

Surgical Treatment of Pulmonary Hydatid Disease: a Nine-Year Single-Center Experience

Petar Uchikov^{1,2}, Nedzhat Ali¹, Milena Sandeva³, Krasimir Kraev⁴, Krasimira Eneva⁵, Bozhidar Hristov⁶, Mariya Kraeva⁷, Elizabet Dzhambazova⁸, Daniela Taneva⁹, Tihomir Tenchev¹, Angel Uchikov¹

¹ Department of Special Surgery, Faculty of Medicine, Medical University of Plovdiv, Plovdiv, Bulgaria

² St George University Hospital, Plovdiv, Bulgaria

³ Medical Simulation and Training Center, Department of Midwifery Cares, Medical University of Plovdiv, Plovdiv, Bulgaria

⁴ Department of Internal Medicine, Faculty of Medicine, Medical University of Plovdiv, Plovdiv, Bulgaria

⁵ Department of Infectious Diseases, Faculty of Medicine, Medical University of Plovdiv, Plovdiv, Bulgaria

⁶ Second Department of Internal Diseases, Section of Gastroenterology, Faculty of Medicine, Medical University of Plovdiv, Plovdiv, Bulgaria

⁷ Department of Otorhinolaryngology, Faculty of Medicine, Medical University of Plovdiv, Plovdiv, Bulgaria

⁸ Department of Social Medicine and Public Health, Faculty of Public Health, Medical University of Plovdiv, Plovdiv, Bulgaria

⁹ Department of Nursing and Midwifery Care, Faculty of Public Health, Medical University of Plovdiv, Plovdiv, Bulgaria

Corresponding author: Krasimir Kraev, Department of Internal Medicine, Faculty of Medicine, Medical University of Plovdiv, 15A Vassil Aprilov Blvd., 4002 Plovdiv, Bulgaria; Email: kkraev@hotmail.com

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Abstract

Introduction: Hydatidosis is one of the most critical parasitic zoonotic diseases worldwide. Lungs are the second most common site of the disease.

Aim: This study aimed to evaluate the clinical presentation, diagnosis, radiological findings, surgical treatment and post-operative complications of pulmonary hydatid cyst in patients referred to the Second Surgery Clinic at St George University Hospital in Plovdiv, Bulgaria.

Materials and methods: From January 2014 to December 2022, 69 patients were operated on due to pulmonary hydatidosis in the Clinic of Thoracic and Abdominal Surgery at St George University Hospital in Plovdiv, Bulgaria. Demographic data of the patients were collected including clinical symptoms, laboratory studies, radiological findings, location of the lung involvement, and surgical procedures and post-operative complications were recorded.

Results: Pulmonary hydatidosis was confirmed for 69 (46 male and 23 female) patients. The average age of the study group was 31.59 ± 19.49 years. In 29 of the tested patients, specific antibodies of the IgG class to *Echinococcus granulosus* were positive, and 23 patients showed negative results. The leading symptom was non-productive cough followed by shortness of breath, chest pain, fever, productive cough; rash was reported in one patient. 91.3% of the cases presented with a typical X-ray image and in 8.7% it was atypical. It turned out that 66.7% of patients with an atypical X-ray findings developed complications in the postoperative period. Right lung was affected in 50.7% of the cases. The average size of the echinococcal cyst was 7.43 ± 3.23 cm. Statistical analysis revealed a correlation between the size of the hydatid cyst and the length of the postoperative period. Dissemination in other organs was found in 16 of the patients. No statistically significant differences were reported in the patients with dissemination, regarding the size of the primary hydatid cyst, complications and duration of the postoperative period. The preferred methods of approach were thoracotomy and VATS. The most commonly performed surgical technique was echinococectomy and capitonnage a modo Delbet followed by two lobectomies and one wedge resection. The mean postoperative period was 7.00 ± 2.81 days. In 12 of the analyzed patients, complications occurred in the postoperative period, and mortality was reported in one patient.

Conclusion: Pulmonary echinococcosis remains a significant health issue in many countries worldwide including Bulgaria. With a prolonged silent period, it is usually diagnosed when clinical symptoms as cough, dyspnea, chest pain and fever start manifesting. Plain

chest radiography remains the basic imaging method for initial diagnosis while ELISA test has limited diagnostic accuracy in cases of pulmonary hydatidosis. Irrelevant to surgical approach, Delbet's capitonnage procedure is associated with good postoperative results and low complication rates.

Keywords

pulmonary hydatidosis, symptoms, surgical treatment, Delbet's capitonnage procedure

INTRODUCTION

Echinococcosis is a global epidemic zoonotic disease caused by the larval stages of taeniid cestodes of the genus *Echinococcus*.^[1] It is considered a significant health issue in many regions of the world including Bulgaria.^[2] According to the estimations, 19,300 lives and 871,000 disability-adjusted life years are lost worldwide each year due to cystic echinococcosis.^[3] The global burden of controlling the disease exceeds billions US dollars annually.^[4]

There are currently several species of the genus *Echinococcus* recognized^[5] and *E. granulosus sensu stricto* and *E. multilocularis* are the two most widely distributed species causing human cystic echinococcosis (CE) and alveolar echinococcosis (AE), respectively.^[6] *Echinococcus granulosus* is known to be endemic in all continents with the only exception of Antarctica^[5] and with highest incidence in southern South America, the Mediterranean coast, Eastern Europe, North and East Africa, the Near and Middle East, Central Asia, the Indian subcontinent, Russia, China, Mongolia, and Australia.^[2] *Echinococcus multilocularis* has a limited geographical range, typically found in endemic regions in central Europe, northern and central Eurasia, and specific areas in North America.^[2] An epidemiological report for 2021 of the European Centre for Disease Prevention and Control placed Bulgaria amongst the European countries with highest incidence of echinococcosis. Although a decline was observed during the last decades, the disease is still prevalent in all parts of the country and all of the confirmed cases are caused by the *Echinococcus granulosus* species.^[7]

Naturally, the parasite is transmitted between canids and ungulates in a fecal-oral and predator-prey cycle.^[8] Humans act as an accidental intermediate host and most commonly infested organs are the liver (55%–70%) followed by the lung (18%–35%).^[9] The diagnosis is usually radiological, parasitological, and immunological.^[10] Pulmonary hydatid cysts are often solitary and unilateral in distribution, although bilateral involvement and multiple cysts are not unusual.^[11] Frequently, in lung hydatid disease, cysts are located in the lower lobes, more often posteriorly than anteriorly and more often in the right lobes (up to 50% occur in the right lung).^[12] The majority of lung hydatid disease cases are asymptomatic, some may have mild symptoms while some present with more severe clinical manifestation.^[13]

AIM

The aim of this study is to provide a comprehensive evaluation of the clinical presentation, diagnostic approaches, radiological findings, surgical treatments, and post-operative complications in patients diagnosed with pulmonary hydatid cysts at the Second Surgery Clinic of St George University Hospital, Plovdiv, Bulgaria, over a nine-year period from 2014 to 2022.

MATERIALS AND METHODS

Patient selection

The study group consisted of patients who underwent surgery for lung diseases, whether diagnosed or undiagnosed, that showed radiologically cystic or heterogeneous opacity from January 2014 to December 2022. They were studied in a retrospective manner. The medical records of these patients underwent a thorough examination. Both preoperative and postoperative characteristics were documented. The imaging methods were performed by radiologists who had a minimum of 10 years of expertise in the field. Each patient underwent preoperative cardiopulmonary evaluation testing, bronchoscopy and abdominal ultrasonography. A chest radiogram and thoracic computed tomography were also conducted. The anti-*Echinococcus* IgG ELISA test was not regularly conducted for the diagnosis of lung hydatid cyst due to its relatively low sensitivity. However, it was used in cases where hydatid cysts were suspected based on radiological findings.

Surgical approach and technique

All patients underwent general anesthesia. Double lumen tube was used in order to avoid the possible spillage of cyst contents into the contra lateral bronchus. We did not perform single-stage surgery on concurrent bilateral intact pulmonary hydatid cysts. Video-assisted thoracic surgery (VATS) or anterolateral thoracotomy was the preferred method. Although we do not have definite criteria for the choice of the surgical method, thoracotomy was preferred more frequently in lesions bigger than 5 cm and VATS in smaller cysts. After entering the hemithorax, the lung was spared from adhesions of chest wall and then cysts were

identified and surrounded by 5% povidone iodine irrigated abdominal lap to prevent seeding of possible ruptured laminated membrane. Pericyst wall was opened and the germinative membrane was delivered and enucleated. Aspiration and evacuation of intact cysts were performed. Bronchial openings were identified using intrapulmonary positive pressure maneuver and irrigation of saline into the cystic cavity and closed by single silk sutures. All of the cavities were obliterated by imbrication sutures from deep to superficial layers using the same suture material. The preferred surgical technique was capitonnage a modo Delbet. Wedge resection or lobectomy operations were performed according to the pathological evaluation and surgical exploration findings. After insertion of one or two chest tubes 24 or 26 French sizes in the pleural cavity, one in the posterolateral and the other in the upper pleural spaces to drain blood and air, the chest was closed using classic approach. Three or four port incisions were used in patients who underwent VATS. First of all, the cyst or cavity was aspirated, and the lesion wall was incised and explored for the germinative membrane. In the absence of germinative membrane, frozen sections were obtained from the cyst cavity contents and studied for intraoperative and definitive pathological diagnosis

Postoperative follow-up

Postoperatively, most patients were kept in the surgical department. Those with significant comorbidities were transferred to the intensive care unit (ICU) for the first 24 hours. All patients received prophylactic antibiotic therapy with ceftriaxone at 25-30 mg/kg/day perioperatively. Lung expansion status was monitored with a chest X-ray performed the day after surgery. Chest tubes were removed in patients with expanded lungs and no active air or fluid discharge, typically 3-7 days after surgery, following a mandatory air leak test before drain removal. Decisions for reoperation and a second thoracotomy were made 7-10 days postoperatively, or sooner if a massive air leak was present in the chest tubes, indicating a bronchopleural fistula. The day after chest tube removal, patients in stable condition and able to maintain normal daily activities were discharged and instructed to continue with anthelmintic treatment

Statistical analysis

To analyze the data, several statistical methods were employed based on the study's objectives and data characteristics. Descriptive statistics included measures of variation such as standard deviation, minimum, maximum, and range. Frequency analysis was conducted for qualitative variables, presenting absolute and relative frequencies (in percentages), as well as cumulative relative frequencies (in percentages). Graphical representations were also used to illustrate the data.

For hypothesis testing, different methods were applied.

Parametric methods:

– T-test for two independent samples: This test was used to assess whether there is a statistically significant difference between the means of two independent groups.

Non-parametric methods:

– Mann-Whitney U test: Used to compare the mean values between two groups when the distribution is not normal.

– Kruskal-Wallis H test: Applied to compare the average values across three or more groups when the distribution is not normal.

– Chi-square test or Fisher's exact test: Utilized to explore the relationship between two qualitative variables.

– Median Test: Used to compare the medians between two groups of a quantitative variable.

Regression analysis

– Linear regression analysis: it is employed to evaluate potential functional relationships between two or more random variables.

The significance level was set at $\alpha=0.05$, and the null hypothesis was rejected if the p -value was less than α . SPSS version 23.0 was used for data analysis.

RESULTS

This is a retrospective single-center study focusing on a study group consisting of 69 patients operated on due to lung hydatid disease from January 2014 to December 2022 in the Second Surgery Clinic at St George University Hospital in Plovdiv, Bulgaria (**Table 1**).

Table 1. Descriptive characteristics of the study group

Characteristic	Value
Total number of patients	69
Average age (\pm SD)	31.59 \pm 19.49 years
Most common age	12 years
Age range most common	10-19 years (39.1%)
Male patients	46 (66.7%)
Female patients	23 (33.3%)
Positive ELISA results	29 (55.8%)
Negative ELISA results	23 (44.2%)
Average size of cyst (\pm SD)	7.43 \pm 3.23 cm
Size range of cyst	3 cm to 17 cm
Complications	12 (17.4%)
Deaths	1
Duration of postoperative period (\pm SD)	7.00 \pm 2.81 days

The average age of the study group was 31.59 \pm 19.49 years, with the most common age being 12 years. The majority of patients were in the age range of 10-19 years (39.1%). There were 46 (66.7%) male and 23 (33.3%) female

patients, with a male-to-female ratio of 2:1. The average age of females was higher, at 38.04±22.74 years, compared to 28.37±17.00 years for males ($p>0.05$).

In 52 (75.4%) of the cases, specific antibodies of the IgG class to *Echinococcus granulosus* were tested using the ELISA method. Out of these, 29 (55.8%) tested positive, and 23 (44.2%) tested negative. No statistically significant correlation was found between the mean size of the hydatid cyst and the results of the ELISA test ($p>0.05$). The mean size of cysts in ELISA-negative patients was 7.52±3.51 cm, compared to 7.31±3.04 cm in the positive ones, indicating that the cyst size was not related to antibody formation. Of the 69 patients analyzed, 16 (23.2%) had echinococcus dissemination. Notably, 10 (62.5%) of these patients had a positive ELISA result, 3 (18.75%) had a negative result, and 3 (18.75%) were not tested.

The leading symptom in patients with pulmonary hydatid disease was non-productive cough (46, 66.7%), followed by shortness of breath (30, 43.5%), pain (26, 37.7%), fever (22, 31.9%), productive cough (16, 23.2%), and rash (1, 1.4%). Twenty-two (31.9%) had one symptom, 24 (34.8%) had a combination of two symptoms, and 23 (33.3%) had three or more symptoms. There was no statistically significant relationship between the size of the echinococcus cyst and the symptoms manifested. However, a relationship between the number of symptoms and the duration of the postoperative period was demonstrated ($p=0.007$). The lowest average length of stay was observed in patients with one symptom (mean = 6.14±1.58 days), while the highest was in patients with three or more symptoms (mean = 7.83±3.61 days).

In analyzing the localization of the hydatid cyst, there was an even distribution: 34 (49.3%) cases involved the left lung, and 35 (50.7%) involved the right lung. No significant difference was found in the localization of the cysts across different gender and age groups.

The average size of the echinococcal cyst among the study group was 7.43±3.23 cm, with the smallest size being 3 cm and the largest 17 cm. Linear regression analysis revealed a relationship between the size of the hydatid cyst and the length of the postoperative period (multiple $R=0.342$) (Fig. 1). Larger cyst sizes were associated with longer postoperative periods (Sig. $F=0.004$; Sig. $T=0.0001$).

The largest average cyst size was observed in the age group 20-29 years (8.38±2.96 cm), while the smallest was in the age group 30-39 years. A simple T-test revealed a significant difference in mean cyst sizes between these two age groups ($p=0.01$). No statistically significant difference was

found between cyst size and postoperative complications.

Dissemination in other organs was found in 16 (23.2%) of the patients (Table 2). Of these, 11 (68.75%) had dissemination to the contralateral lung, 4 (25%) to the liver, and 1 (6.25%) had simultaneous dissemination to both the contralateral lung and liver.

No statistically significant differences were found in patients with dissemination regarding the size of the primary hydatid cyst, complications, and duration of the postoperative period (Table 3).

Three surgical methods were primarily used: thoracotomy with echinococectomy and capitonnage a modo Delbet (79.7%), VATS with echinococectomy and capitonnage a modo Delbet (14.5%), and lung resection (5.8%) which included two lobectomies and one wedge resection (Fig. 2).

Linear regression analysis revealed a relationship between the size of the echinococcus cyst and the type of operative approach (multiple $R=0.241$) (Fig. 3). Cysts removed via thoracotomy with echinococectomy and capitonnage a

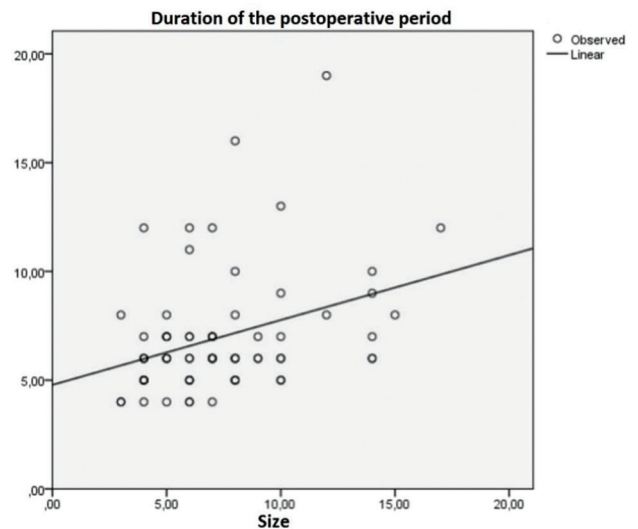


Figure 1. Linear regression between echinococcal cyst size and length of postoperative period.

Table 2. Dissemination of *Echinococcus* in other organs

Dissemination	N	%
Contralateral lung	11	68.75%
Liver	4	25%
Contralateral lung and liver	1	6.25%

Table 3. Comparative analysis of patients according to dissemination status

	Dissemination cases X±SD	Cases with no dissemination X±SD	<i>p</i>
Size of the primary hydatid cyst	7.19±3.41	7.51±3.21	NS
Postoperative period duration	7.81±2.51	6.75±2.88	NS
Complications	N (%) 5 (31.3%)	N (%) 7 (13.2%)	NS

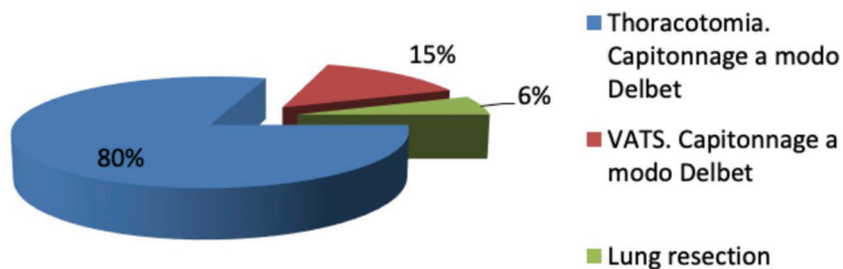


Figure 2. Percentage distribution of applied surgical interventions.

modo Delbet had the largest mean size (7.89 ± 3.21 cm) (Sig. $F=0.04$; Sig. $T=0.04$) (Fig. 3).

A statistically significant difference was found regarding size, age, and duration of the postoperative period. A simple T-test showed a significant difference in the average age between the studied groups ($p=0.003$). The lowest average age was observed in the thoracotomy group with echinococectomy and capitonnage a modo Delbet (29.98 ± 19.30 years), and the highest in the lung resection group (53.50 ± 19.39 years). The longest postoperative period was observed in

the lung resection group (8.25 ± 3.30 days), and the shortest in the VATS group with echinococectomy and capitonnage a modo Delbet (6.00 ± 1.41 days) (Table 4).

Although no statistically significant difference was reported ($p>0.05$), the thoracotomy group experienced the most complications and the need for rethoracotomy. The mean postoperative period, regardless of the type of surgery performed, was 7.00 ± 2.81 days, with a minimum of 4 days and a maximum of 19 days (Fig. 4). Notably, the shortest postoperative period was observed in the 20-29 years age

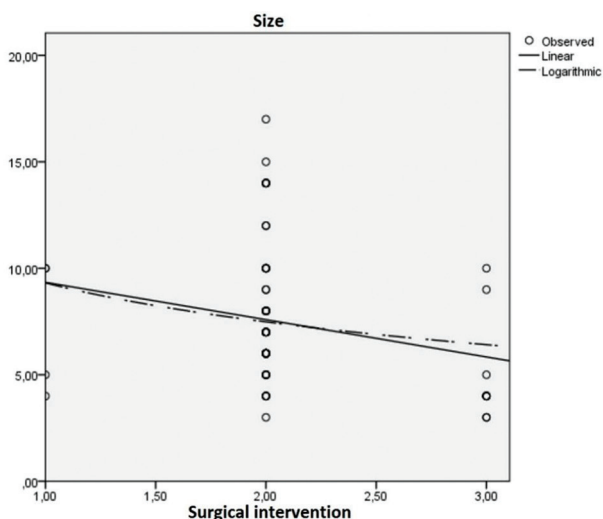


Figure 3. Linear regression between the size of the echinococcal cyst and the type of operative approach used.

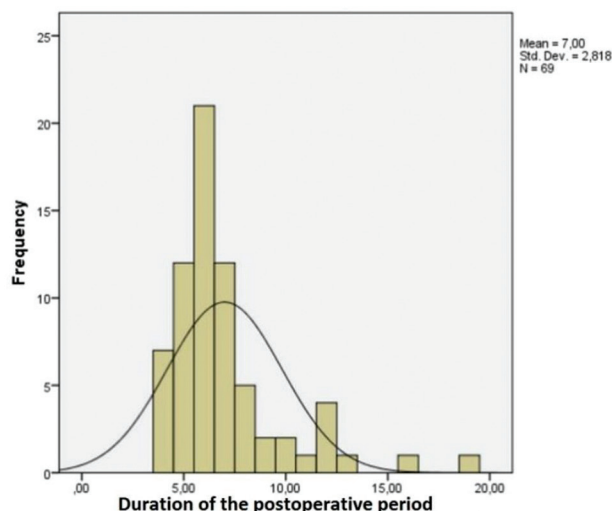


Figure 4. Average duration of the postoperative period.

Table 4. Duration of the postoperative period according to the type of surgical intervention

	Mean	Standard deviation /X±SD/	Min.	Max.	P
Thoracotomy					
Echinococectomy	7.09	2.95	4	19	0.03
Capitonnage a modo Delbet					
VATS					
Echinococectomy	6.00	1.41	4	8	-
Capitonnage a modo Delbet					
Lung resection	8.25	3.30	6	13	0.001

group, while the longest was in the 40–49 years age group. This could be explained by the fact that most complications were observed in the 40–49 years age group (30.8%).

In 12 (17.4%) of the analyzed patients, complications occurred in the postoperative period, and death was reported in one patient (Table 5).

Table 5. Complications observed in the postoperative period

Complications	N	%
Pleural empyema	4	33.33%
Hydropneumothorax	4	33.33%
Hemopneumothorax	1	8.33%
Pneumonia	1	8.33%
Prolonged air-leak	1	8.33%
Pneumothorax, encapsulate	1	8.33%

Three patients with complications required rethoracotomy, and one required re-rethoracotomy. The X-ray image was typical in 63 (91.3%) cases, with no diagnostic difficulties. In 6 (8.7%) cases, it was atypical, requiring a contrast-enhanced CT of the chest for diagnosis. It was found that 66.7% of patients with an atypical X-ray finding developed postoperative complications. A statistically significant relationship was found between an atypical X-ray image and the occurrence of complications ($p=0.001$; $r=0.37$). The strength of the relationship between these variables was medium (Cramer's $V=0.401$). The probability of developing a postoperative complication in patients with an atypical X-ray image was 13.75 times greater compared to those with a typical X-ray finding (OR=13.75; 95% CI [2.16 – 87.65]).

DISCUSSION

Surgical approach

Surgery is universally recognized as the primary treatment for lung hydatid cysts worldwide. The surgical technique is determined by various aspects including the cyst's size, whether it is intact or complicated, if it affects one or both sides, whether it is solitary or multiple, and whether it has caused damage to the lung tissue.^[14] Commonly, thoracotomy is the preferred surgical approach for the treatment of lung hydatidosis. Median sternotomy is also accepted to be useful for the treatment of bilateral anterior hydatid cysts.^[15,16] Recently, minimally invasive thoracoscopic techniques have been shown to be a viable and secure therapeutic option, particularly for addressing tiny and peripheral cysts.^[14–16] With reported advantages of VATS associated with shorter surgical time, decreased length of hospital stay, lower experienced pain, and reduced surgical morbidity.^[17,18] Regardless of the surgical approach the principle of curative treatment is to completely remove

the cyst, prevent extravasation of cyst fluid, avoid allergic reaction and dissemination, and preserve normal pulmonary tissue to the greatest extent.^[1]

Surgical technique

The surgical techniques for treating pulmonary hydatid disease, as described in the literature, encompass various procedures such as complete internal capsule extraction, internal capsule puncture extraction, complete internal and external capsule resection, segmental pulmonary resection, lobectomy, pneumonectomy, and thoracoscopic pulmonary hydatid surgery.^[19] Due to the variability of pathology in lung hydatidosis cases, a universal surgical approach cannot be recommended. However, regardless of the chosen technique, the principle of curative treatment is to completely remove the cyst, prevent fluid extravasation, avoid allergic reactions and dissemination, and preserve normal pulmonary tissue as much as possible.^[1,15,16] Lung resections are rarely needed, and parenchyma-sparing procedures are preferred, although segmentectomy, lobectomy, or even pneumonectomy may occasionally be required.^[20]

Different surgical techniques are used for cyst removal. The Ugon enucleation technique is suitable for small cysts, where the space around the lesion is fixed with packs saturated with a scolicidal agent (povidone-iodine or hypertonic saline). An opening is created over the fibrous layer, revealing the white-colored laminated membrane.^[14,16] Positive pressure ventilation is applied by the anesthesiologist to expel the cyst from the cavity. The remaining cavity is irrigated with isotonic saline, and any air leaks are closed with non-absorbable stitches.^[15]

Cystotomy with capitonnage (Barrett method) involves an incision through the lung parenchyma, dissection of the cyst, and positive pressure ventilation. The cavity walls are then closed using non-absorbable sutures. Delbet first described the capitonnage method, involving the folding of the pericyst with circular sutures.^[21] The Posadas method is similar to Barrett's procedure but includes suturing airway openings on the cavity's surface before capitonnage. The Perez-Fontana method of pericystectomy involves removing the hydatid cyst along with the pericyst, which is adhered to the normal lung parenchyma.^[16] Since the pericyst forms as a host tissue response, its removal is not always necessary and can result in prolonged air leakage.^[20]

The Figuera technique uses needle aspiration for cyst extraction. To avoid contamination, towels saturated with povidone-iodine are placed around the cyst, and the fluid is aspirated before the cyst is removed.^[14,16] If the cyst cannot be completely removed, protoscolicidal agents should be used as a complementary treatment, especially with procedures like sub-total cystectomy or the percutaneous PAIR technique.^[22] Among the various surgical techniques, cystotomy with capitonnage is the most preferred.^[23] Combining this technique with postoperative anti-hydatid drug therapy can provide good therapeutic results.^[24] Parenchyma-preserving surgery is favored over anatomical resections, even in cases

of giant cysts, due to acceptable rates of postoperative complications such as atelectasis, infection, and air leaks.^[25,26,27] The decision for resection is made intraoperatively based on lung expansion after cyst excision. Indications for lobectomy include large cysts occupying more than 50% of the lobe, multiple cysts, and unexpandable lobes.^[14-16]

In the literature, the lobectomy rate varies between 0.5% and 45%.^[15] Cyst enucleation is considered safe even with up to 70% lobe involvement.^[28] The effectiveness, mortality rate, and recurrence risk vary across surgical treatments. The Ugon approach has an efficacy rate of 95%, with a mortality rate below 1% and recurrence rates of 2-4%. Cystotomy with capitonage and sealing bronchial apertures share an efficacy rate of 98%-99%, with low mortality (<1%) and an acceptable recurrence rate (1%-2%).^[29,30-32] Capitonage is also associated with reduced rates of prolonged air leak and shorter postoperative chest tube drainage and hospital stay.^[30]

As the cyst diameter increases, more complications are expected, including prolonged air leakage and atelectasis in large cysts (>10 cm). Intraoperative rupture of cysts can lead to life-threatening anaphylactic shock, with mortality rates between 0% and 23.5%.^[33-35] In such cases, steroids and octreotide infusion should be administered.^[15] Recurrence is typically caused by the spillage of protoscolex-rich fluid during surgery or inadequate elimination of protoscolexes and germinal membranes during percutaneous procedures.^[22] Therefore, the use of protoscolecidal agents is crucial to minimize recurrence risk.^[36] The WHO-IWGE currently recommends using 20% hypertonic saline or 95% alcohol in PAIR procedures.^[37] While surgery remains the treatment of choice for hydatid disease, medical management is an option for patients with recurrent cysts, multiorgan disease, or those who cannot undergo surgery.^[38] Albendazole and mebendazole are the only effective medications for interrupting the larval growth of *Echinococcus spp.* Combining albendazole and praziquantel as chemoprophylaxis before surgery is considered more effective than either treatment alone and may potentially shorten the treatment duration.^[39,40]

CONCLUSIONS

Pulmonary echinococcosis remains a significant health issue in many countries worldwide including Bulgaria. With a prolonged silent period, it is usually diagnosed when clinical symptoms as cough, dyspnea, chest pain and fever start manifesting. Plain chest radiography remains the basic imaging method for initial diagnosis while ELISA test has limited diagnostic accuracy in cases of pulmonary hydatidosis. Irrelevant to surgical approach, Delbet's capitonage procedure is associated with good postoperative results and low complication rates.

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Competing Interests

The authors have declared that no competing interests exist.

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Хирургическое лечение эхинококкоза лёгких: девятилетний опыт одного центра

Петар Учиков^{1,2}, Неджат Али¹, Милена Сандева³, Красимир Краев⁴, Красимира Енева⁵, Божидар Христов⁶, Мария Краева⁷, Елизабет Джамбазова⁸, Даниела Танева⁹, Тихомир Тенчев¹, Ангел Учиков¹

¹ Кафедра специализированной хирургии, Факультет медицины, Медицинский университет – Пловдив, Пловдив, Болгария

² Университетская больница „Св. Георги“, Пловдив, Болгария

³ Медицинский симуляционный тренировочный центр, Кафедра „Акушерское дело“, Медицинский университет – Пловдив, Пловдив, Болгария

⁴ Кафедра внутренних болезней, Факультет медицины, Медицинский университет – Пловдив, Пловдив, Болгария

⁵ Кафедра инфекционных болезней, Факультет медицины, Медицинский университет – Пловдив, Пловдив, Болгария

⁶ Вторая кафедра внутренних болезней, Секция гастроэнтерологии, Факультет медицины, Медицинский университет – Пловдив, Пловдив, Болгария

⁷ Кафедра оториноларингологии, Факультет медицины, Медицинский университет – Пловдив, Пловдив, Болгария

⁸ Кафедра „Социальная медицина и общественное здравоохранение“, Факультет общественного здравоохранения, Медицинский университет – Пловдив, Пловдив, Болгария

⁹ Кафедра сестринского и акушерского дела, Факультет общественного здравоохранения, Медицинский университет – Пловдив, Пловдив, Болгария

Адрес для корреспонденции: Красимир Краев, Кафедра внутренних болезней, Факультет медицины, Медицинский университет – Пловдив, бул. „Васил Априлов“ № 15А, 4002 Пловдив, Болгария; E-mail: kkraev@hotmail.com

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Резюме

Предыстория: Эхинококкоз является одним из наиболее серьёзных паразитарных зоонозных заболеваний во всём мире. Лёгкие являются вторым по распространённости местом заболевания.

Цель: Целью данного исследования была оценка клинической картины, диагностики, рентгенологических данных, хирургического лечения и послеоперационных осложнений лёгочной эхинококковой кисты у пациентов, направленных во Вторую хирургическую клинику университетской больницы „Св. Георги“ в Пловдиве, Болгария.

Материалы и методы: С января 2014 года по декабрь 2022 года 69 пациентов были прооперированы по поводу лёгочного эхинококкоза в Клинике торакальной и абдоминальной хирургии университетской больницы „Св. Георги“ в Пловдиве, Болгария. Были собраны демографические данные пациентов, включая клинические симптомы, лабораторные исследования, рентгенологические данные, место поражения лёгких, а также хирургические процедуры и послеоперационные осложнения.

Результаты: Лёгочный эхинококкоз был подтверждён у 69 пациентов (46 мужчин и 23 женщины). Средний возраст исследуемой группы составил 31.59 ± 19.49 лет. У 29 обследованных пациентов специфические антитела класса IgG к *Echinococcus granulosus* были положительными, а у 23 пациентов результаты отрицательные. Ведущим симптомом был непродуктивный кашель, за которым следовали одышка, боль в груди, лихорадка, продуктивный кашель; у одного пациента была отмечена сыпь. В 91.3% случаев наблюдалась типичная рентгенологическая картина, в 8.7% – атипичная. Оказалось, что у 66.7% пациентов с атипичной рентгенологической картиной в послеоперационном периоде развились осложнения. Правое лёгкое было поражено в 50.7% случаев. Средний размер эхинококковой кисты составил 7.43 ± 3.23 см. Статистический анализ выявил корреляцию между размером эхинококковой кисты и длительностью послеоперационного периода. У 16 пациентов была обнаружена диссеминация в другие органы. Не было зарегистрировано статистически значимых различий у пациентов с диссеминацией относительно размера первичной эхинококковой кисты, осложнений и продолжительности послеоперационного периода. Предпочтительными методами доступа были торакотомия и VATS. Наиболее часто применяемой хирургической техникой была эхинококкэктомия и капитонаж по методу Delbet с последующими двумя лобэктомиями и одной клиновидной резекцией. Средний послеоперационный период составил 7.00 ± 2.81 дня. У 12 из проанализированных пациентов в послеоперационном периоде возникли осложнения, а у одного пациента была зарегистрирована летальность.

Заключение: Эхинококкоз лёгких остаётся значительной проблемой здравоохранения во многих странах мира, включая Болгарию. При длительном периоде затишья он обычно диагностируется, когда начинают проявляться клинические симптомы, такие как кашель, одышка, боль в груди и лихорадка. Простая рентгенография грудной клетки остаётся основным методом визуализации для первоначальной диагностики, в то время как тест ELISA имеет ограниченную диагностическую точность в случаях эхинококкоза лёгких. Независимо от хирургического подхода процедура капитонажа по Delbet связана с хорошими послеоперационными результатами и низким уровнем осложнений.

Ключевые слова

лёгочный эхинококкоз, симптомы, хирургическое лечение, капитонаж по Delbet