification of hydrothorax by the amount of fluid, but most sources offer such a transcription:

• small hydrothorax - fluid accumulation up to 500 ml;

• medium - 500-1500 ml;

• large - more than 1500 ml;

• total - when almost the entire pleural cavity is filled with fluid.

• By location, the disease can be left-sided, right-sided and bilateral (on both sides).

• According to radiologic signs are distinguished:

• medium hydrothorax - up to the level of the lower angle of the scapula;

• large hydrothorax - above the lower angle of the scapula[15].

Complications of hydrothorax

The main complication of hydrothorax is respiratory failure, which is a combination of symptoms: dyspnea, rapid fatigue and a feeling of chest tightness. It sharply reduces the quality of life of patients, limits physical activity and forces to be in a certain posture that alleviates the condition.

Sometimes hydrothorax leads to pneumonia due to compression of the lung and disruption of its normal blood supply, as well as pulmonary embolism (TELA). When complications develop, the patient's temperature gradually rises, shortness of breath becomes more severe, there is a constant cough (with sputum in the case of pneumonia).

- Pleural empyema - when the fluid in the pleural cavity becomes infected and the infection spreads to the pleural sheets;

- heart rhythm disturbance (up to severe arrhythmia and cardiac arrest) - in massive hydrothorax, which leads to displacement of the mediastinum and heart failure[16].

Diagnosis of hydrothorax

If you suspect hydrothorax, as soon as possible it is necessary to consult a general practitioner, who will conduct an initial diagnosis and determine further actions.

During examination, the doctor may notice the lagging of half of the chest during breathing, bulging of the intercostal spaces, dulling of the sound when tapping, weakening or absence of breath sounds when listening.

At the appointment, the patient should specify the date of appearance of symptoms and tell how their dynamics changed (the condition worsened, improved or did not change). The doctor will find out all the details of the anamnesis (medical and life history), including whether there are any close blood relatives with oncologic diseases

If the patient has previously had a puncture for hydrothorax, he needs to give all the details: the date of the procedure, the volume of fluid and the time interval for which it was evacuated.

Instrumental diagnostics

The main methods of radial diagnostics of the chest organs are:

- radiography;
- ultrasonic diagnostics (ultrasound);
- computerized tomography (CT).

Most often used radiography and ultrasound, as the most cost-effective, accessible, but at the same time quite informative. CT is performed when the radiological picture is unclear, when detailed visualization of chest structures is necessary. It is also used in differential diagnosis, as CT shows the formations in the chest, including helping to assume what nature they have (benign or malignant).

When the doctor has no doubt that there is fluid in the pleural cavity, he performs thoracentesis (drainage of the pleural cavity), during which the fluid is removed with a needle and catheter. Thoracocentesis also has a therapeutic effect, as it relieves the patient's condition and lung function[17].

Examination of pathologic fluid

After puncture or drainage of the hydrothorax, a number of tests are performed to determine the cause of pleural effusion: visual inspection (analyze the color, consistency, presence of inclusions and sediment), biochemical analysis and cytological examination. Based on the results of the tests, it is possible to determine the cause of fluid accumulation with a high probability. For example:

- high levels of gamma-glutamyl transpeptidase (GGTP) and amylase indicate reactive pleurisy, which develops in pancreatitis;

- urea and creatinine indicate urinothorax;
- protein or white blood cells indicate inflammation;
- tumor cells - for a metastatic lesion or primary tumor.

In the latter case, the patient may also undergo positron emission tomography (PET), which determines the stage of the disease.

However, given the difficult accessibility, minimal number of PET units in Russia and high cost, this study is rarely ordered.

In case of suspected inflammatory reaction with accumulation of purulent discharge (pyothorax), culture on nutrient medium is performed to select antibacterial therapy[18].

Treatment of hydrothorax

There are no clinical guidelines for the treatment of hydrothorax in Uzbekistan. Most surgeons treat based on their life experience, medical literature and international clinical standards of therapy, such as the British Thoracic Society guidelines for the treatment of hydrothorax, as they are more relevant [7].

The treatment of hydrothorax depends on the volume of fluid and the nature of the occurrence. For example, in congestive heart failure, thoracentesis is indicated only if the volume of fluid is large or if the effusion does not disappear with medical treatment. In some cases, heart failure is only a concomitant pathology, then the doctor can also perform thoracentesis.

Pleural cavity drainage

If hydrothorax is diagnosed for the first time, a puncture (with a small amount of fluid) or drainage of the pleural cavity (with an accumulation of more than 500 ml of fluid) is mandatory. Usually, drainage is installed for a day, but if more than 200-300 ml of liquid is released during this time, it is left indefinitely until the contents are completely removed and it is made sure that the liquid does not accumulate again. At this time, they also analyze whether the nature and physiological properties of the liquid are changing.

Before puncture or drainage, the patient is given local anesthesia, so it is important to immediately inform the doctor about an allergy to any type of local anesthetics (for example, Lidocaine, Novocaine, Ropivacaine, etc.). It is usually impossible to make the procedure completely painless due to the peculiarities of the parietal (external) pleura, since it has pain receptors. The passage of the needle somehow causes an unpleasant sensation, but it passes quickly.

Drainage is installed along the upper edge of the underlying rib under ultrasound control to exclude the development of pneumothorax, hemothorax, bleeding, damage to the capsule or parenchyma of the liver, spleen and even kidney.

If the puncture is performed with a syringe without drainage, it is very important to send the resulting liquid for cytological examination (if necessary, with immunocytochemical analysis), to carry out inoculation for antibacterial sensitivity and biochemical examination (to determine the level of lactate dehydrogenase, creatinine and urea).

If more than 1,500 ml of liquid has accumulated in the pleural cavity, it is removed gradually, since simultaneous evacuation is associated with formidable complications in the form of cardiac arrhythmias, a sharp decrease in pressure, a decrease in the amount of total

protein, etc. If there is an accumulation of more than 3000 ml of liquid, it is removed for at least two days.

Treatment of recurrent hydrothorax

In patients with oncological diseases and metastatic lesions of the pleura, hydrothorax often recurs due to loss of total protein and a decrease in oncotic pressure, therefore, drainage is performed in two cases:

- if there is an unconfirmed tumor lesion of the parietal pleura and it is necessary to obtain fluid for cytological examination;
- in case of respiratory failure of II–III degree (i.e., a person has impaired breathing even in a calm state) as a result of accumulation of a large amount of fluid.

In addition, any surgical intervention in the pleural cavity is associated with various complications, such as bleeding, damage to the lung parenchyma, air leakage and empyema, which are especially undesirable for this group of patients.

One of the complications that can occur during repeated drainings is the formation of closed hydrothorax — accumulations of fluid isolated from each other by partitions. They make subsequent draining difficult, since the doctor cannot evacuate fluid from all cavities. In this case, the option of destruction of adhesions during surgical intervention (videothoracoscopy) is considered. It is important to note that the circumscribed hydrothorax does not depend on surgical complications in any way and can occur on its own.

In case of recurrent hydrothorax, which can be observed in patients with cancer, a channel port is sometimes installed [11]. This system is equipped with a valve mechanism that prevents air from entering through the channel, and allows you to independently evacuate fluid from the pleural cavity at home[19].

With recurrent hydrothorax, which force drainage of the pleural cavity more often than once every few weeks, pleurodesis is often used — artificial sealing of the pleural cavity. The decision to perform this operation is made by the patient together with the thoracic surgeon.

Pleurodesis reduces the free cavity and damages tumor cells that secrete fluid (in case of malignant lesion of the parietal pleura). Exists:

- biological pleurodesis (with blood);
- chemical (Talc, Iodine, cytostatic drugs);
- physical (argonoplasmic coagulation, electrocoagulation of the parietal pleura, physical damage to the pleura);
- combined (a combination of different methods).

During this operation, the patient is put under anesthesia and an endobronchial tube is installed for single-lung ventilation. With the help of a special device, the doctor burns the pleura — a thin film that lines the ribs from the inside and causes a large amount of fluid to be released. After damage to the pleural cells, the pathological secretion of fluid slows down. Aseptic inflammation also occurs with the development of "adhesion and fusion" of the lung with the pleura, which causes the free space where fluid previously accumulated to disappear[20].

However, pleurodesis is not always effective, and hydrothorax recurs after surgery. However, even in these cases, the volume of accumulated liquid decreases, which allows drainage to be performed less frequently.

The most effective options for pleurodesis are physical and combined [12][13]. The standard version of the procedure is thoracoscopic argonoplasmic pleurodesis (after several punctures in the chest).

Forecast. Prevention

The prognosis depends on many factors, and its exact definition is extremely difficult: it all depends on the cause of the hydrothorax, its volume, composition and management tactics of the patient. With timely access to a doctor, proper treatment and the non-oncological nature of the disease, the prognosis is usually favorable: the patient can expect a full recovery.

With recurrent hydrothorax, the prognosis is worse. Such results were obtained by monitoring patients with hepatic hydrothorax [16].

Prevention of hydrothorax

There are no reliable data and scientific studies that would indicate possible options for preventing the development of pathology. The only study that confirmed a reduction in the risk of developing hydrothorax was conducted among patients with primary liver cancer: those who underwent radical surgical treatment, i.e., the liver was removed using argon beam coagulation, hydrothorax developed less frequently than those who had stitches after liver removal [15].

The main prevention of the development of hydrothorax is the timely treatment of the underlying disease, which can lead to the development of this formidable condition.

Conclusions: Thus, the optimization of the diagnosis and treatment of rigid hydrothorax requires a well-coordinated approach, including advanced technologies and interdisciplinary cooperation. Further research is needed in the development of diagnostic and therapeutic procedures to improve patient outcomes. Thoracoscopic decortication and pleurectomy are effective and relatively safe methods of treating patients with fibrothorax and pancyric pleurisy. They contribute to improving the respiratory function and quality of life of patients, while being characterized by less trauma and faster recovery compared to traditional methods. However, to choose the optimal treatment method, it is necessary to take into account the individual characteristics of the patient and the degree of damage to the lung tissue.

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