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CHOICE OF TACTICS AND METHOD OF SURGICAL TREATMENT OF COMBINED ECHINOCOCCOSIS OF THE LUNG AND LIVER IN CHILDREN

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ABSTRACT

Background: Echinococcosis, a severe and widespread parasitic disease, remains a critical public health concern, particularly in pediatric populations. This study addresses the challenges of combined echinococcosis affecting the lungs and liver in children. The aim is to develop a comprehensive strategy and determine the optimal surgical approach for effective treatment.

Methods: A retrospective analysis of 346 children (3-14 years) with various forms of echinococcosis was conducted. Of these, 11.3% presented with combined echinococcosis of the lungs and liver. Clinical, laboratory, and radiological assessments, including chest radiography, ultrasound, and computed tomography, were employed. Surgical interventions were based on organ-preserving principles, with a focus on simultaneous and staged echinococcectomy. Techniques included a modified capitonnage method, electrocoagulation, and bronchial occlusion during pulmonary echinococcectomy. Postoperative chemotherapy with Zentel was administered to prevent relapses.

Results: Surgical success was influenced by disease stage, anatomical factors, and patient characteristics. Simultaneous echinococcectomy was performed in 35.9%

of cases, while a two- or three-stage approach was employed in 51.3%. Preliminary bronchial occlusion during pulmonary echinococcectomy proved crucial in minimizing complications. Postoperative chemotherapy with Zentel contributed to satisfactory lung and liver function; no relapses were observed.

Conclusion: The study highlights the complexity of surgical tactics in managing combined echinococcosis in pediatric patients. A comprehensive approach, incorporating preoperative preparation, careful surgical strategy selection, and optimal intervention methods, proved effective. The findings emphasize the importance of prioritizing echinococcectomy based on cyst risk and initiating phased interventions with pulmonary localization. This approach achieved favorable outcomes and demonstrated the significance of a well-structured surgical strategy in treating combined echinococcosis in children, pointing towards a promising avenue for future research and clinical practice.

KEYWORDS: children, echinococcosis, echinococcectomy of the lungs and liver.

INTRODUCTION

Echinococcosis is one of the most severe and dangerous parasitic diseases in many regions of the world, which is characterized by extensive damage and a long-term chronic course, causing the development of severe dysfunctions of the affected organs [2, 7, 9]. According to the WHO, echinococcosis remains in the 21st century in leading positions in terms of occurrence, while in endemic areas, human incidence rates reach 50 cases per 100,000 people per year [5, 10, 11, 12]. In several countries where hydatid echinococcosis is a regional pathology, its elimination has been elevated to a state task, and unique national programs are being developed to control and prevent the disease. Thanks to such programs, the disease has been practically eradicated in many countries previously disadvantaged by echinococcosis [13].

Analysis of literature data and our observations indicate that the proportion of hydatid disease in the structure of surgical morbidity has increased over the past decades from 4-8% to 20%, simultaneous damage to two or more organs from 4 to 26.7%, while mortality during surgical treatment ranges from 2 to 7%. The frequency of purulent complications has increased to 17.9-28.5%, postoperative relapse of echinococcosis is 5-12%, and the formation and suppuration of a residual cavity after

echinococcectomy is observed in 7-20% of cases [1, 3, 6, 8]. In recent years, simultaneous damage to several organs has become more frequent, with the formation of cysts of central localization with deformation of the anatomical structures of the organ and severe impairment of their functions. The severity and originality of the clinical course of the disease, the difficulties of early diagnosis, and the variety of surgical treatment methods make this pathology one of the complex problems of modern medicine.

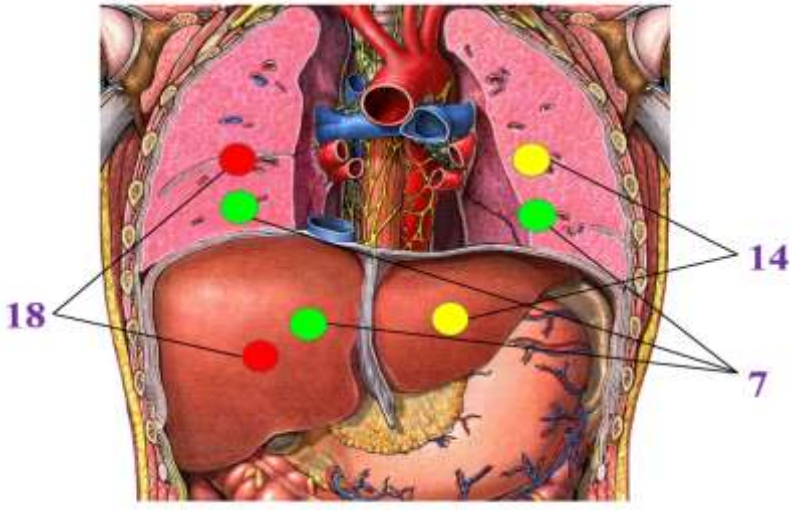
Treatment of echinococcal disease today presents specific difficulties. Even though many treatment options for this parasitic disease are offered in the world today, controversy over the effectiveness of one or another method continues to be discussed at many international forums and conferences. A multifaceted, long-term study of the problem of echinococcosis has led to the conclusion that complex surgical treatment of this parasitic disease is the only effective method, regardless of radicality. This applies equally to uncomplicated and complicated, multiple, multiorgan, and combined forms of the disease.

The data presented indicate the relevance of early diagnosis and timely surgical treatment of various forms of echinococcosis in children, which was the basis for this study.

Purpose of study: Development of a strategy and choice of method for surgical treatment of combined echinococcosis of the lungs and liver in children.

MATERIALS AND METHODS

This study is based on the examination and treatment results of 346 children aged 3 to 14 years with various forms of echinococcosis, of which, in 39 (11.3%) cases, combined echinococcosis of the lungs and liver was detected. Echinococcosis of the right lung and liver was detected in 18 (5.1%) cases, the left lung and liver in 14 (4.1%), and both lungs and liver in 7 (2.1%) patients (Fig. 1).



Rice. 1. Organ localization of combined echinococcosis of the lungs and liver.

All patients admitted to the clinic with echinococcosis underwent clinical, laboratory, and instrumental research methods, mainly plain chest radiography, ultrasound methods for examining the lungs and liver, and multislice computed tomography.

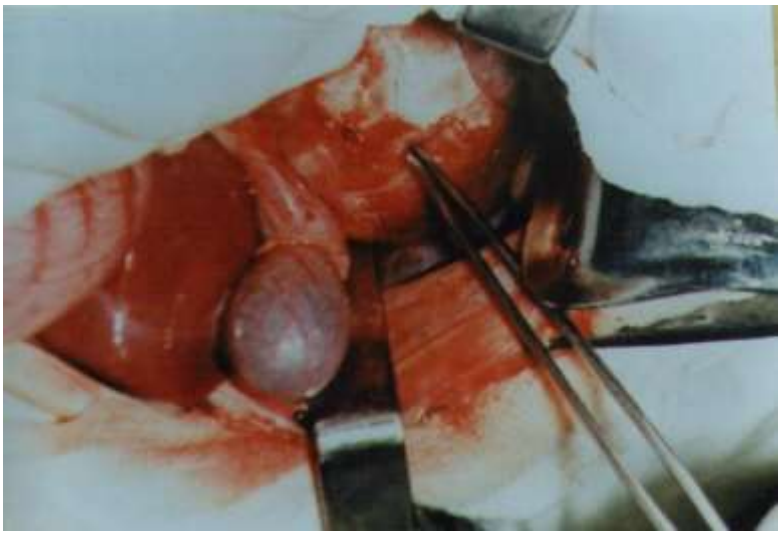
RESULTS AND DISCUSSION

The success of surgical treatment of echinococcosis is determined by the stage of the disease, the anatomical and topographic location of the parasite, the size of the cysts, the presence of complicated forms, the age of the patient, the state of the immunobiological forces of the body and the presence of concomitant diseases. These factors significantly influence the choice of tactics and rational sequence of surgical interventions for combined echinococcosis of the lungs and liver in children, determining the risk of surgical intervention. In our observations, in all 39 cases of combined echinococcosis of the lungs and liver, the tactical decision was based on the principles of organ-preserving interventions. After appropriate preoperative preparation, the patients were operated on to improve their general condition, reduce body intoxication and allergic background, improve immunological parameters, and normalize the leading functional indicators of vital organs.

With combined lesions of the right lung and liver, simultaneous echinococcectomy was performed in 14 (35.9%) patients, with combined lesions of the left lung and left lobe of the liver in 5 (12.8%) patients. The rationale for the simultaneous operation of the interventions was the localization of cysts in the middle and lower lobes of the right lung and in the VII-VIII segments of the liver, as well as the localization of cysts in the lower lobe of the left lung and the I-II segments of the liver. The surgical approach in these cases was a lateral or posterolateral thoracotomy in the seventh-eighth intercostal space with a simultaneous transdiaphragmatic echinococcectomy from the liver. In the remaining 20 (51.3%) patients with combined damage to the lungs and liver, a two- and three-stage echinococcectomy was performed since the localization of the cysts in these observations did not allow their immediate removal. At the same time, the interval between the stages of surgical intervention did not exceed two months. Simultaneous echinococcectomy on the lungs and liver is possible only if there are no significant technical difficulties in mobilizing the lung and liver when both operations can be performed from one access. In such situations, they are justified since they eliminate the need for repeated surgery.

The order of removal of hydatid cysts was determined depending on their size and the presence of complications, which made the subsequent stages of surgical intervention technically easier. Larger cysts were removed first in order to prevent their intraoperative breakthrough in case of accidental iatrogenic damage. Then hydatid cysts that did not interfere with free manipulation in the surgical field were removed, thereby creating a convenient situation for a favorable completion of the surgical intervention, without any complications.

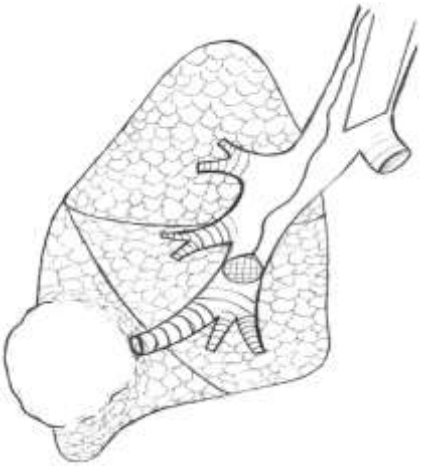
It was challenging to decide on the order of echinococcectomy in 7 patients with bilateral pulmonary echinococcosis in combination with liver damage. Thus, in 2 patients with large and complicated liver cysts, the first stage of surgical intervention was performed on the liver and then on the lungs (Fig. 2).



Rice. 2. Echinococcal cyst occupying the entire left lobe of the liver.

In the case of single-cystic lesions of both lungs and liver (3 observations), the cysts were approximately the same size and had no signs of complications; these patients underwent multi-stage surgery with an interval of 2-3 months, and the sequence of operations began with the pulmonary localization. In the presence of multiple bilateral echinococcosis of the lungs and liver (2 patients), the intervention stage was determined by the most significant number of cysts in the affected organ.

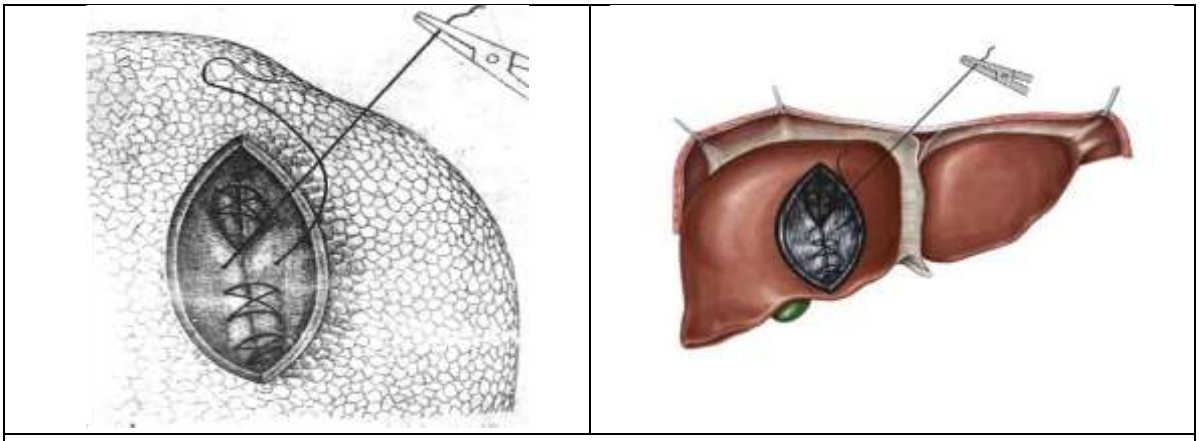
A necessary condition for the successful implementation of surgical interventions for echinococcosis is strict adherence to measures to prevent the contamination of surrounding organs and tissues with parasite elements. We consider preliminary short-term occlusion of the lobar bronchus of the affected area for the period of emptying and sanitation of the cystic cavity to be a mandatory condition for ablasticity during pulmonary echinococcectomy, which allowed us to reduce intra- and postoperative complications (Fig. 3) significantly.



Rice. 3. Schematic representation of short-term occlusion of the lobar bronchus.

This technique is appropriate and is used by us for echinococcectomy of medium, large and complicated cysts, when the risk of endobronchial leakage of hydatid fluid is exceptionally high. Before intubation of the trachea, obturation of the lobar bronchus is performed in the system of which the echinococcal cyst is located. This stage of echinococcectomy seems to us to be fundamental from the point of view of both the ablasticity of the operation and the prevention of bronchopulmonary complications due to chemical contact germicides entering the bronchi.

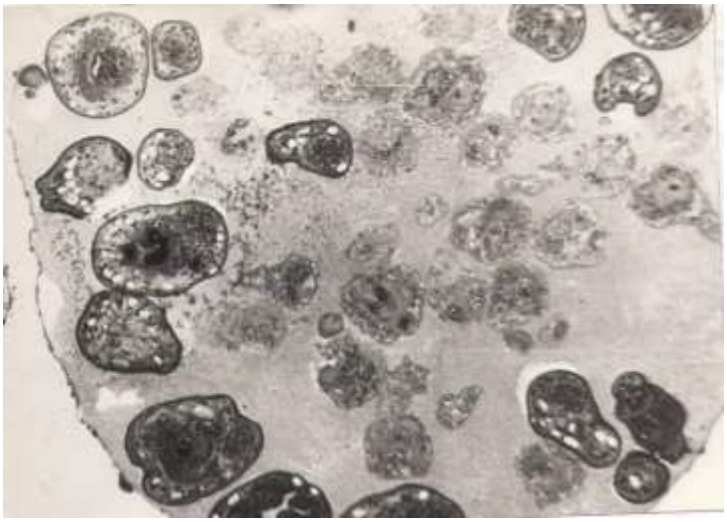
The technical methods of echinococcectomy were traditional: covering the cyst with napkins moistened with contact germicide, puncture of the cyst and evacuation of its contents, cystotomy, removal of the chitinous membrane, treatment of the cystic bed with a solution of betadine + alcohol, electrocoagulation of the entire internal surface of the fibrous capsule, suturing of bronchial and biliary fistulas, elimination the cystic bed is tightly sealed using the capitonage method. In our clinic, a modified version of the capitonnage technique with “8”-shaped floor-to-floor sutures has been introduced and successfully used to eliminate the cystic bed (cross-floor-to-floor sutures) (Fig. 4).



Rice. 4. Schematic representation of execution capitonnage with “8”-shaped floor seams.

When performing capitonnage with "8"-shaped floor-by-floor sutures, we strictly follow the rules for applying sutures: from the bottom to the surface - parallel to the vessels, bronchi, and bile ducts, to avoid their damage and deformation. At the same time, we always try to achieve complete contact between the opposite walls of the fibrous capsule, which ensures their reliable fusion even in the presence of small bronchial and biliary fistulas. The advantage of this method of eliminating a cystic bed is a significant saving of time, tightness, creation of favorable conditions for healing of the lung and liver due to the similarity of the compared sides, and reduction of ischemic zones.

The use of electrocoagulation during echinococcectomy had several practical justifications. First, coagulation of small bleeding vessels, bronchial and biliary fistulas was carried out to prevent postoperative complications in the form of accumulation of blood, mucus, and bile in the cystic bed. In turn, electrocoagulation of the entire internal surface of the fibrous capsule led to a delicate coagulation scab - which served as a biological barrier. In contrast, the fibrous capsule itself became denser and wrinkled, and its area was reduced. In addition, electrocoagulation of the inner surface of the fibrous capsule had a detrimental antimicrobial and anti scolex effect as a result of thermal effects on protoscoleces located both in the fibrous capsule itself and perinatally at a depth of 1 cm. We proved this in histological and electron microscopic studies (Fig. 5.).



Rice. 5. Alteration and destruction of protoscolexes.
(betadine treatment and electrocoagulation)

Despite compliance with all rules of ablasticity when performing operations and the introduction of various chemical and physical methods of influencing the parasite, the incidence of relapses of the disease remains high and reaches 12–33% [4]. In this regard, in the pre- and postoperative period, we carried out chemotherapy in order to sanitize the child's body from echinococcosis and prevent relapse of the disease. For this purpose, chemotherapy was carried out with the anthelmintic drug Zentel, which showed its high efficiency and broad spectrum of action. Zentel was mandatory prescribed to all patients; its daily dose was 10 mg/kg in 2 divided doses for 14 days, followed by a course after two months. Studies have shown that the anthelmintic drug Zentel causes irreversible disturbances in the utilization of glucose by the helminth body and inhibits the synthesis of ATP. It has a detrimental effect on the germinal elements of echinococcus, disrupting the function of the microtubular apparatus of the cell and causing damage to the tubulin protein. The consequence is biochemical disturbances of the cell - inhibition of glucose transport and fumarate reductase, which underlies the suppression of cell division at the metaphase stage. With this mechanism, the suppression of oviposition and the development of helminth larvae are associated.

The study's results showed that the criteria for assessing the immediate and long-term results of the effectiveness of surgical treatment of combined echinococcosis of the lungs and liver were the presence or absence of complications and relapses of the disease. The data from our studies indicated satisfactory function of the operated lungs and liver, while no relapses of the disease were noted in our observations. Surgery and chemotherapy are the main criteria for preventing relapse of the disease and completely curing the patient from echinococcosis.

CONCLUSION

Thus, comprehensive preoperative preparation, selection of a rational surgical approach and the optimal method of surgical intervention, and active postoperative management of patients are the main components of a successful and favorable treatment outcome. Surgical tactics for combined echinococcosis of the lungs and liver in children are pretty complex; this is explained by the stages and sequence of echinococcectomy, depending on the location of the cysts and the presence of complications. When determining the sequence of operations and choosing access, it is logical to carry out echinococcectomy as the first step in those areas where cysts are most dangerous for developing complications. Under other equal circumstances, it is advisable to start phasing surgical intervention with pulmonary localization.

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