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Pulmonary Echinococcosis Surgery

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ABSTRACT

We present an analysis of the results of surgical treatment of 182 patients with pulmonary echinococcosis (126 patients with uncomplicated and 56 with complicated pulmonary echinococcosis). Of these, only in 23 patients out of 25 planned, it was possible to carry out echinococcectomy purely thoracoscopically through trocar punctures. In 134 cases, videothoracoscopic echinococcectomy was performed using a mini-access. In case of bilateral localization of cysts, stage-by-stage operations were performed in 7 patients, and in 3 (36.36%) cases - single-stage echinococcectomy. Echinococcectomy from the lung was performed in 25 patients using a wide thoracotomy approach. In 134 cases, videothoracoscopic echinococcectomy was performed using a mini-access. In case of bilateral localization of cysts, stage-by-stage operations were performed in 7 patients, and in 3 (36.36%) cases - single-stage echinococcectomy. Echinococcectomy from the lung was performed in 25 patients using a wide thoracotomy approach. All patients underwent anterolateral thoracotomy. Basically (97.67%) performed organ-preserving operations with the elimination of the residual cavity in the light suture plastics in various modifications. In 2 patients with marginal location and pneumocirrhosis, marginal resection of the lung with an echinococcal cyst was performed. With combined echinococcosis of the lungs and liver, 10 patients were operated on. 6 patients underwent surgical interventions on the lungs and liver through separate approaches at the same time. The use of minimally invasive techniques for pulmonary echinococcosis is possible in more than 2/3 of patients.

KEYWORDS

Pulmonary echinococcosis, videothoracoscopic echinococcectomy.

INTRODUCTION

According to WHO, in endemic areas, the human incidence of echinococcosis is 50 cases per 100,000 people per year, and in some parts, the prevalence rates can reach 5-10%. Surgeons and infectious disease specialists from endemic regions of several countries of the world are particularly interested in this disease. Although parasites can infect various organs of the body, echinococcosis usually affects the liver and lungs. In adults, the lungs (18-35%) are the second most common localization of echinococcosis after the liver (50-70%). The mortality rate in echinococcosis reaches 2.5-7% [1, 5].

The only radical treatment for echinococcosis is still surgical. The introduction of endosurgical technology has eliminated one of the most significant drawbacks of traditional cavity surgery - the discrepancy between traumatic access and minimal intervention on the organ itself, and mini-invasive surgery has become a possible approach to the treatment of echinococcosis of the lungs. The wide development of operative endoscopy, low trauma rate and low complication rate, cost-effectiveness and reduced rehabilitation time of patients allows us to review the principles of treatment of patients with echinococcosis of all localizations [2, 3, 4].

Chemotherapy is considered suitable for small cysts (< 3 cm), patients with contraindications to surgery. Albendazole has better bioavailability and is more effective and is currently the drug of choice. Although the optimal duration of pharmacotherapy for echinococcosis of the lungs is unknown, it is usually prescribed for 3-6 months. More recently, it has been demonstrated that continuous therapy is more effective than cyclic therapy, without increasing side effects. Most lung cysts disappear 5-14 months after treatment [8, 9]. It has been demonstrated that treatment with albendazole in preoperative conditions, despite the high

concentration of albendazole in the serum and fluid of the cyst, the cyst can remain viable. Protoscolics retain their viability in dead cysts. A high rate of relapses without postoperative anthelmintic therapy has been reported [5, 6, 7].

MATERIALS AND METHODS OF THE RESEARCH

We analyzed the data of surgical treatment of 182 patients with echinococcosis of the lungs (126 patients with uncomplicated and 56 patients with complicated echinococcosis of the lungs) conducted in our clinic in the period from 2005 to 2020. The age of the patients ranged from 5 to 83 years. Men – 77 (42.30%), women – 105 (57.70%).

There are 223 cysts in the lungs. At the same time, 81 (36.32%) cysts were localized in the upper lobes, 24 (10.76%) – in the middle lobe, and 118 (52.92%) – were located in the lower lobes of the lungs. There were 132 (59.19%) cysts in the right lung and 91 (40.81%) cysts in the left lung. The size of cysts in the lungs varied from 3 to 15 cm in diameter. In the lungs, the complicated course of echinococcosis was observed in 56 (30.76%) patients. Of these, 34 (60.72%) had a cyst breakthrough in the bronchus, 15 (26.79%) had cyst suppuration, and 7 (12.50%) had a cyst breakthrough in the pleural cavity.

In addition to the clinical examination, the main diagnostic method was chest X-ray and computed tomography. A serological test for echinococcus was not performed in our clinic. With atypical clinical and radiological signs, fibrobronchoscopy (detection of endobronchial whitish-yellow or white gelatinous membrane) was used to diagnose patients. Using computed tomography (CT) of the chest, oval or spherical opacities were observed in the lungs. To detect liver cysts, CT and ultrasound of the abdominal cavity were

performed, cystic liver lesions were detected in 23 cases.

Of the 182 operated patients with echinococcosis of the lungs, 23 (12.64%) underwent thoracoscopic echinococectomy (through trocar punctures on the chest wall). In 134 (73.62%) patients, echinococectomy from the lungs was performed through a mini-thoracotomy with video-assisted surgery. 25 (13.74%) patients underwent echinococectomy from the lung through a wide thoracotomy approach.

To perform thoracoscopic operations, an endoscopic stand and a set of tools from the companies “Karl Storz” and “Auto Suture” were used. The operating team consisted of 3 surgeons, an operating nurse, and a junior operating nurse.

Taking into account the non-standard localization of cysts in the lungs, the points of application of pneumothorax and the introduction of trocars were selected individually in each case. Preference was given to points located in the 7-8 intercostal space along the posterior axillary line, 3 intercostal space along the anterior axillary line, taking into account the use of these punctures to drain the pleural cavity at the end of the operation, as well as points located along the 5 or 6 intercostal spaces, taking into account the possibility of switching to thoracotomy. A pneumothorax was applied, and a thoracoscope trocar was inserted at the point as far as possible from the cyst localization zone. A thorough revision of the pleural cavity was performed and a 5 mm instrument trocar was inserted at one of the above points. After determining the exact location of the cyst, a trocar was inserted directly above it to puncture the echinococcal cyst. Cyst puncture is the first stage of thoracoscopic surgery for echinococcosis of the lungs. The technique of puncture and the appropriate devices are of

paramount importance to comply with the principle of the operation's aparasitarity to prevent the contents of the echinococcal cyst from entering the pleural cavity. For the puncture of the cyst, we used a special "suction cup needle" developed by us (rational proposition №1812). The advantage of this needle is its well-known design feature: the needle is located in a suction cup tube that is connected to the vacuum. Before the puncture, it is necessary to connect the needle to the aquapurator in the aspiration mode, the suction function of the tube was provided by the tight fit of its tip to the protruding surface of the cyst and the connection of a vacuum electric pump (rarefaction of 20-30 mm Hg). The puncture needle was carried out along the lumen of the sucker tube. After puncture and evacuation of the echinococcal fluid, the fibrous capsule collapsed. Immediately after the evacuation of its contents and before opening the fibrous capsule, 100% glycerin was injected into the cyst cavity. During thoracoscopic surgery, this made it possible to safely move the parasite's cuticle from the residual cavity to the endocontainer in the future. After puncture, evacuation of the contents, and antiparasitic treatment of the cyst, the chitinous membrane was removed. To do this, in the most convex part of the cyst, the fibrous capsule was opened with electrosurgical scissors, after bringing the open wide endocontainer here. In all cases, endovideoscopy of the residual cavity was performed to inspect the residual cavities, completely remove the cuticular membrane, and detect bronchial fistulas. The chitin shell, identified parasite remnants, and safety cloths were placed in an endocontainer, which was removed at the end of the operation through one of the 10-millimeter trocars, if necessary, slightly expanding the wound. Elimination of the residual cavity is the final stage of surgical intervention. Free areas of the fibrous capsule were excised under electrocoagulation. The

inner surface of the cyst was also further coagulated to eliminate small bronchial fistulas. The remaining cavity was a kind of saucer.

During thoracoscopic operations, the capitonage of the residual fibrous cavity is particularly difficult. In intracavitary ligation with endoscopic clamps, the nodes are usually not completely tightened. To eliminate this drawback, we have developed a device for endoligation (rational proposition No. 1814.).

Technical difficulties in performing thoracoscopic echinococcectomy associated with the removal of the chitin shell and the observance of aparasitarity led to the development of the operation echinococcectomy from the lungs through a mini-thoracotomy with video assisting.

Technique: Depending on the size of the echinococcal cyst, surgical intervention (access to the object) was started using two methods:

For cysts ranging in size from 5 to 10 cm in diameter, surgical intervention was started with the application of a pneumothorax. The Veresh needle was inserted into the VII-VIII intercostal space along the posterior axillary line when the cyst was localized in the anterior-upper parts of the lung and into the III intercostal space along the anterior axillary line when the cyst was localized in the posterior-lower parts of the lung.

According to the indicators of the insufflator sensors, the free application of the pneumothorax was monitored. After applying the pneumothorax at the same point, a trocar and optics were inserted into the pleural cavity. During the revision of the pleural cavity, the exact localization of the cyst was established and a mini - thoracotomy was performed over its projection-an incision up to 5 cm long. Depending on the location of the cyst, minitoracotomy was performed in the IV-VI

intercostal space in the area between the anterior and posterior axillary lines.

In cysts larger than 10 cm in diameter, as well as in the event of difficulties in applying a pneumothorax associated with the adhesive process in the pleural cavity, surgical intervention began with the performance of a mini-thoracotomy, the guidelines for which were planned in advance according to the data of the X-ray examination. At the same time, the localization of cysts was crucial: when the echinococcal cyst was localized in the upper lobe, a mini-step was made along the 4-5 intercostal space, and depending on the segmental localization, the incision was mixed to the anterior or posterior axillary line. When the cyst is localized in the lower lobe, the incision was made along the 6th-7th intercostal space. Under visual control, a 10 mm trocar for optics was inserted in the III intercostal space along the anterior axillary line or in the VII-VIII intercostal space along the posterior axillary line.

A wound expander was installed and the cyst was isolated from the pleural cavity with a cloth moistened with glycerin. The stages of removal of the echinococcal cyst were the usual: - puncture of the cyst with fluid evacuation; - cystotomy and removal of the chitinous membrane; - treatment of the fibrous cavity with scolexocide (100% glycerin); - excision of a part of the fibrous capsule protruding above the lung tissue; - suturing of large bronchial fistulas, coagulation of small ones; - elimination of the residual cavity by suture surgery.

Performing minimally invasive interventions is difficult in the presence of daughter blisters in the cyst. In such cases, we use the "trocar-extractor" developed by us (rational proposition No. 1815).

The pleural cavity was drained in the III intercostal space along the midclavicular line and the VII or VIII intercostal space along the posteromuscular line. The minitoracotomy wound was sutured in layers. Drains were connected to the active aspiration system with a small vacuum.

The special features of the operation were bright lighting and visual control of the operation from the pleural cavity, the use of tools with long branches for manipulation in the depth of the wound.

RESULTS OF THE RESEARCH AND THEIR DISCUSSIONS

In case of uncomplicated echinococcosis of the lungs, only 23 patients out of 25 planned patients were able to perform echinococcectomy purely thoracoscopically through trocar punctures. In 2 cases, intraoperative technical difficulties required the transition to a mini-thoracotomy. The size of the cysts varied from 5 to 8 cm. In 5 cases, after thoracocystoscopy, a partial pericystectomy was performed and due to the absence of bronchial fistulas, a Vishnevsky capitonage was performed. In 7 cases, the residual cavity was eliminated according to Vakhidov. And in the remaining 11 cases, the fibrous cavity was eliminated by Bobrov. Postoperative complication was observed in 2 (8.69%) patients (residual lung cavity).

In 2 cases, due to technical difficulties during thoracoscopic echinococcectomy by trocar method, it was necessary to switch to minitoracotomy and after manual revision, echinococcectomy was performed.

In 134 cases, video-thoracoscopic echinococcectomy was performed using a mini-access. The size of the cysts varied from 10 to 17 cm. In 7 (5.22%) cases, 3 cysts were removed, and in 12 (8.95%), 2 cysts were removed. When cysts were localized in the upper lobe in 12

(8.95%), minitoracotomy was performed in 4 and in 38 (28.36%) patients in 5 intercostals, and in cysts of the middle and lower lobes in only 23 (17.16%) in 7 intercostals and in 61 (45.53%) in 6 intercostals. In 42 (31.34%) cases of large cysts, minitoracotomy was performed without prior thoracoscopy in order to prevent damage to the cyst during thoracocentesis and thoracoscopy. Capitonage of the cavity was performed depending on the configuration and volume of the cyst. With rounded cysts in 70 patients, the cavity was eliminated according to the Vakhidov method. In deep semioval cysts in 34 patients, capitonage was performed by vertical semioval sutures. The Bobrov-Spasokukotsky method was performed in 18 patients. In 12 cases, the Vishnevsky method was performed. With bilateral localization of cysts, 12 patients underwent step-by-step operations, and in 5 cases – simultaneous echinococcectomy.

In 25 patients, echinococcectomy from the lung was performed from a wide thoracotomy access. Anterolateral thoracotomy was performed in all patients. It should be recognized that echinococcectomy from the lungs with thoracotomy access was most often performed only in patients with complex cases of echinococcosis. In 12 (48%) cases, it was recurrent echinococcosis, in 9 (36%) – multiple echinococcosis, where cysts are scattered, and in 4 (16%) giant cysts were detected. In most cases – 9 (81.82%) - organ-preserving operations were performed with the elimination of the residual cavity in the lung by suture plastic surgery in various modifications. In 2(18.18%) patients according to the Vishnevsky method, in 3(27.27%) – according to Bobrov-Spasokukotsky, and 4(36.36%) vertical semi-sutures were applied. And 2 (18.18%) patients underwent marginal lung resections.

Basically, organ-preserving operations were performed with the elimination of the residual cavity in the lung by suture plastic surgery in

various modifications. In 2 patients with a marginal location and pneumocystosis, a marginal resection of the lung with an echinococcal cyst was performed.

Currently, for suppuration of echinococcal cysts, transthoracic drainage of cysts is performed under the control of thoracoscopy or radioscopy, This method of drainage was used in 12 patients, in 7 cases, the cavities were drained under the control of a thoracoscope, in 5 cases-under X-ray control. With a right-sided single cyst in 8 patients, left-sided-in 4 patients.

Out of 12 cases, one patient had a complication, which was manifested by a limited empyema of the pleura. After conservative measures with drainage of the abscess, the process was resolved. In one case, the cyst cavity was not obliterated, leaving a dry residual cavity. In this case, the cyst diameter exceeded 12 cm.

34 patients were operated on with a cyst breakthrough in the bronchus, without obvious signs of suppuration. In 18 patients, cysts were localized in the right lung, in 9 - in the left lung, and in 7 cases, a bilateral arrangement of cysts was noted. 2 patients were diagnosed with 3 cysts in one lung and 5-2 cysts.

All patients underwent surgical interventions. In 32 patients, operations were performed by mini-thoracotomy. In this category, due to possible complications, the mini-test was performed without prior thoracoscopy. After polypositional radioscopy, in accordance with our method, in 2 cases, access was performed by IV, in 12 - by V, in 14 - by VI, and in 6 patients by VII intercostal space. In 2 cases, 3 cysts from one lobe were removed from the mini-access, and in 4 patients, 2 cysts from two lobes were removed. In 7 cases, the localization of cysts was bilateral. In 4 patients, the first stage of surgery was performed on the side of the complicated cyst. In 3 patients, a single-stage

operation was performed through mini-accesses. These patients had a high probability of breakthrough of cysts of the opposite lung during the operation or the immediate postoperative period. The breakthrough of the cyst into the pleural cavity is considered one of the severe complications of echinococcosis. For the prevention of pyopneumothorax, patients should be subjected to surgery in a timely manner.

In our patients, in 6 cases, an X-ray examination revealed a hydropneumothorax. In all patients, the operation was performed through a mini-thoracotomy approach after a preliminary thoracoscopy, where the breakthrough of an echinococcal cyst into the pleural cavity was revealed.

When echinococcal cysts burst into the pleural cavity in all 6 cases, the pleural cavity was sanitized with ozonated saline solution, the chitinous membrane was removed, and the residual cavity was capitalized without suturing the bronchial fistulas.

10 patients with combined lung and liver echinococcosis were operated on. 6 patients underwent surgical interventions on the lungs and liver through separate mini-accesses at the same time. In 4 cases, echinococectomy from the lungs and liver was performed simultaneously with separate mini-approaches, and in 2 cases, the mini-thoracotomy approach was combined with a wide laparotomy. In 4 patients, the removal of cysts from the lungs and liver was performed in stages. At the same time, all stages of treatment were carried out using only mini - accesses.

In most cases, organ-preserving operations were performed with plastic surgery of the residual cavity in various modifications. Indications for lobectomy in 2 patients were cases of complicated echinococcosis, in which

cysts occupied the entire lobe of the lung and led to its pneumocystosis.

All patients in the postoperative period, a month later, were prescribed chemotherapy with albendazole at a dose of 12 mg / kg per day for 30 days. One of the positive properties of this drug is its low toxicity, which allows it to be used for quite long courses with a significantly lower risk of side effects.

CONCLUSIONS

Thus, echinococectomy from the lungs through minimally invasive approaches was possible in more than 2/3 of patients, and the use of endovisual technology reduced the number of postoperative complications to 4% and the duration of treatment from 14.2 to 6.4 days.

In our opinion, thoracoscopic echinococectomy requires further technical improvement. In this regard, it is easier to perform and more effective according to the results of echinococectomy from the mini-thoracotomy approach. At the same time, it should be recognized that echinococectomy from thoracotomy access is most often indicated for recurrent echinococcosis of the thoracic cavity and sometimes for a complicated course of the disease.

Simultaneous operations from mini-accesses, with bilateral echinococcosis of the lungs or in combination with the liver, are the operations of choice and can be performed in patients with good functional indicators of the cardiovascular and respiratory systems.

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