



## OPTIMIZATION OF SURGICAL TACTICS IN DETERMINING THE VOLUME OF LUNG RESECTION IN PATIENTS WITH ECHINOCOCCOSIS

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<https://doi.org/10.5281/zenodo.14498712>

### ARTICLE INFO

Received: 09<sup>th</sup> December 2024

Accepted: 15<sup>th</sup> December 2024

Online: 16<sup>th</sup> December 2024

### KEYWORDS

*Echinococcosis of the lungs;  
surgical treatment; volume of  
resection; organ-preserving  
operations; differentiated  
approach; parasitic cysts;  
thoracic surgery*

### ABSTRACT

*The purpose of this study is to optimize approaches to choosing the volume of lung resection in the surgical treatment of echinococcosis based on a comprehensive analysis of the clinical and morphological characteristics of the disease and the results of various types of surgical interventions. Special attention is paid to the development of criteria to justify the choice of organ-preserving operations without prejudice to the radicality of treatment. Solving this problem is of great practical importance, since it will improve the results of surgical treatment, reduce the frequency of postoperative complications and improve the quality of life of patients with echinococcosis of the lungs.*

**Introduction.** Echinococcosis of the lungs remains one of the urgent problems of thoracic surgery, especially in endemic regions where the incidence reaches 50-100 cases per 100,000 population. Despite significant progress in the diagnosis and treatment of this pathology, the issues of choosing the optimal volume of surgical intervention continue to cause discussion in the professional community.

Modern statistics show that echinococcosis occupies a leading position in the structure of parasitic lung diseases, accounting for 10-15% of all localities of the parasite. At the same time, the frequency of postoperative complications varies from 14% to 26%, which is largely due to the choice of an irrational volume of lung tissue resection.

Determining the optimal volume of resection is a complex clinical task that requires taking into account many factors: the size and localization of cysts, the degree of damage to lung tissue, the presence of complications, the general condition of the patient and the functional reserves of the lungs. Of particular importance is the issue of organ-preserving



operations that minimize the loss of functioning pulmonary parenchyma while maintaining the radicality of the intervention.

In recent years, there has been a tendency to individualize surgical tactics, taking into account the morphological features of cysts, their location and the nature of interaction with surrounding tissues. However, the lack of clear criteria for choosing the volume of resection makes it difficult to standardize surgical approaches and can lead to unreasonably radical interventions or, conversely, to perform insufficient operations.

The development of modern imaging techniques and the improvement of surgical techniques open up new opportunities for optimizing surgical tactics. Nevertheless, the development of algorithms to objectify the choice of lung resection volume in echinococcosis remains an urgent task.

**The purpose of the study:** to study the features of choosing the volume of resection in the surgical treatment of echinococcosis of the lungs

**Materials and methods of research:** The tasks of experimental research included: to establish a technique for intubation of the trachea through natural pathways in experimental rats; to establish optimal parameters of artificial lung ventilation in rats and methods of anesthesia; to develop a technique for lobectomy in rats; to develop a model of microbial contamination of the lung resection zone; to develop a technique for laser stimulation of lung wound healing during contamination with pathogenic microflora; to study in an ex vivo experiment the ability of the hemostatic drug Chemoben in sealing the sutures of the bronchial stump.

The clinical part of the studies was conducted from 2010 to April 2023. The study included a total of 366 patients with EL. According to the set goal, all patients were divided into 2 groups. The main group included 84 patients who, during the period from 2021 to 2024, underwent resection operations with EL using the proposed method, which included both technical aspects of novelty and the addition of the operation by physical methods of exposure in the form of laser irradiation of the surgical intervention area and the use of domestic hemostatic agent Chemoben.

Results of the study: Taking into account the fact that organ-preserving operations continue to be performed in many clinics of the country both in the complicated course of the disease and in giant forms of EL, two subgroups were included in the comparison group. The first subgroup included 157 patients who underwent organ-preserving operations - echinococcectomy with suturing of the residual cavity. The second subgroup included 125 patients who underwent resection interventions (lobectomies - 118 or bilobectomies - 7) according to the traditional method. In the main group, 78 lobectomies were performed, and 6 patients underwent bilobectomies.

Of all the patients, there were 221 males (60.4%) and 145 females (39.6%). The age of patients ranged from 18 to 73 years, 42 (11.5%) patients were under 19 years old, 216 (59.0%) were 19-44 years old, 93 (25.4%) were 45-59 years old, and 15 (4.1%) were 60-74 years old. Primary echinococcosis was found in 332 (90.7%) patients, and in 34 (9.3%) it was recurrent. On the right, 187 (51.1%) had EL, of which 49 (13.4%) in the upper lobe, 30 (8.2%) in the middle lobe and 108 (29.5%) in the lower lobe; on the left, 179 (48.9%), of which 74 (20.2%) in the upper lobe and 105 (28.7%) in the lower lobe.



Unilateral solitary EL was noted in 301 (82.2%) patients, and in 65 (17.8%) unilateral multiple. Bilateral and combined forms of echinococcosis were not included in the study. Of the 366 patients, 226 (61.7%) had complicated forms of echinococcosis, 37 (10.1%) had giant forms of echinococcosis and 103 (28.1%) had uncomplicated EL.

In the subgroup with organ-preserving operations, complicated forms of lesion prevailed (97 patients): 11 patients had suppuration of an echinococcal cyst, 53 patients had a cyst breakthrough into the bronchi, 27 had suppuration with a breakthrough into the bronchi, into the pleural cavity in 4 cases and in 2 cases iatrogenic damage to the echinococcal cyst by puncture. The nature of surgical interventions in this group was organ-preserving, capitulation operations according to the Delbe method (155) were widely used, echinococectomy according to Askerkhanov in 2 cases.

In the comparison group, in the subgroup with resection operations, 74 patients had complicated forms of lesion: 8 had cyst suppuration, 47 had cyst breakthrough into the bronchi, 16 had suppuration with a breakthrough into the bronchi, into the pleural cavity in 3 cases. Of the lung resections in echinococcosis, only frontal bilobectomies were selected for comparison.

The main group consisted of 84 patients. Complicated forms of the lesion were in 55 patients: 9 patients had suppuration, 32 had a cyst breakthrough into the bronchi, 12 had suppuration with a breakthrough into the bronchi, into the pleural cavity - 2 cases. Hemoptysis was observed in 5 people and pulmonary hemorrhage in 2 patients among cases complicated by suppuration and bronchial breakthrough.

All patients in the comparison groups were comparable in terms of the main parameters: localization, nature and severity of the course of the disease, age, gender and clinical manifestations of the disease.

The conducted experimental and morphological studies have convincingly demonstrated all the advantages of the proposed method, which made it possible to introduce it into clinical practice and actively apply it in surgery.

The proposed method of suturing the bronchial stump in combination with the use of hemostatic agent Chemoben and laser exposure during resection interventions in patients with EL allowed to reduce the incidence of postoperative complications from 26.8% during organ-preserving operations (in 42 out of 157 patients in the first subgroup of the comparison group;  $\chi^2=15.080$ ;  $df=1$ ;  $p<0.001$ ) and 20.0% in traditional resection operations (in 25 out of 125 patients in the second subgroup of the comparison group;  $\chi^2=8.064$ ;  $df=1$ ;  $p=0.005$ ) to 6.0% (in 5 out of 84 patients in the main group). (Table. According to the classification of Clavien-Dindo (2004), in the main group, it was possible to significantly change the structure of the severity of complications, in particular, grade V was noted only in the comparison group for 1 case in each subgroup (0.6% after organ-preserving operations; 0.8% after resection interventions), grade III was 11.5% (18 patients) in the first subgroup comparison groups, 8.0% (10 patients) in the second subgroup of the comparison group and 2.4% (2 patients) in the main group, and grade I-II in 14.6% (23;  $\chi^2=15.142$ ;  $df=3$ ;  $p=0.002$ ), 11.2% (14;  $\chi^2=8.187$ ;  $df=3$ ;  $p=0.042$ ) and 3.6% (3), respectively, which generally required additional conservative or minimally invasive measures in the comparison group in 19.7% (31 patients after organ-preserving operations;  $\chi^2=15.795$ ;  $df=2$ ;  $p<0.001$ ) and 15.2% (19



patients after resection interventions;  $\chi^2=8,931$ ;  $df=2$ ;  $p=0.012$ ), as well as retoracotomies in 7.0% (11) and 4.8% (6), whereas in the main group all complications were resolved minimally or conservatively (6.0%).

The proposed tactical and technical aspects in the surgical treatment of EL made it possible to reduce the time of drainage of the pleural cavity from  $4.5\pm 3.6$  days after organ-preserving operations ( $t=4.57$ ;  $p<0.05$ ) and  $4.2\pm 3.5$  days after resection interventions ( $t=3.67$ ;  $p<0.05$ ) to  $2.9\pm 1.6$  days in the main group, as well as The duration of the postoperative hospital stage was from  $10.0\pm 3.9$  days ( $t=4.24$ ;  $p<0.05$ ) and  $9.8\pm 3.4$  days ( $t=3.82$ ;  $p<0.05$ ) to  $8.2\pm 2.6$  days. Improving the course of the period of early postoperative rehabilitation made it possible to achieve an increase in the proportion of good immediate results in the main group from 73.2% (115 out of 157 patients with organ-preserving operations) and from 80.0% (100 out of 125 patients with resection operations) to 94.0% (in 79 out of 84 patients), as well as to level the risk of unsatisfactory results, associated with the development of complications from the residual cavity with 5.7% (in 9 patients) after organ-preserving operations;  $\chi^2=14,095$ ;  $df=2$ ;  $p<0.001$ ) and from the bronchial stump with 3.2% (in 4 patients after resection who underwent repeated open operations;  $\chi^2=4.069$ ;  $df=1$ ;  $p=0.044$ ).

**Conclusions:** Thus, the proposed method of surgical treatment of giant and (or) complicated EL by applying separate octagonal sutures to the stump of the bronchus, unlike a hardware suture, can be used with a short stump, which eliminates its excessive compression and trophic disorder, and unlike a simple nodular or continuous suture creates better sealing, while laser radiation accelerates wound healing and has an antimicrobial effect, and applying Chemoben powder to the resection zone provides additional sealing of the bronchial stump, as well as hemo- and lymphostasis. The proposed method of suturing the bronchial stump in combination with the use of hemostatic agent Chemoben and laser exposure during resection interventions in patients with EL allowed to reduce the incidence of postoperative complications from 26.8% in organ-preserving operations ( $p<0.001$ ) and 20.0% in traditional resection operations ( $p=0.005$ ) to 6.0%, while eliminating the risk the development of complications from the residual cavity (5.7%), as well as the probability of bronchial stump failure decreased from 5.6% to 1.2% and hemorrhagic complications from 6.4% and 2.4% to 1.2%.

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