

# LONG-TERM RESULTS OF VIDEO-ASSISTED THORACOSCOPIC AND THORACOTOMY OPERATIONS DURING PULMONARY ECHINOCOCECTOMY.

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**Objective.** Improve the results of surgical treatment of children with echinococcal lung disease through the use of new technologies.

**Materials and methods.** During the period from 2005 to 2023, 72 children with echinococcal lung disease were operated on at the RSPCMIESC. In the diagnosis of echinococcosis of the lungs, the main method was; X-ray examination of the chest, ultrasound, serological tests for echinococcosis (ELISA), MSCT of the chest organs.

**Results.** Analysis of the results shows that echinococcal cysts with a diameter of more than 50 mm, as well as recurrent cysts complicated by suppuration, are considered as "relative" contraindications to videothoracoscopic lung echinococcectomy. In the treatment of pulmonary echinococcosis, endovideosurgical echinococcectomy is and should be a priority.

**Key words:** Echinococcus lung; videothoracoscopy; trocars; pediatric surgery.

Despite the achievements in the diagnosis and treatment of pulmonary echinococcosis, many unresolved issues remain that require a new approach. Recently, a new technology has been used for the treatment of echinococcosis, particularly in lung localization—video-endoscopic echinococcectomy, especially for its complicated forms. The polymorphism of clinical manifestations of pulmonary echinococcosis (PE) creates difficulties for the timely identification of this category of patients. This leads to numerous errors and complications, the frequency of which ranges from 26% to 52% [1,2] However, the trauma of the surgical approach is often much greater than the trauma of the actual cyst removal stage. An echinococcal cyst in the lung with a diameter of 3-4 cm forces the surgeon to make an incision in the chest wall measuring 15-20 cm. The use of rib-spreaders to widen the wound often leads to rib fractures. In the postoperative period, significant pain syndrome can disrupt pulmonary ventilation, leading to lung atelectasis and postoperative pneumonia. Infections of the surgical wound, chondritis, and osteomyelitis of the ribs, although not common, can still result in long-term disability or even invalidity [3]. Therefore, video-assisted thoracoscopic removal of echinococcal cysts in the lung has a clear advantage over traditional thoracotomy in terms of trauma. To determine the advantages of video-assisted thoracoscopic operations over traditional thoracotomies, we compared the duration of the surgery, the course of the postoperative period (the amount of exudate drained, the duration of pleural cavity drainage, the amount of analgesics administered postoperatively, and the length of hospital stay).

### Materials and Methods of Research

At the Republican Scientific and Practical Center for Minimally Invasive and Endoscopic Surgery of Childhood, from 2005 to 2023, 72 children aged 2 to 16 years were operated on for pulmonary echinococcosis. The majority of children were older than 10 years (35 children or 48.6%). There were 49 boys (68.1%) and 23 girls (31.9%).

Based on these parameters, we compared the course of surgery and the postoperative period in children who underwent echinococcectomies for pulmonary echinococcosis. Among them, 41 operations were performed via video-assisted thoracoscopic surgery (Group I), and 31 via thoracotomy (Group II). The duration of thoracotomy echinococcectomy ranged from 70 to 180 minutes (an average of  $101.11 \pm 6.90$  minutes), while video-assisted thoracoscopic surgeries took between 60 and 120 minutes (an average of  $80.46 \pm 3.63$  minutes).

Postoperative pain syndrome was assessed based on the amount of narcotic analgesics administered to relieve pain and the patients' complaints.

In the postoperative period, all patients who underwent thoracotomy reported "severe" pain during the first two days. On the third day, 26 patients still experienced severe pain, while 5 reported less intense pain. By the fourth day, 25 patients (50%) described their pain as "less severe," and 5 patients reported no pain.

After video-assisted thoracoscopic surgery (VATS), all patients rated their pain as less severe on the first day. On the second day, only 14 patients experienced pain, while 17 had no pain. By the third day, none of the patients reported pain.

Thus, by surveying the patients, we established the presence of a less severe pain syndrome throughout the early postoperative period in patients who underwent video-assisted thoracoscopic surgeries compared to those who underwent thoracotomy.

Severe pain was managed with narcotic analgesics (promedol 2% - 1.0 ml or its analogs) administered 2-3 times a day, while less severe postoperative pain was managed with 1-2 administrations of narcotic analgesics. The remaining patients received prophylactic pain relief with non-narcotic analgesics.

Any surgery on the thoracic organs is accompanied by increased fluid exudation by the pleural sheets during the postoperative period. The more traumatic the intervention, the more intense the accumulation of fluid in the pleural cavity.

Exudation from the pleural cavity and the duration of drainage were significantly higher after echinococcectomies performed via thoracotomy compared to those performed via VATS (video-assisted thoracoscopic surgery). After VATS echinococcectomies, exudation was as follows: on the first day -  $65.63 \pm 9.88$  ml, on the second day -  $45.00 \pm 10.54$  ml, and on the third day -  $35.38 \pm 3.03$  ml. Meanwhile, after thoracotomy, exudation was  $85.40 \pm 10.15$  ml on the first day,  $75.50 \pm 8.21$  ml on the second day,  $45.75 \pm 7.80$  ml on the third day, and  $25.65 \pm 8.2$  ml on the fourth day.

The average drainage duration of the pleural cavity after VATS echinococcectomies was significantly shorter ( $3.16 \pm 0.15$  days) compared to thoracotomy operations ( $4.30 \pm 0.31$  days). Thus, in the first three days after thoracotomy, the amount of pleural exudation was almost double.

Starting from the second day after VATS, exudation became minimal, allowing us to remove the drainage by the second day post-surgery. After thoracotomy, drainage was removed on the 3rd to 4th day, and in some cases, on the 6th to 7th day (in 4 patients).

Patients in the first group (VATS) were discharged from the hospital between the 4th and 10th day ( $7.43 \pm 0.83$  days), while patients in the second group (thoracotomy) were discharged between the 7th and 20th day ( $11.58 \pm 0.69$  days).

To summarize, the severity of pain syndrome, the number of administered narcotic medications, pleural exudation, the duration of pleural drainage, and the length of hospital stay after VATS surgeries were all less than after similar procedures performed via thoracotomy.

In 41 cases, complete recovery was achieved after using thoracoscopic methods, and traditional surgical interventions were not required for these patients.

Among the patients in the main group, the majority underwent echinococcectomy according to A.A. Vishnevsky (25 patients), Delbet's method (12 patients), A.T. Pulatov's method (5 patients), a combination of several methods (4 patients), atypical lung resection (3 patients), and decortication or pleurectomy with elimination of the residual cavity in 1 patient with chronic pleural empyema, where fibrotic changes in the lung parenchyma were predominant.

In the control group, the majority of echinococcectomies were performed using the Delbet method (21 cases). However, indications for this operation were broader, and it was performed more frequently compared to the main group. Three operations using the A.A. Vishnevsky method were performed, which was more frequent than in the main group. Patients with infected echinococcal cysts were more often operated on using these methods.

The absence of a differentiated approach to selecting the surgical method and targeted preoperative preparation was clearly evident in the analysis of the medical histories of patients in this group. In particular, Delbet's capitonnage was often performed for large cysts when the methods of A.A. Vishnevsky and A.T. Pulatov could have been used, which would have avoided severe lung deformation. The inability to achieve good sanitation of echinococcal cysts with traditional preoperative measures increased the number of organ-removing surgeries. Among the combined surgical methods, 6 patients underwent a combination of the Delbet and A.A. Vishnevsky methods, and 7 patients had one of these methods combined with atypical lung resection.

Thus, the analysis of the surgeries performed in both the main and control groups confirms that a differentiated approach to choosing the surgical method, combined with targeted preoperative preparation and postoperative management in patients with pulmonary echinococcosis (PE), using endoscopic methods, significantly increases the number of organ-preserving surgeries, reduces postoperative complications, and shortens the duration of hospital stays.

Long-term results up to 5 years were studied in 59 (53.6%) of the 72 observed patients. Long-term results were not studied in the control group. In the clinic, physical examinations, chest fluoroscopy, and radiography were conducted, as well as assessments of pulmonary function. Additionally, in all cases, comprehensive examinations were supplemented by ultrasound scanning of the lungs and liver.

Of the 59 operated patients with PE, 38 were examined at intervals ranging from 3 months to 3 years, and 21 at intervals ranging from 3 to 5 years. Sixteen patients reported no complaints. Among those with complaints, chest pain and dry cough, especially after hypothermia, were reported by 3 patients, shortness of breath with minor physical exertion by 3, and 1 patient experienced hemoptysis during the year following surgery.

Physical examinations of 39 patients revealed no abnormalities. Mild weakening of vesicular breathing was noted in 9 patients, most of whom had complications either before or after surgery.

Chest radiography showed lung tissue fibrosis in the area of the cyst bed in 5 cases, deforming bronchitis in 4 cases, diaphragm dome deformation in 4 cases, and a pronounced adhesive process in 2 cases.

Thus, the study of long-term outcomes of endoscopic surgical treatment for pulmonary echinococcosis (PE) showed that good results were achieved in 78.8% of patients, satisfactory in 15.6%, and unsatisfactory in 5.6%, regardless of the nature of the lesion and the method of surgery. The best outcomes were noted after video-assisted thoracoscopic echinococcectomy (VATS) and with the use of video-assisted echinococcectomy techniques. The primary cause of unsatisfactory outcomes was complications arising from extensive lung tissue involvement, which led to irreversible changes in the respiratory system, often involving the cardiovascular system as well. Several complications were due to the severity of the surgical intervention and failure to follow postoperative protocols.

Serious complications such as pleural empyema and bronchial fistulas were characteristic of more severe forms of lung echinococcosis, particularly when a ruptured, suppurative cyst had penetrated the pleural cavity or emptied into the bronchus. These conditions were typically associated with delayed presentation and pulmonary hemorrhage due to cyst suppuration, where the urgency of the patient's condition precluded comprehensive preoperative preparation.

Thus, VATS is a highly informative method in cases of lung echinococcosis complicated by cyst rupture into the pleural cavity with the development of pleuritis or pleural empyema. This method not only clarifies the diagnosis but also allows for an objective assessment of the severity and nature of inflammatory changes, with morphological verification of the pleura and lungs. Moreover, video-assisted thoracoscopy enables therapeutic interventions aimed at eliminating the pathological process.

The most crucial factor in favorable surgical outcomes for PE is targeted and differentiated preoperative preparation, as emphasized by many authors [4,5]. Along with drug therapy aimed at correcting the function of vital organs, homeostasis parameters, suppressing or alleviating symptoms of allergies and intoxication, preventing and treating infectious complications, and ensuring the drainage function of the bronchi, the duration of preoperative preparation was determined by the nature and severity of complications, as well as the effectiveness of the interventions in each case.

For tense cysts or when a non-infected cyst had ruptured into the bronchus or pleural cavity, preoperative preparation lasted from 3 to 10 days. In cases of chronic complications, such as a rupture into the bronchus or pleural cavity with the development of pleural empyema, the preoperative preparation was longer, lasting up to 2-6 weeks.

A comparative analysis of the obtained data allows us to conclude that the severity of pain syndrome, the amount of narcotic medication administered, pleural cavity exudation, the duration of pleural drainage, and the length of hospital stay after thoracoscopic and bronchoscopic surgeries for PE were significantly less compared to similar procedures performed via thoracotomy.

**Conclusion:**

1. The use of video-assisted thoracoscopic surgery (VATS) for treating pulmonary echinococcosis (PE) is feasible in patients with severe intoxication symptoms, comorbidities,



and low functional capacity, who are at high risk of fatal complications, compared to traditional surgical interventions.

2. Indications for therapeutic video-assisted thoracoscopy include:

Rupture of the echinococcal cyst into the pleural cavity

Suppurative, bronchial-ruptured, poorly draining, and peripherally located echinococcal cysts.

Suppurative cysts without perforation.

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